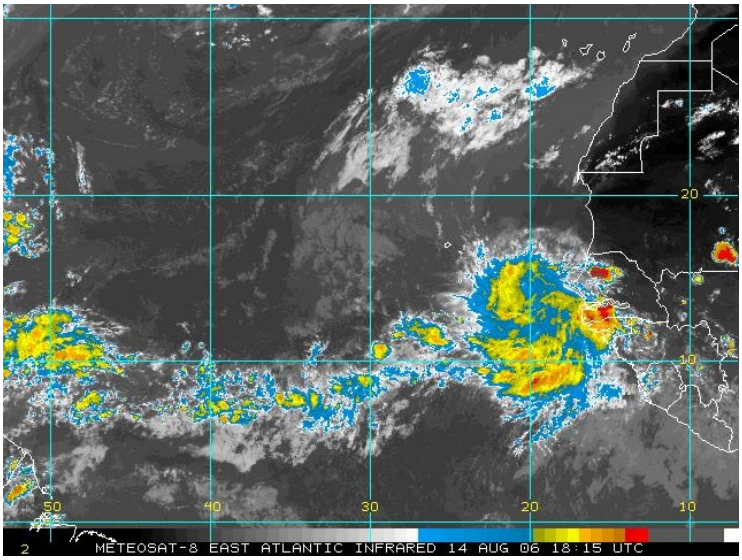
NAMMA – TOGA Radar Scientist Log – Part 1 of 2

15 August

00Z: Gustavo in the radar. NAMMA dataset officially starts using NAMMA_Far scan sequence. However, data has been somewhat continually collected today since 16:20Z (15:20 local time). Reliability of data sequence is questionable until we re-acquaint ourselves with SIGMET as we have changed the scanning modes multiple times. Weatherwise we have an approaching tropical wave moving off the coast of Africa. The airport in Dakar was closed (and stranded here in Praia some of the technicians going there to setup N-pol). Latest information from the NHC indicated a low-pressure system with 1009 mb, which could potentially develop into a tropical depression within the next few hours. At the lower PRF setting of the surveillance scans we are able to see some 30 dBZ echoes nearly 200 km E-SE of Praia moving at approximately 5 m/s. Some echoes seem to be dissipating. The other weather feature presently observed is a NW-SE oriented convergence boundary that developed 100 km SW of Praia and is moving SW-ward roughly at 40-50 km/h.



02Z: Some of the cloudiness from the tropical wave has reached the central-south part of Maio. This SW-NE oriented cluster is moving towards the NW at approx. 40 km/h. Reflectivities are relatively low throughout the cluster (~ 15-25 dBZ) with the strongest Zs in the northern edge of the cluster, which is located between Maio and Boavista. The convergence boundary continues to propagate away from Praia. More echoes continue to move into the surveillance scan domain from the SE quadrant.

04Z: The nearby cluster has dissipated. Several low reflectivity echoes continue to fill the screen between 90 and 180 degrees.

06Z: Echoes with reflectivities up to 45 dBZ continue to move W-NW. The closest echoes are found about 180 km S-SE of Praia. Weather is foggy and misty here. Some drizzle was observed outside the radar around 06:30Z. The

radar did show a small feature moving along the south side of Sao Tiago around that time.

08Z: One of the clusters found to the S-SE of the radar seems to have started to develop a few convective cells, particularly in the northern end of the cluster. Some of these cells, which are found about 75 km south of Praia, have developed reflectivities in excess of 50 dBZ.

09:30Z: Since no tall echoes were observed near the radar in the last 12 hours, the NAMMA_Far sequence was used the entire night shift. Gustavo out.

10Z: Cifelli on duty. We are operating on a 10 minute repeat cycle which includes a 1 tilt surveillance scan (NAMMA_SURV) and one of the following volume scans: NAMMA_FAR, NAMMA_NEAR, NAMMA_EVAD, or NAMMA_SECA and NAMMA_SECB. Current settings of each "task" include:

NAMMA_SURV (0.8 deg)

PRF	# samples	PW	Max range	Unambig. range	Unambig. Vel.	Bin space	Log filter	Sig Filter *	CSR Filter *	SQI Filter *	Speckle
500	50	2	272.5	299.8	6.7	150	2.8 dB	5 dB	25 dB	0.30 dB	Z,V

Data fields collected: T (all pass –raw), *Z (log and CSR applied), *V (SQI and CSR applied), and *W (SQI, LOG, and CSR applied). These settings are taken from Wallops scan set.

NAMMA_FAR (0.8, 1.3, 1.8, 2.3, 3.4, 4.5, 5.7, 6.9, 8.2, 9.6, 11.3, 13.0, 15.0, 17.2, 19.8, 22.5, 26.5, 29.5)

PRF	# samples	PW	Max range	Unambig. range	Unambig. Vel.	Bin space	Log filter	Sig Filter *	CSR Filter *	SQI Filter *	Speckle
1000	64	0.8	150	150	13.4	150	2.8 dB	5 dB	25 dB	0.30 dB	Z,V

*same data fields collected and filters applied

NAMMA_NEAR (0.8, 1.5, 2.3, 3.4, 4.5, 5.7, 6.9, 8.2, 9.6, 11.3, 13.0, 15.0, 17.2, 19.8, 22.5, 26.5, 33.0, 39.0, 45.8, 53.4) – all other settings same as NAMMA_FAR

NAMMA_EVAD (0.8, 1.5, 3.2, 5.5, 7.9, 10.3, 12.7, 15.1, 17.6, 20.0, 22.6, 25.1, 27.8, 30.5, 33.2, 36.1, 39.1, 42.2, 45.4, 48.9, 53.4) – all other settings same as NAMMA_FAR

NAMMA_SECA and NAMMA_SECB – same as NAMMA_FAR except only 120 deg PPI.

SURV and FAR are the default scans to run. If echo gets close (within about 30 km) and we are not topping it, switch to NEAR (preserves low level resolution but can go up to 53 deg). EVAD is only to be used when we have nearly full echo coverage surrounding the radar. SECA and SECB are designed to run

back to back when aircraft are flying – they replace the FAR scan with higher temporal resolution.

Issues: need to verify the filter and speckle settings (SIGMET defaults are: log=0.8 dB, SIG=5 dB, CSR=18 dB, and SQI=0.40. SIGMET description of filters: LOG – average log channel power in dB compared to threshold level. Data passed if greater than threshold. SQI – measure of coherence of Doppler power in linear channel. 0=white noise, 1 = perfectly coherent Doppler target. SQI > about 0.4 needed to measure V and W. Data is passed if it exceeds the threshold. CSR- compares ground clutter power to meteorological signal in the Doppler channel. If data is < than threshold, it is passed. SIG – signal to noise corrected for clutter. If data > threshold, it is passed.

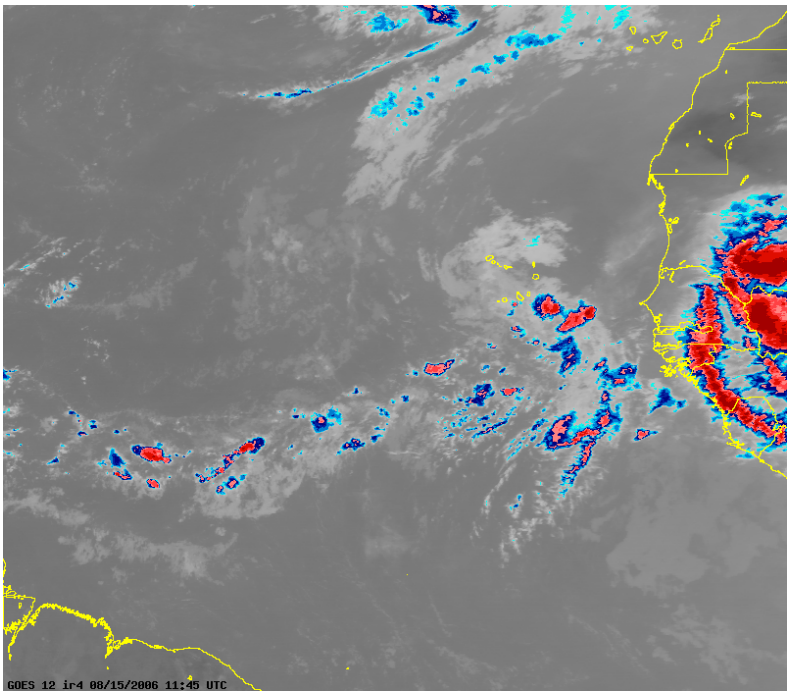
Need to sort out whether long pulse (500PRF) surv scan is calibrated. The unambiguous range is less than max range on this scan – Nathan thinks this is due to large number of bins. May want to try using shorter pulse for this scan but will leave as is for now.

Also, am debating whether to modify the lowest angles in the far to improve resolution for rain mapping. For now, will keep as is. There is a lot of speckle in the surv scan that is not visible in the short pulse scans. Bowie thinks this has something to do with the LNA and the slight change in power/noise level between these scans. Also, dynamic angle syncing is currently on. I need to find more information about this feature but, as I recall, it slows down the antenna when there is an abundance of echo so that the processor does not drop data. We will need to make sure that we do not get out of sync on the 10 minute schedule with this feature.

We have a good view of precipitation from about AZ 60-260. There is significant blockage over azimuth sectors corresponding to Maio (NE), Fogo (W), and higher peaks of Sao Tiago (NW).

11Z: Broad mass of stratiform echo continues to advect from the SE toward the NW. Most of this mass is > 100 km range to our SE. However, over the last hour, we have several linear lines developing in the SE-SW quadrant within 50-100 km range of TOGA. One line (oriented NW-SE with major echo flow) is relatively weak with tops < 8 km. The other line (oriented ~E-W) is more intense with low level reflectivities > 50 dBZ and tops between 10-13 km. Have also observed several small scale vortices embedded within the mean flow: these were quite distinct in 1 km CAPPIs - weaker but still apparent in 6 km CAPPI.

Lots of 2nd trip echo showing up in low level elevation sweeps.



12Z: E-W line is expanding. Now covering over 100 km in length about 50 km S-SW of the site. Activity continues to move W-NW.

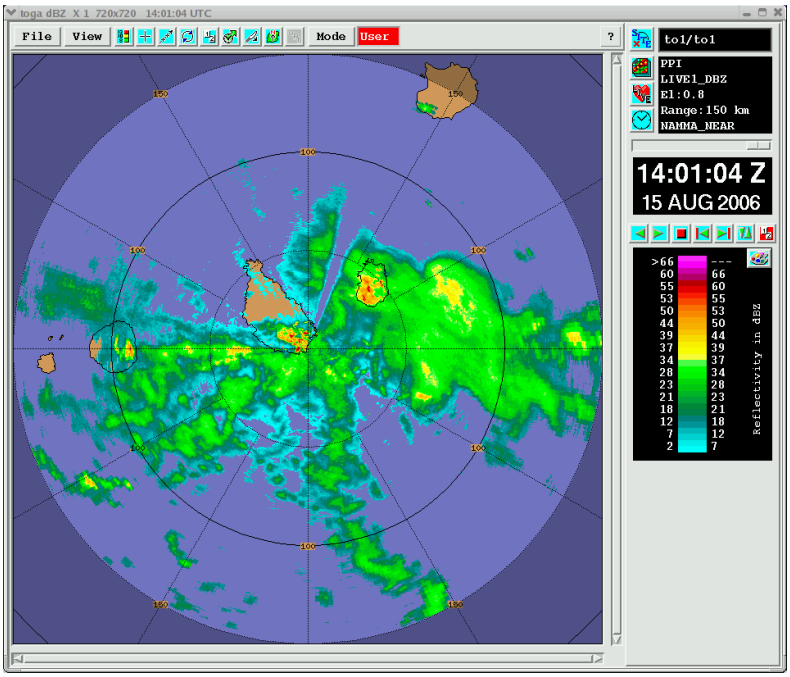
12:50Z: log filter was changed to 0.8 in FAR scan – too much noise – switching back to 2.8 setting

13:30Z: echo coverage continues to increase. Switching to NAMMA_NEAR. Also bumped up the log setting in NAMMA_SURV to 2.9.

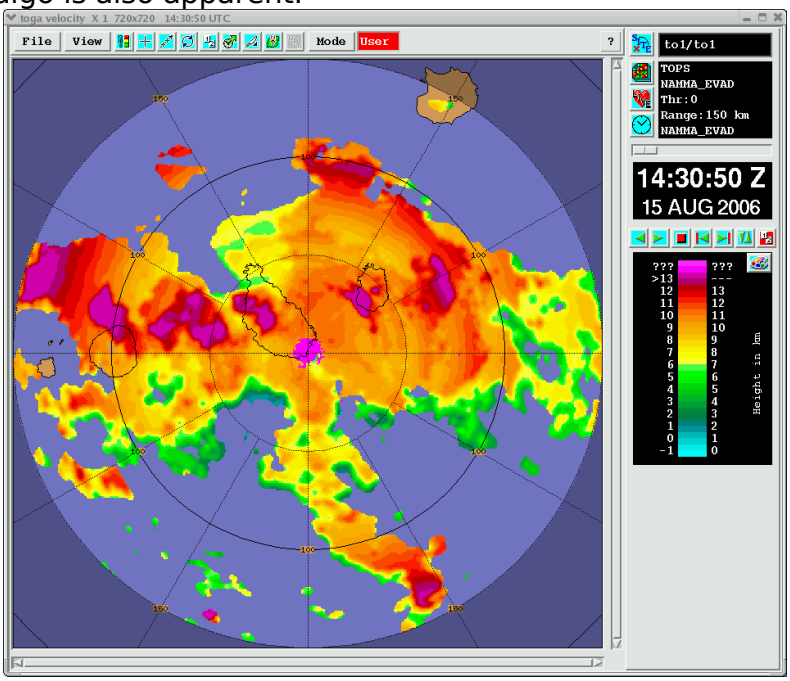
13:40Z: rain at site.

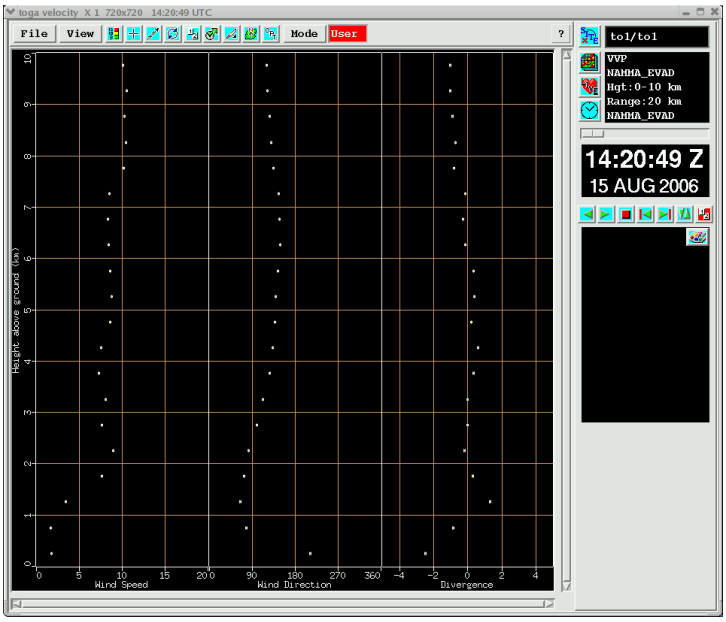
13:50Z: Changed the log on the SURV to 3.0. Nice echo tops to the west about 50 km distant (12-13 km deep). Ragged stratiform coverage surrounding the radar.

14:20Z: starting some EVADs – bright band pretty coherent around radar.



Note: echo over Fogo Island (west) and Maio (NE) is clutter. Blockage to NW-NE on Sao Taigo is also apparent.





14:50Z – dropped the EVAD scan – cable loose in the RCP.

15:00Z – back on line. Wind profile shows some veering in the low levels 0 backing above. Southerly near the surface. Mostly easterly above. Much of echo is passing north of us now…

15:20Z: switching back to NAMMA_NEAR. Chopped off the last part of the EVAD to stay on schedule. Having trouble the last 2 scans since the RCP was reset. Seems to be OK now…

16:20Z – With the exception of one feature ~ 40 km to the SE, most activity has moved off to the NW (Deepest echo region passing just north of Fogo island now). Feature to SE is building, with tops approaching 11 km and reflectivities of 45+ dBZ. Some hints of cyclonic circulation evident as well.

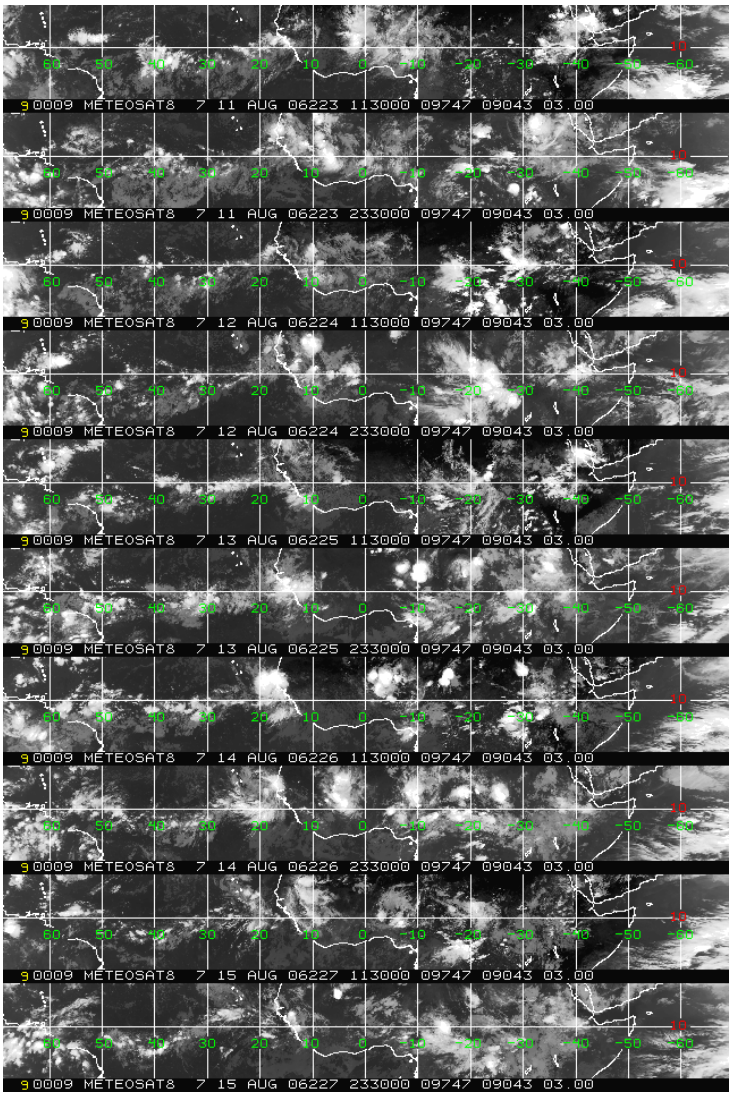
17Z: nice line of echoes developing over northern part of Sao Tiago and extending west – moving w-nw. Tops over 12 km but reflectivities are < 45 dBZ – very oceanic. Activity decreasing overall.

17:40Z – back to NAMMA_FAR. I have created a suite of CAPPI, PPI, MAX, TOP, RAIN (24 hr) and VVP products on TOGA1.

20Z – radar going down for reboot and noise check

20:30Z – back up in surv/far mode. Few echoes NE but most of the action is > 150 km south of us now.

22:22Z - cells north to 60deg. 30 –100 km out dBZ in +40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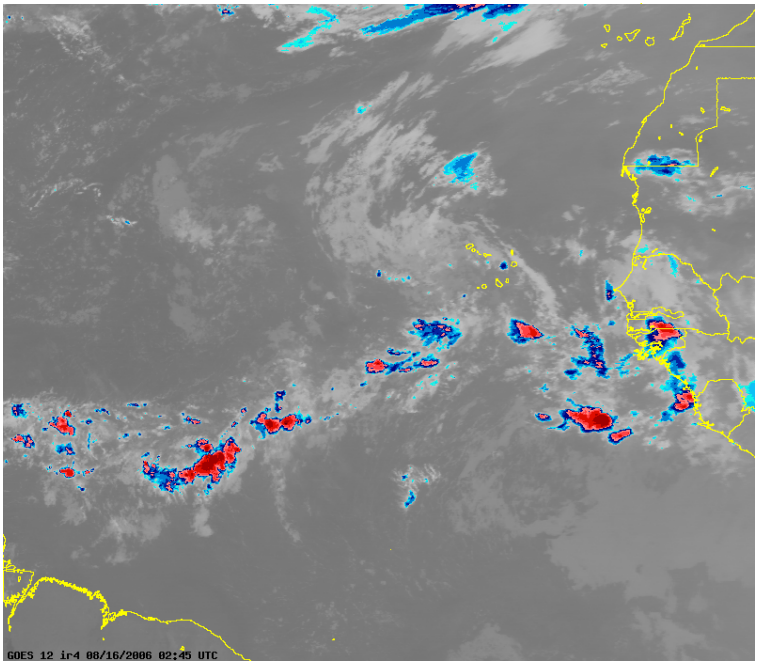
16 August



07:20Z – new area of cells to the south

09Z: Cifelli on shift (somewhat recovered from bad food episode). Current work shifts: (08:30-2030L Cifelli and Gears; 20:30:0830L Pereira and Bowie).

Weak echo activity continues to our south but appears to be decreasing over time. We're still having some network issues with various computers in the seatainers but Nathan is working on it and assures me that all the raw files are indeed being archived in 2 places (TRMM-linux2 and TRMM-linux1). I tried booting the group laptop off of the portable disk but cannot get any kind of terminal window to work and cannot bring up a browser for using the "elog". Therefore, it's probably best to continue to use WORD for the science log.

As far as products go, it appears we now have most of the standard products configured properly and they are being generated on trmm-linux1 from the raw files sent over from toga1. I still do not know why the "site" in the product scheduler on trmm-linux 1 keeps defaulting to np1 – that needs to be resolved. Today I would like to continue testing the surveillance scan with higher thresholding to remove all the speckling as well as start configuring a process to generate image files of all the products (cappi's ppi, etc) for later perusal.

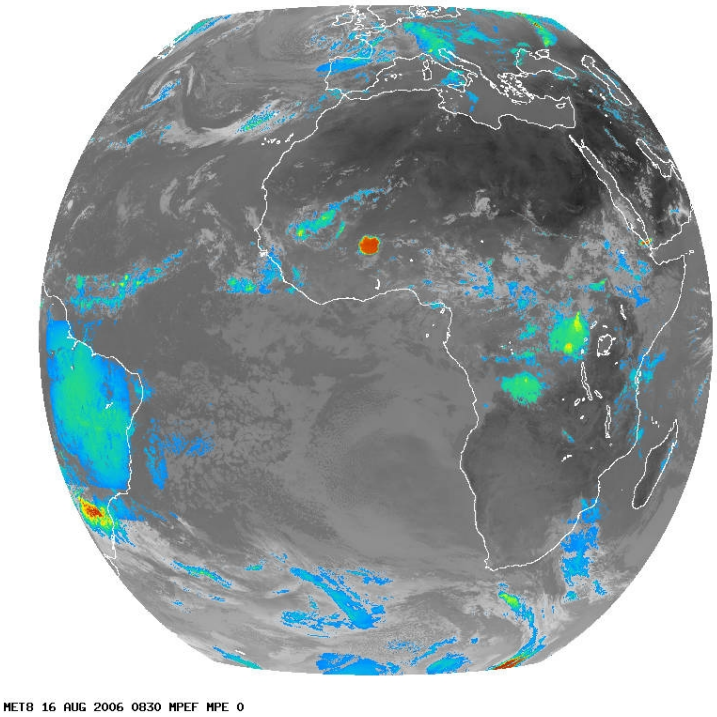
Latest NHC discussion:

..TROPICAL WAVES...
AN ATLANTIC OCEAN 1012 MB SURFACE LOW PRESSURE CENTER IS SW OF
THE CAPE VERDE ISLANDS NEAR 13N27W MOVING WEST 10 TO 15 KT.
CONVECTION NEAR THIS LOW IS LIMITED WITH ONLY ISOLATED SHOWERS

AND TSTMS NOTED IN THE VICINITY.

AN ATLANTIC OCEAN TROPICAL WAVE IS ALONG 39W SOUTH OF 21N MOVING WEST NEAR 10 KT. THIS WAVE CONTINUES TO EXHIBIT A CLASSIC INVERTED V PATTERN BUT CONVECTION REMAINS LIMITED N OF THE ITCZ AXIS NEAR 10N. SCATTERED MODERATE CONVECTION IS NOTED SOUTH OF THE ITCZ FROM 4N-8N BETWEEN 37W AND 42W.

...THE ITCZ...
ITCZ IS CENTERED ALONG 16N16W 13N35W 10N38W 10N41W AND INLAND OVER SOUTH AMERICA TO NEAR 9N69W. VERY LITTLE SHOWER/TSTM ACTIVITY IS NOW NOTED NEAR THE ITCZ OFF THE COAST OF AFRICA. CLUSTERS OF SCATTERED MODERATE CONVECTION LIE FROM 10N TO 12N BETWEEN 28W AND 32W...AND FROM 4N TO 9N BETWEEN 35W AND 50W. ISOLATED SHOWER AND TSTM ACTIVITY IS NOTED ELSEWHERE WITHIN 200NM OF EITHER SIDE OF THE AXIS.



11:40 UTC – testing CSR and log thresholds for SURV scan (keeping surv-far sequence running). Have been observing the development of a weak line of echoes about 50 km south of the radar oriented roughly E-W coming together. This feature is intensifying. At this time echo tops are < 9 km and max reflectivities < 45 dBZ.

12:10 UTC: Settling on log 3.7 CSR 18 for the surveillance scan.

Jose Levy from the Meteorology Service in Praia stopped by. If we need anything, we can contact the Met service at 2617891 (Jose's number is 2815444).

12:40Z – tried a FAR scan with Z,V speckling off. Do not see any degradation of real echoes by using this feature (not using the filter increases specking quite a bit as expected). Re-applied specking thresholds for 12:50 scan and all future scans.

14Z: echo line has mostly dissipated. Few echoes far south 150 km.

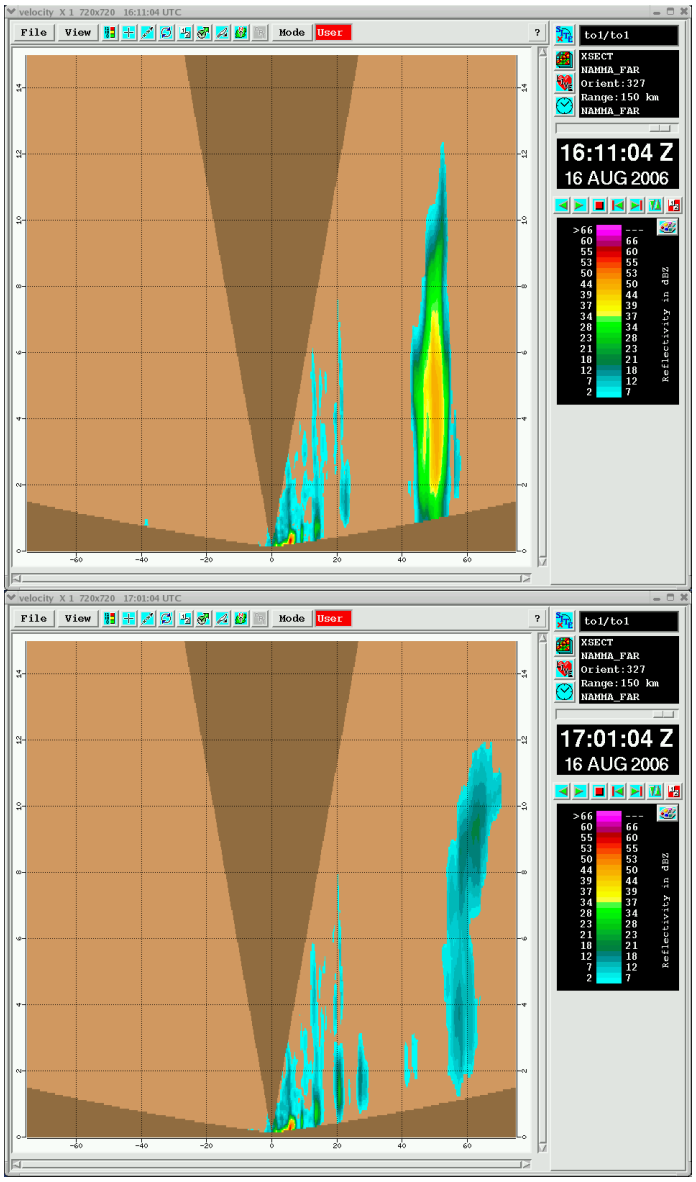
Believe I now have the data generation/archival thing worked out. Raw files are generated on TOGA1 and pushed to both TRMM LINUX 1 and TRMM LINUX 2. The raw files are written to DVD (2 separate DVDs) on TRMM LINUX 2 and to the LDA (RAID) on TRMM LINUX 1. Currently (15Z), there are 592 raw files on the LDA and 590 raw files on the DVDs (~2.7 GB). The 2 file difference was due to some testing done yesterday but otherwise these two archives should have the same number of files (connect to the appropriate machine from IRIS menu and check the archive listing). Derived products (cappi's etc) are generated only on TRMM LINUX 1. These files are being stored on disk right now and will eventually be written over. The plan is to make jpg's of all of them and save those image files only. Also will have to convert the raw to UF but that can probably wait until our laptop arrives with Brad next week.

Side lobes on Maio and Sao Tiago are fairly extensive (~15 deg. For Maio and > 180 deg. For Sao Tiago).

15:30Z: few cells developing on north Sao Tiago – curious if this is a land based diurnal cycle (recall this development yesterday). At this point, fairly weak (tops to ~ 8 km) but cells now appear to be intensifying.

16Z – cell tops on north end of island with tops near 10 km. X-section tool indicates 30+ dBZ to over 6km so I assume these echoes are producing lightning.

17Z – cells move over the water and quickly die.



To mount a USB stick to TRMM LINUX 1, become super user (password: W@tl1783) and type: mount /dev/sdc1 /mnt/jumpdrive (type umount /dev/sdc1 /mnt/jumpdrive when done). From there, you can copy data to the USB stick using: " cp file.png /mnt/jumpdrive".

19Z: Cyclonic circulation evident in weak echo pattern 100-200 km SW of site.

21:30Z: Gustavo is back from his Salmonella scare. Mayo is bad, mm'kay. Not many echoes out there. The majority of them are concentrated in the SW quadrant, just south of Fogo. Cyclonic circulation is still evident, although most echoes seem to be dissipating. A linear feature with approximately 50 km in length seems to be the only developing echo at the moment. That line is propagating N-NE towards Sao Tiago and has some cells with reflectivities in excess of 45 dBZ.

17 August

00Z: The former linear echo continues to move northward … slowly (~4 m/s). It has lost most of its organization, with some cells actually moving in the opposite direction and feeding off the outflow from that line. The nearest echoes are now 30 km SW of the radar, but they are still being easily topped by NAMMA_Far. It seems that the strongest echoes (~ 45 dBZ) from that cluster continue to linger around 50 km.

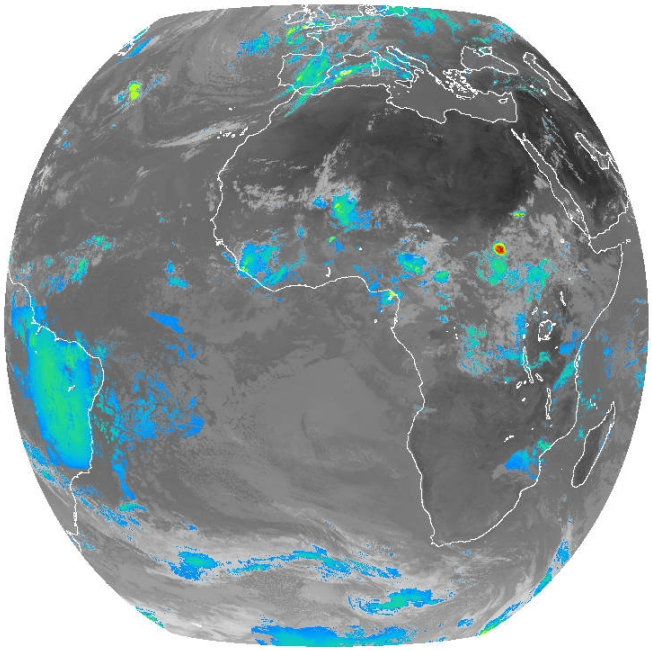
02Z: Small convective cells formed and dissipated to the S-SE within the last hour. The cluster with cyclonic circulation continues to move. The western edge of the circulation seem to have developed a E-W line just a few km south of Fogo. Some of the cells have 40 dBZ cores reaching up to 40 dBZ. No lightning was seen in that direction from the radar site. Skies in Praia are clear.

04Z: Bob observed a few lightning flashes to the S-SW approx. 30 minutes ago. Interestingly, the only convection that was present south of Fogo has decayed in the last 2 hours. The cluster that I have been following in the last few hours does not show much promise, as it seems to be fairly shallow (i.e. tops below 4 km). Most of these cells seem to have taken a more NE oriented propagation.

06Z: Its is now raining on the radar site. The cluster of echoes has finally reached Praia. They are still being topped by the NAMMA_Far scan sequence, so no change is warranted. The cells are scattered between 150 and 210 degrees and continue to move NE at ~3 m/s. According to the SIGMET forecast tool, it should still take another 2 hours for that cluster to reach the radar site if it continues to move at the same speed and direction. Just about when my shift is over.

08Z: What little there was out there is mostly gone by now. There is one small cell S-SW of Fogo that has developed in the last hour. Other than that, the domain is very quiet.

09:30Z: Nothing new developed in the last 90 minutes. Gustavo out.

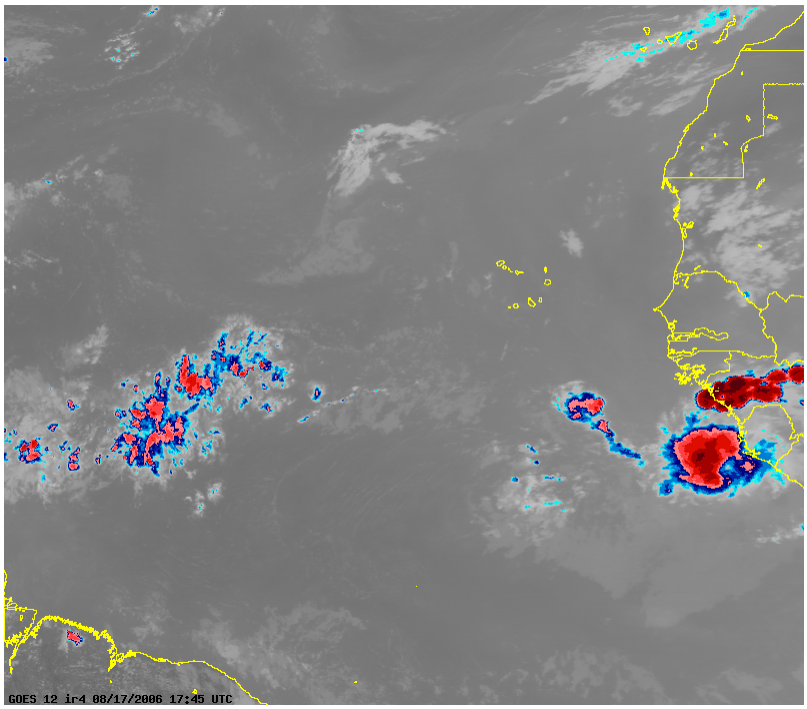


10Z: RC reporting in. Persistent cyclonic circulation ~100 km SW (same place observed last night) – south of Fogo. Cells are not terribly intense: max. reflectivities ~40 dBZ and tops around 10-12 km (not sure how much to trust this product at that distance).

12Z: Ramesh visits site with Jose Lima of the Met service in Sal

13Z: Radar down for measurement of wave guide loss and adjustment of dehydrator duty cycle. No echoes of consequence on the display.

14Z: Back on line.



21:30Z: Gustavo on radar. Radar off line for tech tests. Transmitter is dropping out. It is currently running on lowest setting of 500 PRF and 0.8 mm. This surveillance scan does not show any meteorological echo. Problem first appeared at 19:50Z.

23:10Z: Bob thinks that there is a problem with the magnetron. Radar will be down for the rest of the night. Currently the weather seems very benign, with no echoes present. Hence, no harm to science is apparent. Gustavo out.

18 August

09Z – Bowie replaced the thyratron (sp?) in the transmitter with a spare. Also, big UPS in the transmitter van is having problems and was taken offline and by passed. Currently, the transmitter is working directly off the generator.

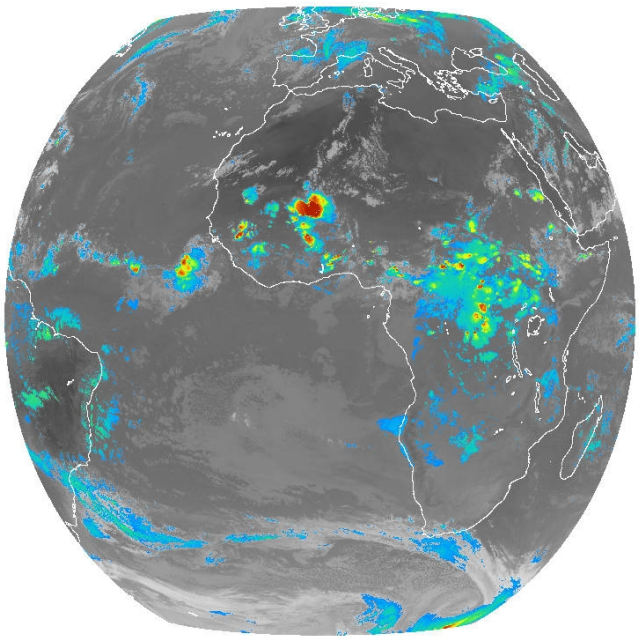
10Z: Nathan did a sun cal and a noise sample I think. We started scanning again at 10:20Z. The surveillance scan has been modified to run at the same short pulse (0.8 us) as the volume scans. Changed the log and CSR filters (after the 10:20 scan finished) to match the volume scans (2.8 and 0.25, respectively).

Lot of sea clutter out to ~40 km, probably due to strong N-NE winds at the site, but no other echoes within 150 km.

DVDs were changed out last night. Currently, on RAID (trmm linux-1), there is ~4.7 GB of raw files.

12Z: few very weak echoes moving S-SE 150-200 km NE of TOGA. VHF antenna is up and ready to go.

14Z: many transient echoes showing up SE of us. There is coherent velocity associated with them so I don't think they're 2nd trip but they look suspicious. Noting a break in sea clutter pattern to our SW that, in animation, is moving toward us. Not sure what that is…



MET8 18 AUG 2006 1745 MPEF MPE 0

18Z: talked with Halverson up in Sal. DC-8 will do a mission tomorrow in our vicinity, leaving Sal at 12:20 pm. The plan is to touch base on phone at 9:30 AM and discuss how the coordination will work, without internet, transponder information, and flakey telephones (apparently, the phone I'm using does not accept calls while I'm inside the seatainer). We will have the VHF radio tuned to 123.45 MHz, starting at 12:15 pm in hope of radio communications and will try doing our sector scans while the plane is flying.

Skies have become dustier throughout the day. Winds are blowing a steady 15-20 knts out of the N.Winds are blowing a steady 15-20 kt out of the N. Not an echo on the scope. The most exciting thing we've had to look at all day is sea clutter.

Image products are being stored on trmm linux-1 in /radar/NAMMA. Within the surveillance and volume directories, we can make individual day subdirectories and then break the products out by type (ppi, cappi, etc). The problem is that SIGMET only allows a 3 character tag for the product type and it is not possible to discriminate dBZ vs velocity products and 1 km CAPPI vs 6 km CAPPI. Might want to consider dropping the 6 km and velocity product images….

21:30Z: Gustavo in. Dead, dead, dead … It will be a long night.

19 August

00Z: Still dead.

02Z: Guess what? Dead.

04Z: Copious convection with lots, lots of lightning and torrential rain is what the weather is like right now … somewhere else in the world I am sure, because here it is dead.

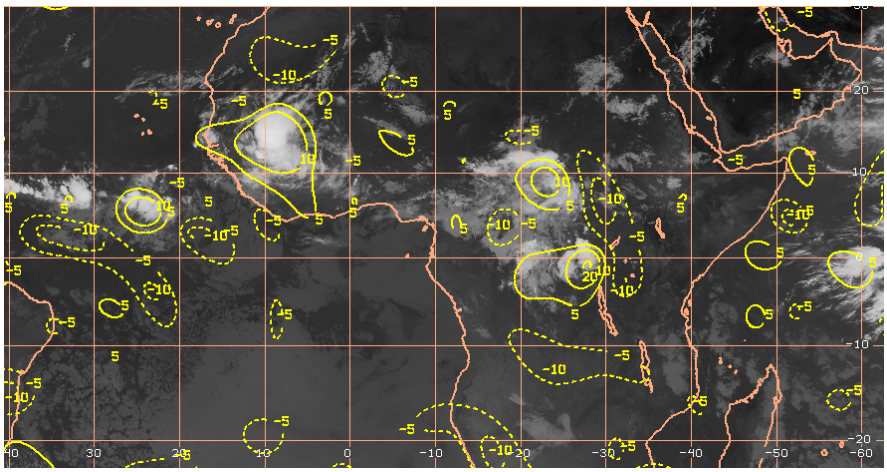
06Z: Ditto.

08Z: Nada.

09:30Z: Not a single darn weather echo in the last 12 hours. Gustavo out.

9:50Z – Transmitter down to add UPS to several computers. Missed a scan.

10Z: Back on line (started 1 minute late). TPC suggests wave convection on a more southerly track, as evidenced in attached satellite image. MODIS imagery nicely shows dust moving off the continent into our region.



Meteosat and model-assimilated 150-300 mb divergence 19 August 06 UTC

P.S. re: above image: Depicted (squall?) cluster associated w/ strong divergence signature reached NPOL approx. 10 hrs later, giving implied W'ly propagation speed of ~8 m/s.

13:30Z – Switching NAMMA_FAR to NAMMA_SECA and NAMMA_SECB for aircraft coordination. Using azimuth sector 0-120 deg. No contact on VHF at this time.

13:40Z – Radar down. Some kind of angle error, according to the message summary. Cannot get new scans to start so I'm taking all scans off-line.

13:45 UTC: VHF radio contact established w/DC-8 – weak at first but better as the aircraft approached our region. Nothing to look at on the display.

13:50 - talked to Nathan. RCP is not initialized (according to radar status menu). Will keep radar off line until Nathan returns.

18Z: radar still down. Some kind of issue with running sectors back-to-back. Guard has an injured leg – Nathan is taking him to hospital.

19:40Z – testing sectors now. Instead of using SECA and SECB, we're trying to use just SECA with a repeat time of ~ 5 min. Still no echo on last surv_scan.

20Z: Still having problems with back-to-back sectors…

21:30Z: Gustavo on duty. The consensus was that the radar is going to be kept offline for the rest of the night because the transmitter fuse keeps blowing out. Only one spare is left. Bob is going to attempt to find out why this is happening. No weather echoes were present and the current forecast calls for clear skies. Next wave is expected later on Monday through Tuesday morning (viz. 21-22 August). I have been relieved of duty for the night.

20 August

11Z: RC reporting from the hotel. Bowie has had the transmitter operating since about 00Z with no problems. He replaced the fuse but suspects that the "sector dilemma" was probably more of an IRIS issue. We'll plan to test this later today. Started operating in SURV-only mode at 10Z and into SURV-FAR mode at 11:40 UTC. Some weak echoes about 150-200 km NE of TOGA.

Forecast is calling for some unsettled weather here in Praia in 2 days but it's hard to see where it's coming from, based on the latest satellite image. Surface analysis still shows us under the influence of sub tropical high pressure. A disturbance passed south of us over night and through the morning but it was too far away to capture with the radar.

17Z: On site. Weak echoes are gone and we are left with just sea clutter.

19:30Z: Have noticed some strange velocity PPI's (in both FAR and SURV products): apparent rays dropping out, based on sea clutter pattern (1901 and 1921Z products are examples). This does not show up in DBZ PPI products.

20Z: Lots of 2nd trip showing up in NE quadrant.

21Z: Decision for both RC and GP to go back to the hotel – minimal activity.

21 August

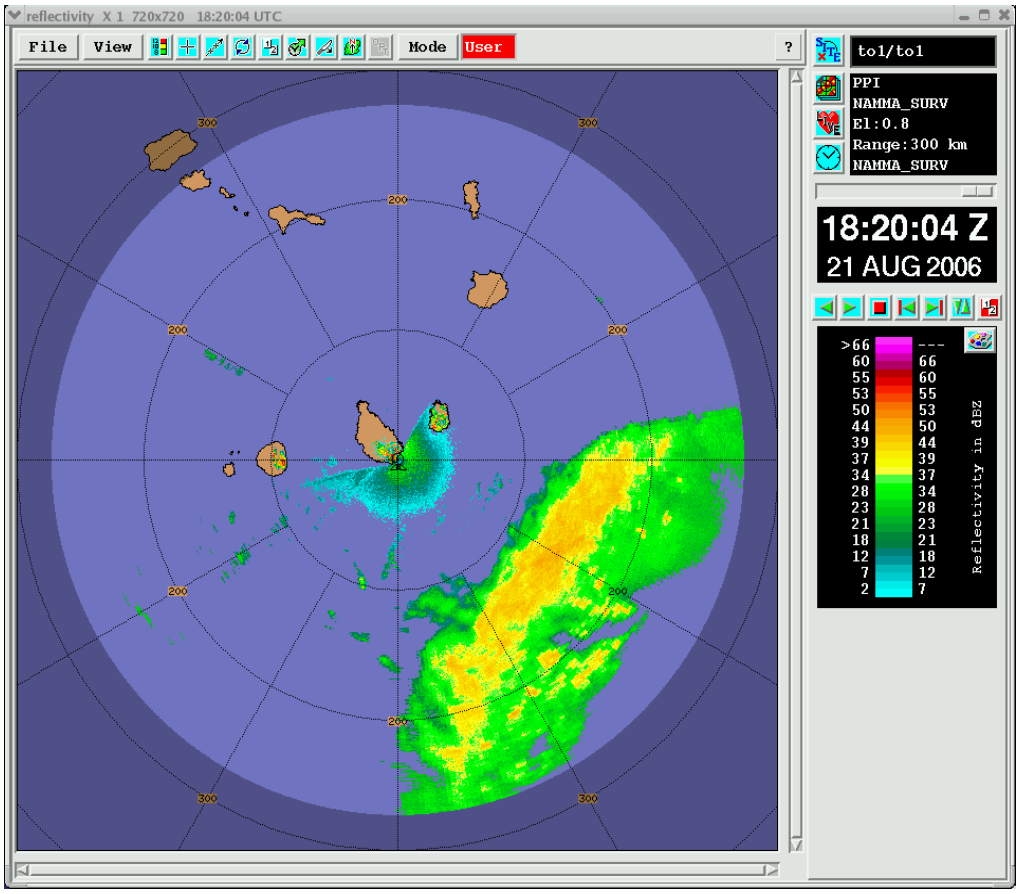
11Z: Radar operated normally all night in SURV-FAR mode. No evidence in animation of either FAR or SURV velocity of apparent dropping of rays since it was documented last night. Few scattered cells ~200 km NE fizzled out by ~04Z. Near 06:30Z, cells passing about 200 km S-SE of us. This activity was recorded until 10:10Z when we went down for transmitter "concerns". There is

some disagreement among technicians as to whether the fuse in the transmitter being 20A vs 10A is an issue and what the source of our fluctuating power is (generator or transmitter).

Talked with Zipser in Sal and the plan is to talk tomorrow by cell phone. If we want to provide input to flight plan discussion, call before 11:00 am. If we just want to hear about the flight plan, call after 12:00 pm. The DC-8 is hard down until Wednesday. According to Ed, we are seeing remnants of squall line that moved off the coast near Dakar last night.

20Z: Radar back up and scanning at 16:30Z. Problem with generator/UPS seems to be solved by keeping UPS in "bypass" mode so that generator does not cycle. Power to transmitter is now steady. It is not clear to me how much the power was fluctuating previously – maybe several dB. Luckily no echoes.

Situation has changed quite a bit since radar came back up. By 16:30, echo mass 180-200 km SE of TOGA moving west. By 18:30Z, this feature is looking like a classic squall line (viz. convex leading edge w/ tight dBZ gradient) with leading convection, trailing stratiform about 100-150 km distant to our E-SE. By 19:30, leading cells are decaying within 100 km and most new development appears to be on the southern end – 200 km distant. Tops of cells within 100 km are in the 8-9 km MSL range with max reflectivities about 40-43 dBZ. Brief rain at site around 19:30Z (stiff N-NE winds at site – 20 kt range). There is also some stratiform rain S of Fogo.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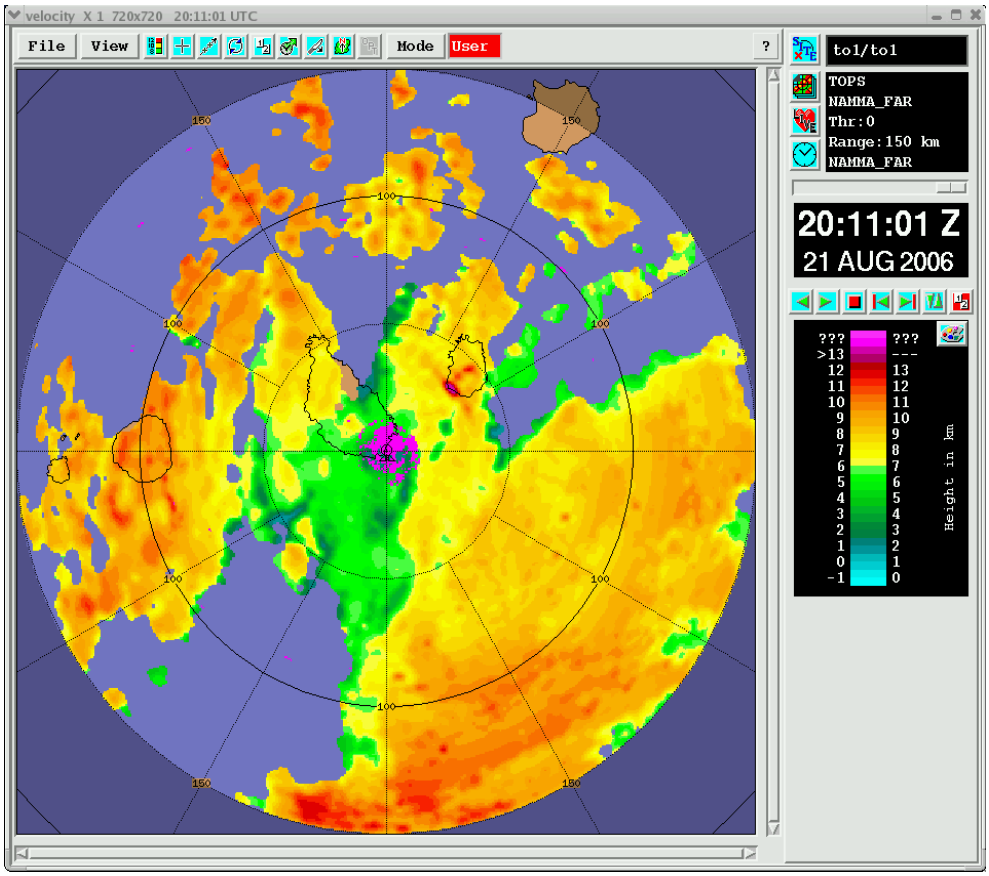


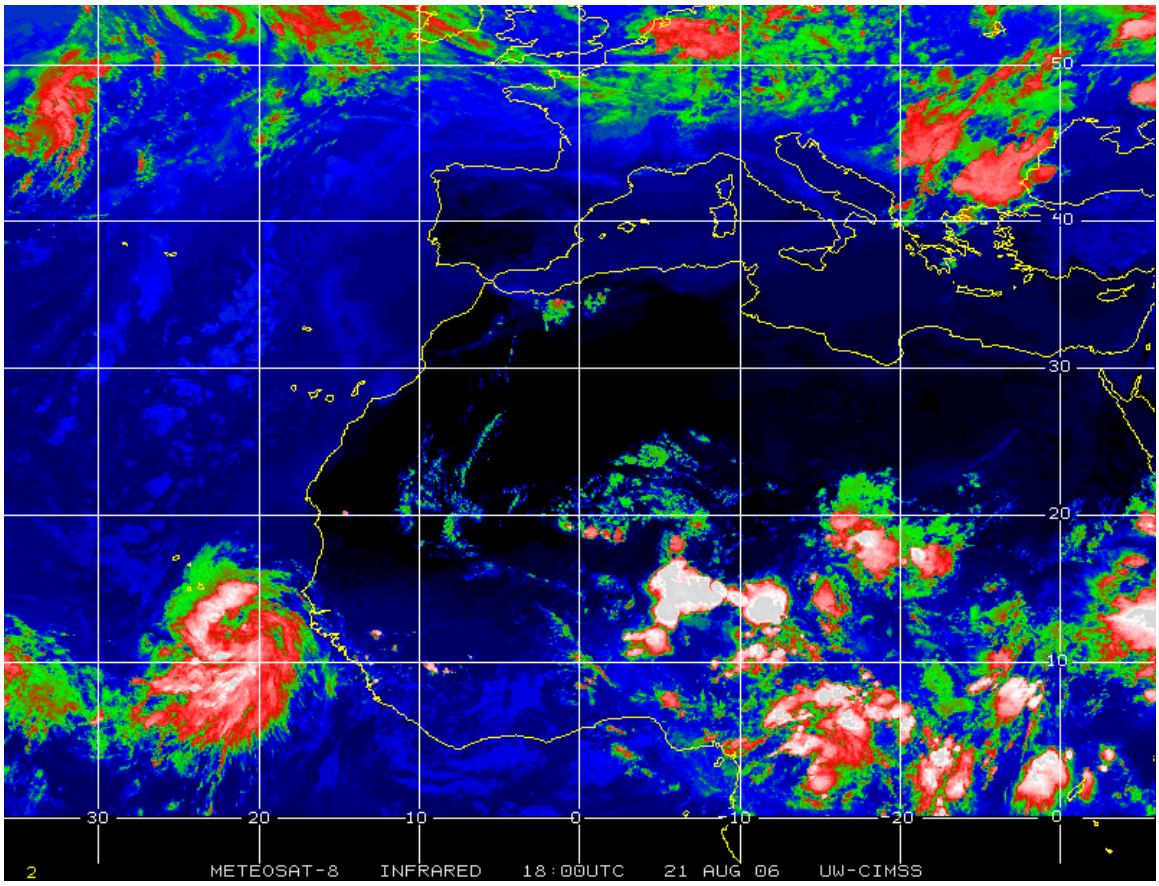
20:30Z: Animation shows echo mass shifting south, about 200 km S of TOGA.

21:30Z: Gustavo in. Start of shift was kind of hectic. While computers were still being rebooted, 3 employees of the Cape Verde Weather Service showed up to get a tour of the facilities.

23Z: We are running NAMMA_Far right now. Currently, we have some interesting echoes to the south in the surveillance images. The echoes are now moving in range of the NAMMA_Far PPIs. Cyclonic movement is evident in the banded precipitation structure. Winds are really fierce in the radar site now. Second trip echoes abound from 90 to 200 degrees.

22 August

00Z: The precipitation feature continues to move westward with a pronounced cyclonic circulation. The northern edge of the feature is now 100 km directly south of the radar. This edge has gained more of a convective structure with reflectivity cores exceeding 50 dBZ, while the remainder of the band looks more stratiform. This banded feature is part of a well organized wave with good potential for further tropical cyclogenetic development according to the last forecast discussion issued by NOAA's National Hurricane Center. That discussion indicated that the system was center near 12 N and moving west at 10-15 kts.



01Z: System continues to move and is soon going to exit the PPI range. Precipitation structure has not significantly changed in the past hour.

02Z: The feature is now near the SW edge of the PPI scan. Banded structure is oriented nearly E-W and located 150-200 km south (180° ± 45°) of the radar. Large-scale cyclonic circulation still vigorous.

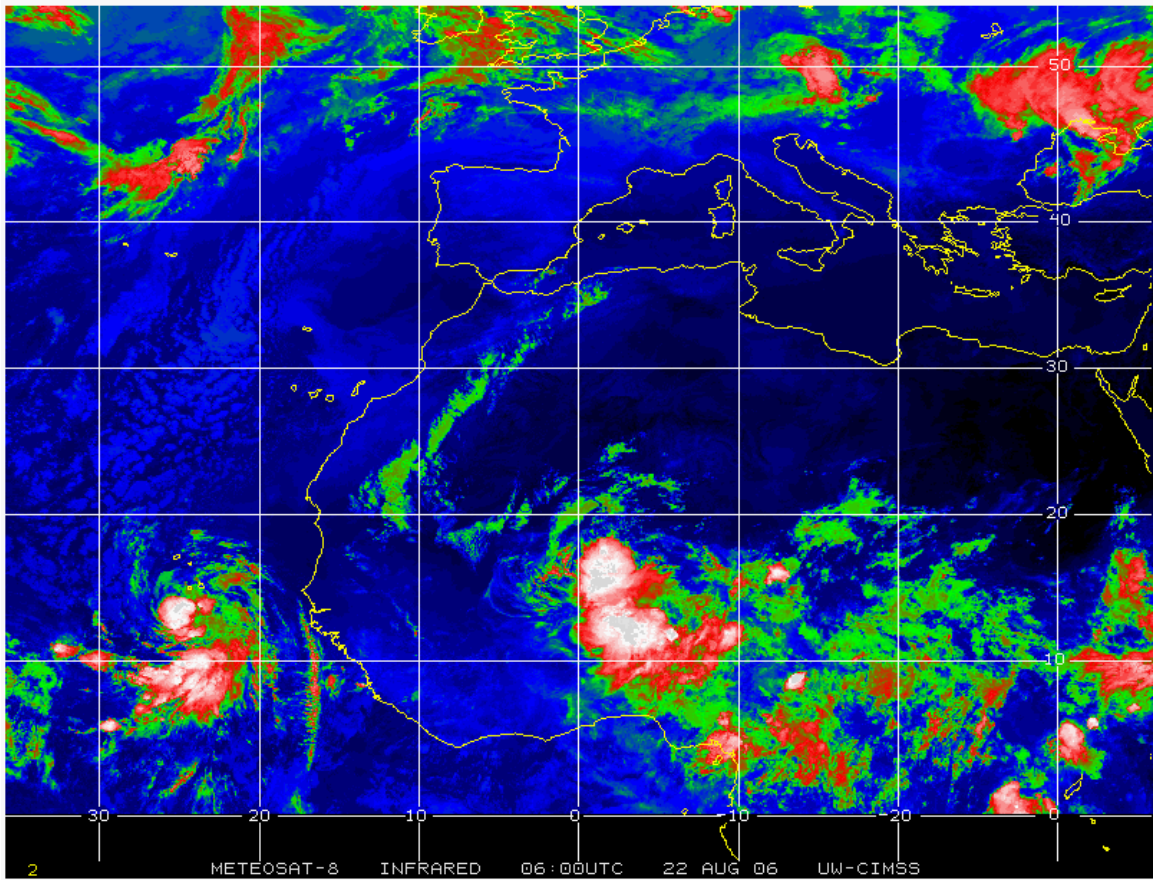
02:30Z: Trmm-linux1 acting strange. A number of error messages began to pop-up saying that no space left on device to write products. Toga1 machine also had an error message saying that there was a network error. I became worried that we were somehow not having the data properly saved. I spoke to Bob and we decided it was best call Nathan and find out if that was something we should be worried about. We were told not to worry about (data were being saved) and he would work on the problem when he got here in the morning. He also said that the error messages would quit popping if I disconnected iris from trmm-linux1. So, I am not saving or generating any figures.

04Z: Precipitation in the eastern flank has become more stratiform but more organized since it compacted into a single region (rather than the scattered features that were previously more prevalent in that part of the band. This flank is now only 60 km away from the radar and possesses reflectivities in excess of 40 dBZ (at a height of 2 km).

06Z: Majority of the precipitation is confined between 180 and 240 degrees. An interesting set of approximately 3 linear bands has developed within the precipitating feature. The line furthest from the radar (~ 180 km) has reflectivities of 59 dBZ (bin is at 4 km ASL). Lightning flashes were observed from the radar site toward the S-SW. Winds are still strong at the radar site. System continues to spin cyclonically. The closest features seem to be passing 40 km S-SW of the radar now. NAMMA_Far continues to top all echoes.

08Z: Pattern has not changed much in the last few hours. Precipitation still concentrated in the same quadrant. Nearest echoes approximately 45 km directly S of Praia. New linear echoes continue to dissipate and regenerate with different orientations. Strong winds continue to blow from the NE. The low level stratocumulus clouds presently observed near the radar continue to quickly move westward under a deck of altocumulus.

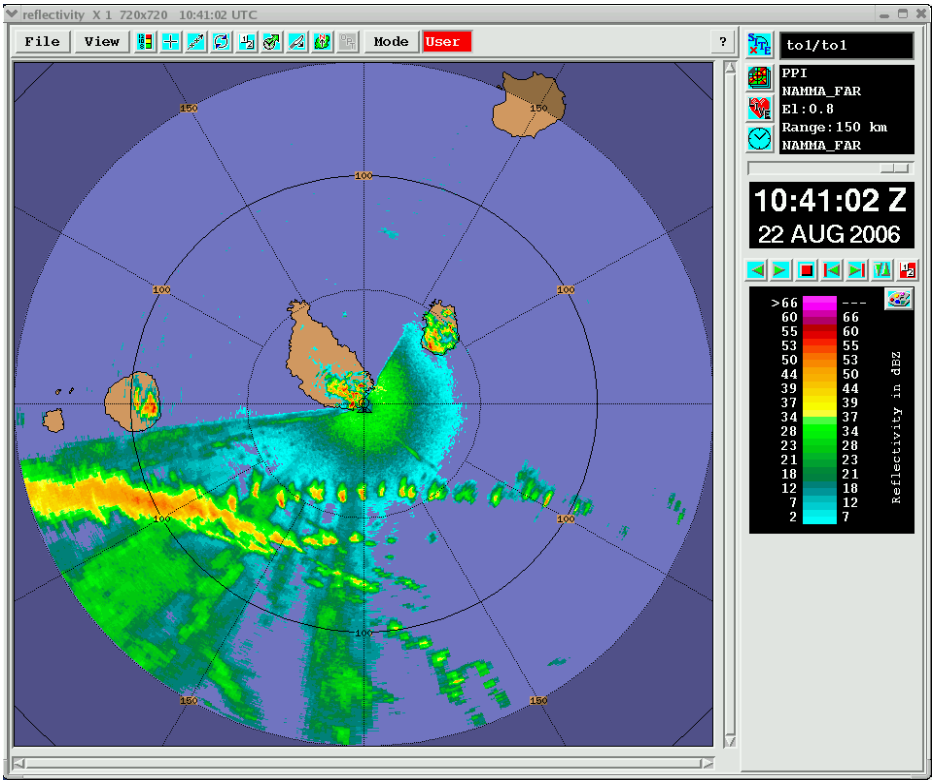
09:30Z: Cyclonic circulation still very pronounced and clearly visible in the radar radial velocity, where upper level values are near 13-15 m/s. NAMMA_Far once again was used throughout the night since echoes were always at least 50 km away from radar. Gustavo off duty.

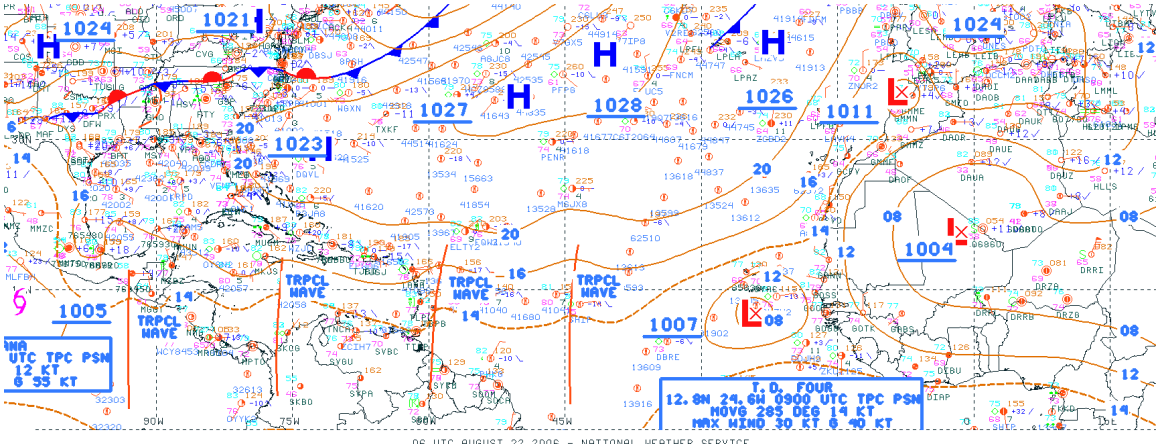


Meteosat 22 August 06Z IR image depicting largest cluster of cold tops WSW of TOGA (viz. beyond Fogo), with banded cirrus outflow to our N-NE-E. Also note amalgamation of cyclone outflow/cirrus with previously distinct ITCZ-type convection along ~9 degN.

10Z: animation shows banded features moving north from main circulation center (well to our S-SW). The major band feature is oriented E-W and extends about 100 km in length. Tops are 12+ km with maximum reflectivities of ~55 dBZ. A secondary band is within about 50 km of TOGA. This feature is comprised of scattered cells (non continuous) to the east of the primary band described above – looks like a gravity wave feature. There is a broad mass of stratiform echo far to the SW (200 km distant).

13Z: Radar down 1140-1315Z – networking problems. Bands described above have more or less dissipated and activity overall is on the wane.





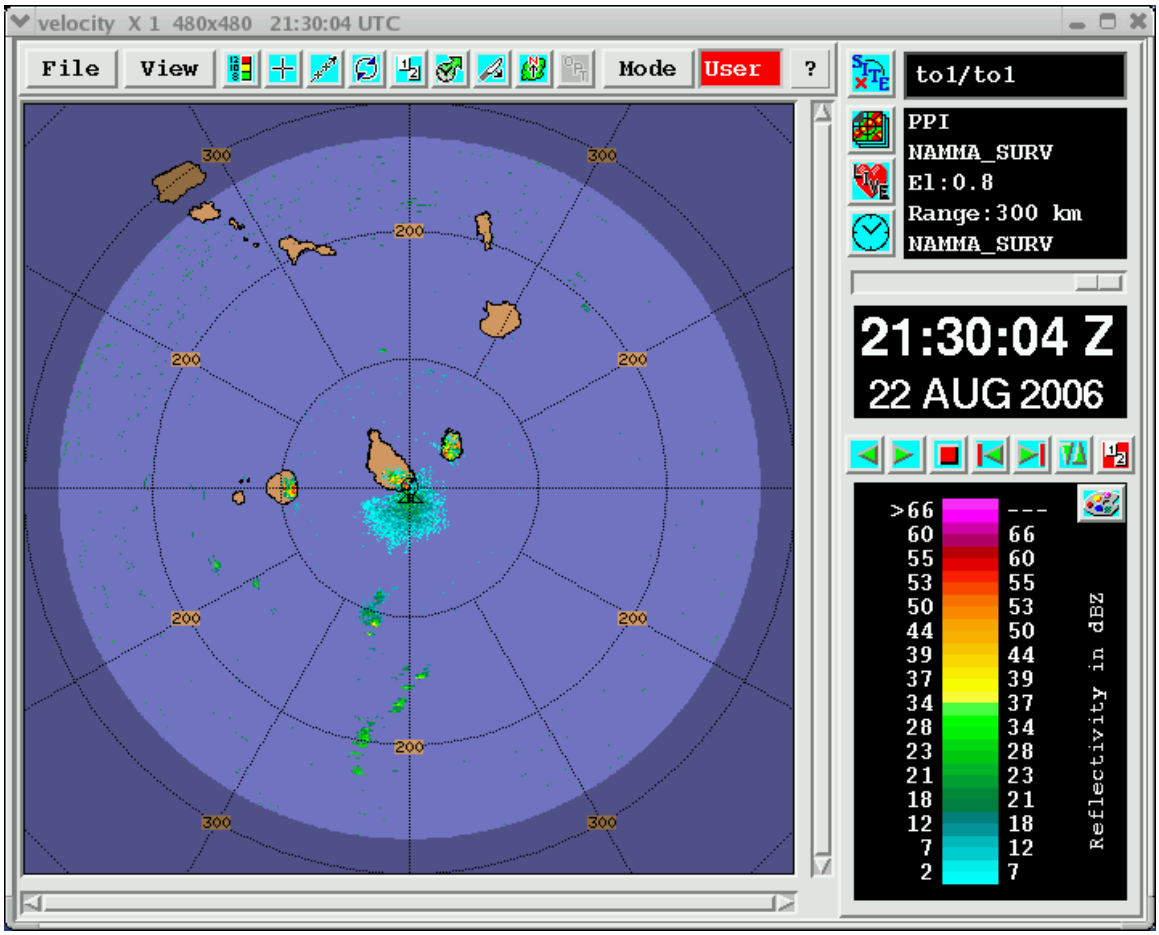
14:30Z - “thin line” forming NE of TOGA with NW-SE orientation -moving north.

16:50Z- switch to NEAR to top line NE of us (passing over Maio now).

18:10Z – noted velocity products appear over filtered -spotty at long range. Changed CSR of NAMMA_NEAR from 25 to 35 dB. Also, SURV thresholds had been changed and we changed (log and CSR) them back to original NAMMA setup, starting at about 17:50 UTC.

19:10Z – Only a thin annulus of anvil-type echo remains overhead at ~30 deg elevation, thus switched from NAMMA_NEAR to NAMMA_FAR sequence.

21:30Z – Gustavo on duty. Running NAMMA_FAR sequence. Weather is pretty clear. Only a few shallow echoes 150-200 km south of the radar are found drifting northward. Mike is going to set up some RHI scans. Although it seems that almost all of our interesting weather passes far south of us, I still told him to run RHI scans at 1000 PRF (150 km) since I see no microphysical purpose to get RHIs on echoes beginning at 5 km and up. I am not completely sure about the filters implemented for RHIs, but assume that they are same as the PPIs.



23 August

00Z: No change in the last 90 minutes. Domain remains devoid of significant weather echoes. Looks like it will be another long night.

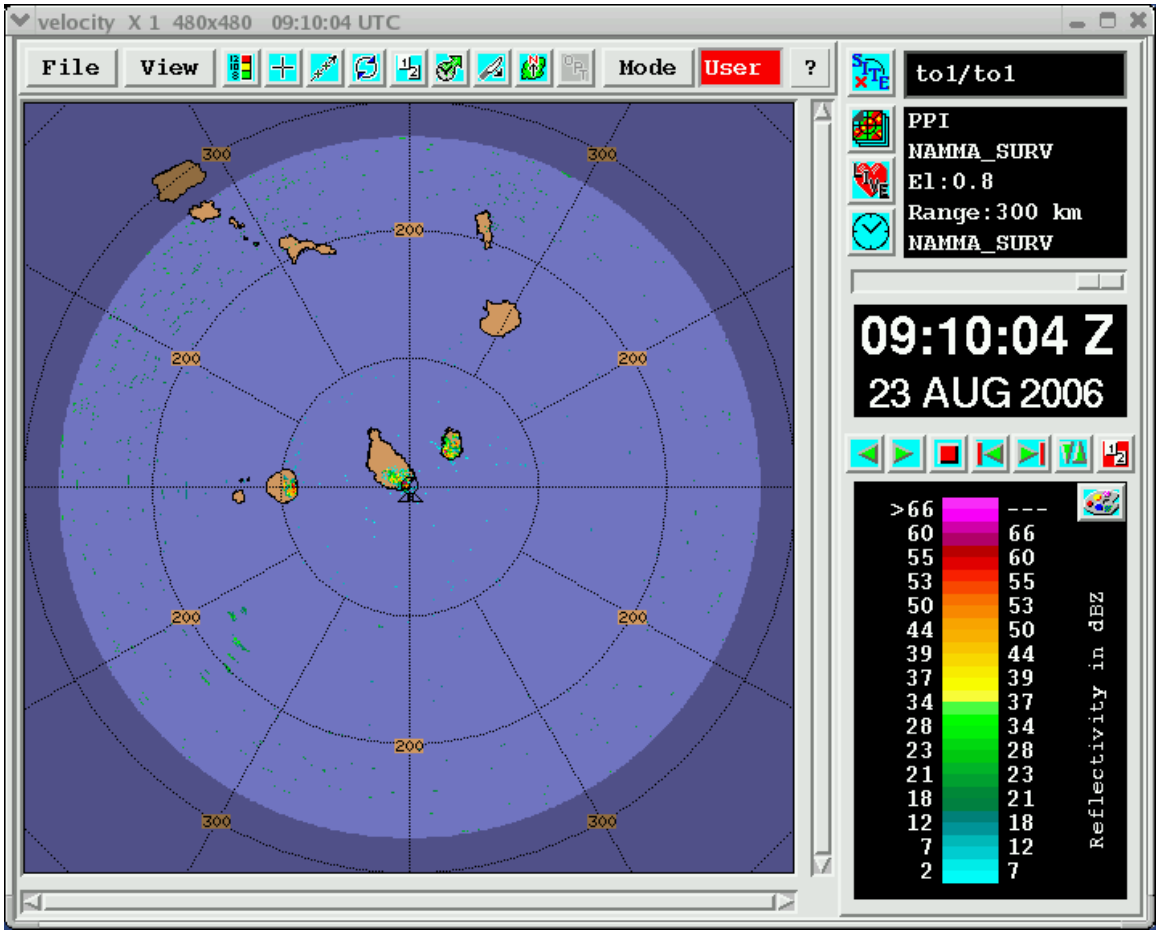
02Z...ZZZZZZZZZZZZZZZZZZZZ ... uh, still nothing out there.

04Z: Nada.

06Z: Niente.

08Z: Other than the ever present clutter from Fogo there is still nothing in the screen to admire. I was wondering what kind of signal we would get if we had an eruption there. OK, I am really bored.

09:30Z: Nothing changed. Check it out. Gustavo off.



10:30Z: Smull/Cifelli onsite for day shift. Called Zipser @ NAMMA-Ops. Today's planned DC-8 flight (nominal noon takeoff) will explore Tropical Storm Debby (upgraded by NHC from TD to marginal TS eff. 03Z, with 06Z position est. 15.2N 28.9W (approx. , moving WNW at 16kt, est. central pressure 1003 mb,

max sustained winds est. 35G45 kt). Plan is for 18 drops w/ one ca. 10Kft run "down the center". No anticipated coms/coordination w/ TOGA. PPI's remain clear of meteorological echo inside 150 km. Long-range surveillance scans have shown narrow/tenuous lines of echo overnight, bubbling up/down beyond 150 km since ~01Z , along narrow lines gen'ly exhibiting N-S orientation and apparent S->N motion of ind. small cells, consistent w/ TS circulation centered far to W and overall S'ly flow in this post-trough phase of broader wave. Activity has bubbled up and down, briefly peaking near 35 dBZ in spots. Noticeable weakening during last hour.

11:30Z: No change. Posting several more general plots for posterity:

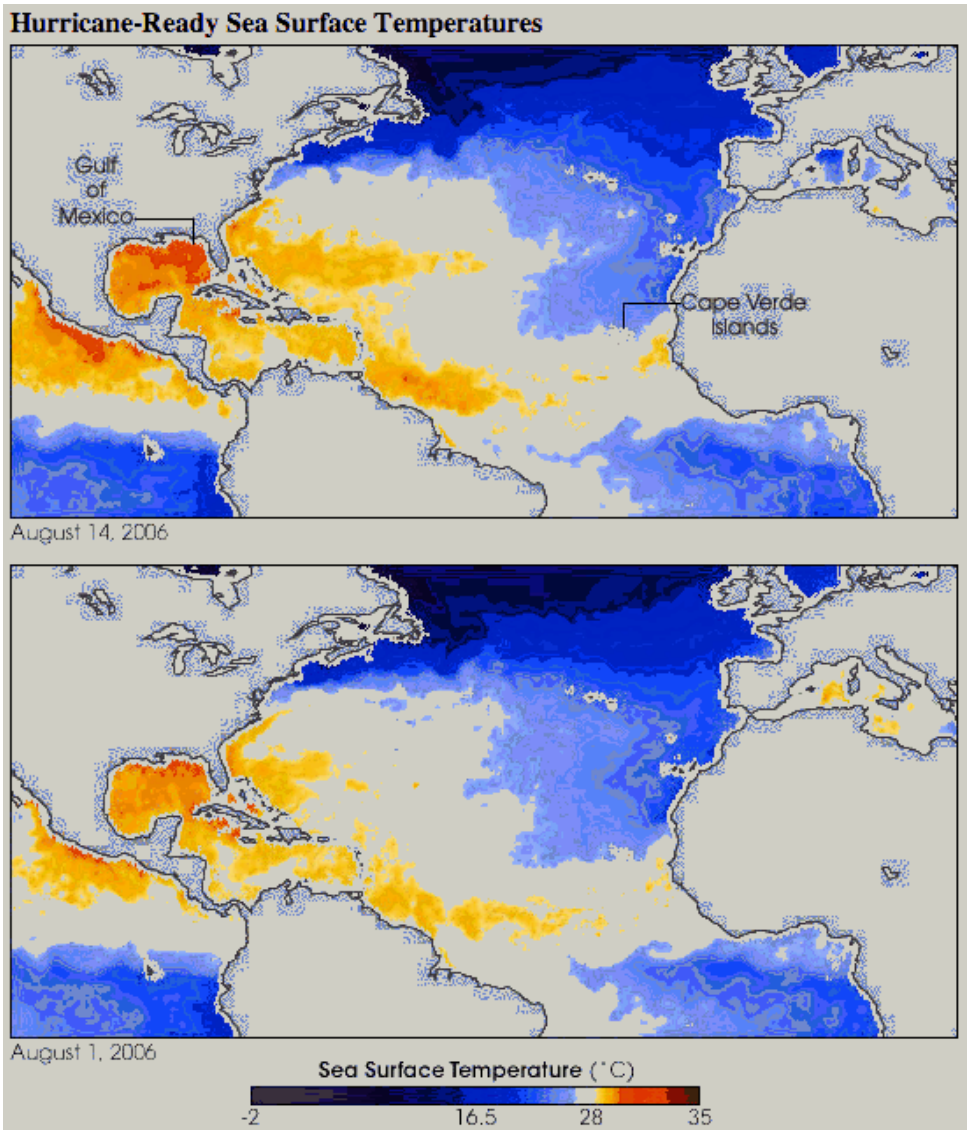


Image 1: NASA/MODIS depiction of Atlantic SST evolution from 1 Aug to 14 Aug, illustrating general warming of subtropical Atlantic and persistence of cooler mid-ocean temps that will likely limit strengthening of TS Debby.

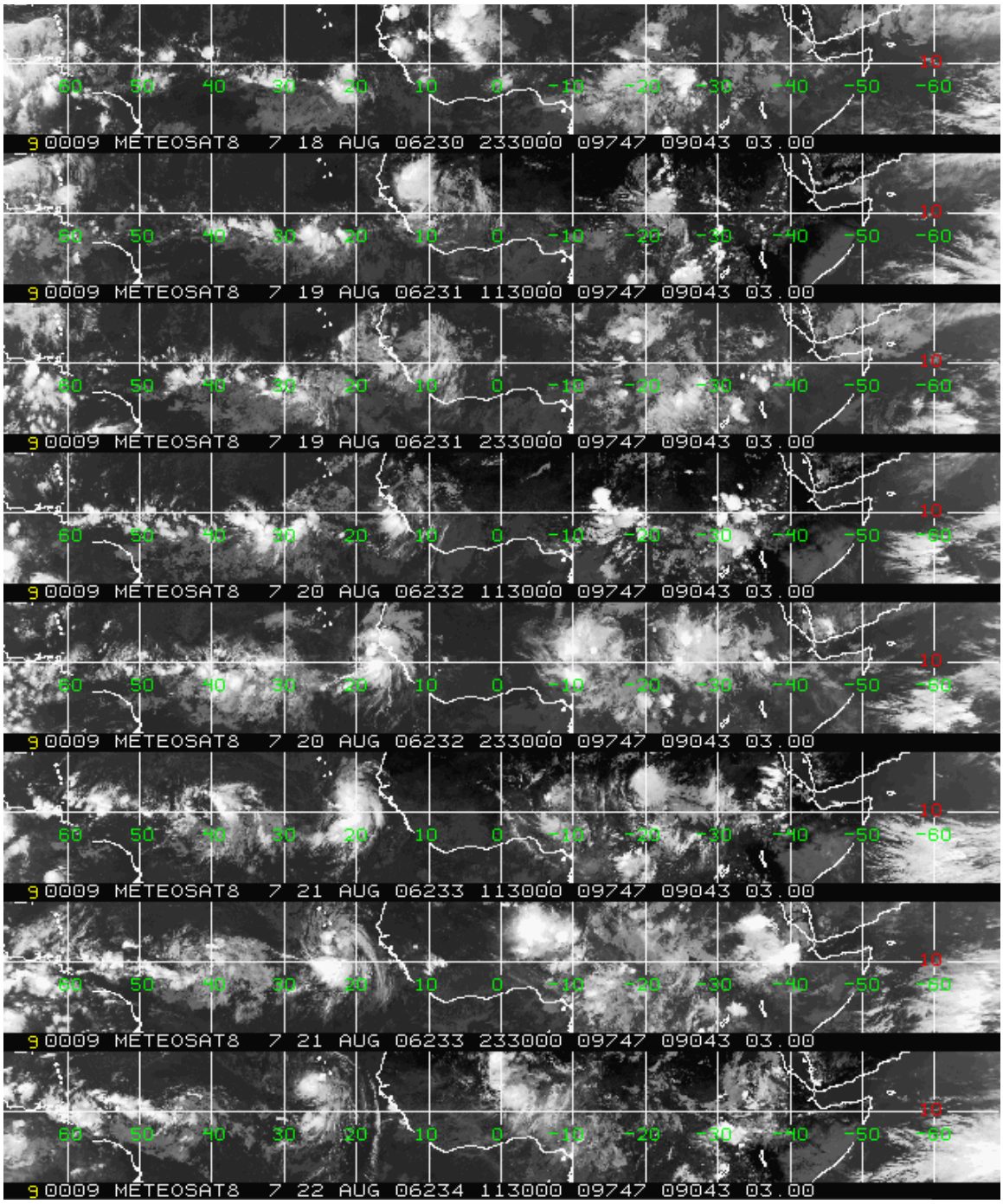


Image 2: Atlantic basin Hovmoller-style IR depiction tracing (1) origins (or at least passage) of broader wave (AEW) disturbance that supported development of yesterday's TD#4 (nee TS Debby) across 15 degW (i.e. ~6 deg west of Niamey radar site within AMMA array) back on 18 Aug, and (2) leading edge of activity assoc. w/ next major wave in series having crossed NAMMA's Niamey (Niger) radar site early yesterday. Based on estimated phase speed, likely arrival of wave-enhanced convection @ NPOL would be expected on/about 24-25 August, and then TOGA on 25-26 Aug (i.e., early this weekend). Standard caveats re: extrapolation in context of a chaotic system of course apply...

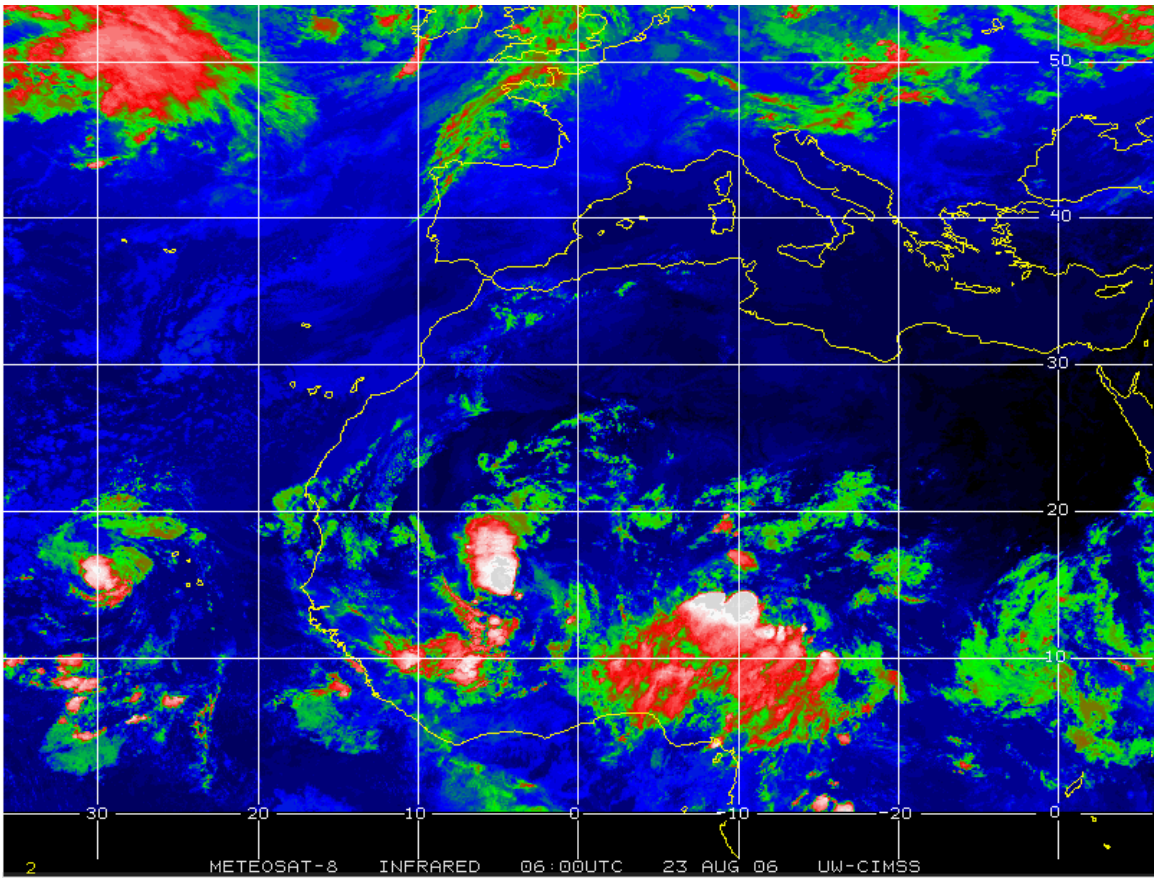


Image 3: This morning's 06Z 23 August Meteosat IR view of TS Debby, indicating that outer bands (or at least colder tops within cirrus outflow layer) have virtually all shifted well W and N of the Cape Verde's. Convection midway between Niamey & Dakar mainly confined to single mesoscale cluster, i.e. lacking arc-like “full latitude” structure exhibited by previous wave in series (cf. 18 Aug strip in preceding Hovmoller plot).

12:30Z: No significant echoes. Few “wet Cu” (~15-20 dBZ peaks) very widely scattered in southern sector; minor WNW-ESE line from 150deg/75km to 135deg/100km. Sun has broken out locally.

13:30Z: No change, apart from slight NE'ward shift of thin line. A dense crop of grasshoppers has emerged outside among the rapidly sprouting low/green groundcover, both evidently aided by recent rains.

14:30Z: Tenuous/weak/broken line of echoes now extends WNW to point S of Sao Tiago—peak intensities only 20-25 dBZ, fairly useless echo but it's “the only show in town” as echoes distant SW have totally dissipated.

15:30Z: No change. Orographic clouds to our N/NW are mainly SCu, i.e. Showing little vertical development.

16:30Z: Thin/broken echo line in S quadrant slowly weakening. Hot, sticky and nearly breezeless outside.

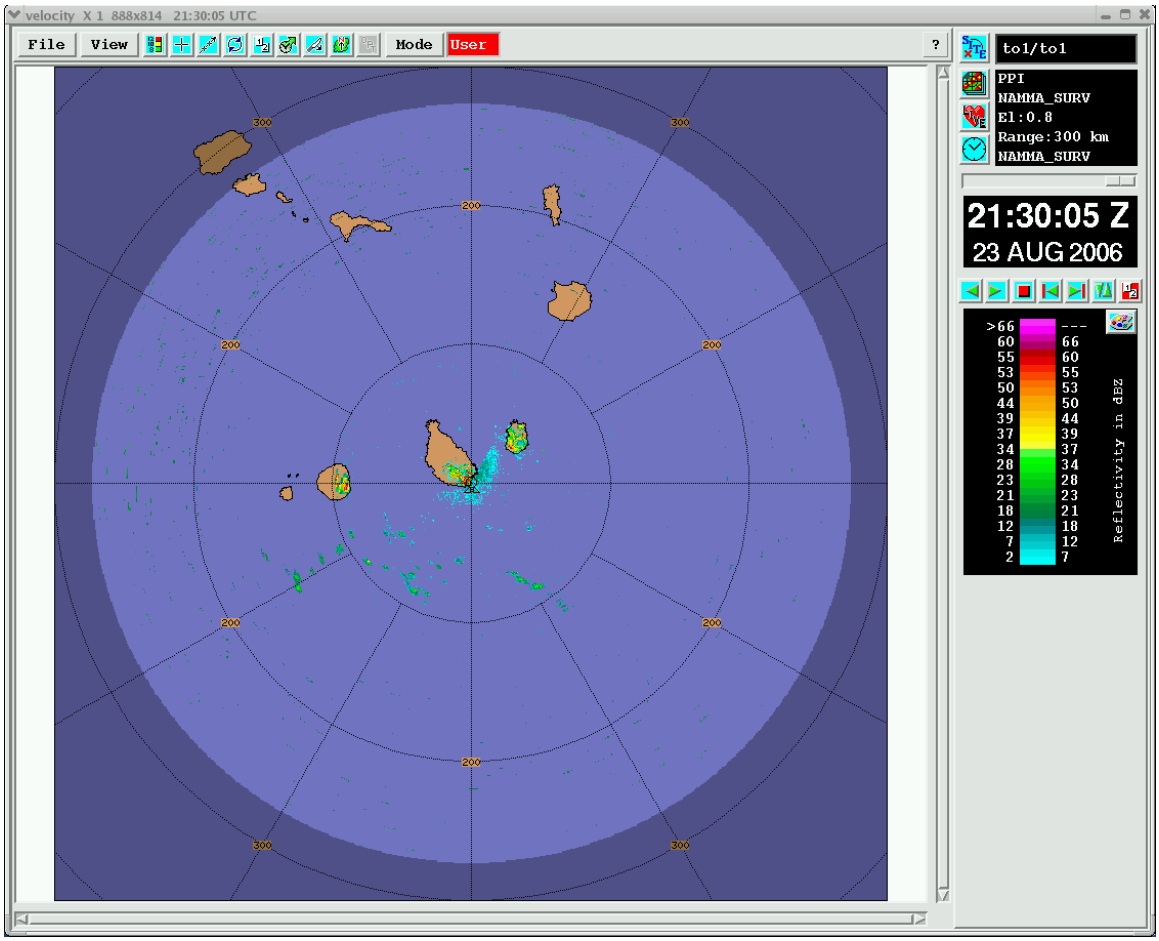
17:30Z: Short line of weak convective returns centered near 150deg/40km survives; strangely, cell motions along band appear to be from WNW to ESE—difficult to believe low-level flow has switched to a W'ly component at this point, however. Light sprinkles at radar site during last hour (island-induced/orographic in nature, though associated echoes are not distinct from clutter).

18:30Z: “PPINE” (an arcane term from the WSR-57 era; possibly google-able, with a working internet connection that is...)

19:30Z: Spotty echo line has reappeared to SE--hardly worth the text though...

20:30Z: Minor line has again built back toward WNW (i.e. extending into SW sector). Another minor but intriguing feature has appeared ~40 km to ESE—a short bow-shaped echo segment (concave-northward), which is weak (20-25 dBZ max) and shallow (<1.5 km deep) but suggestive of convergent response to surge of N'ly flow channeled between Sao Tiago and Maio. Timing soon after sunset is interesting (e.g., diurnal BL-decoupling?). Surface winds at TOGA site are indeed now ~N'ly, having picked-up noticeably since sunset tho still perhaps only 10 kt here on the hill. Pattern suggests possible response to orography, but not a NAMMA focus and definitely not dissertation-quality material (with apologies to Gustavo...).

21:30Z: Gustavo on duty ... and may be it known that his dissertation is not going to use the NAMMA dataset, so he is putting all this time and effort here only because of his love for tropical convection and radars and in the off chance that this effort may be recognized with a minor prize, like the Nobel. Radar is running on NAMMA_Far. A few scattered echoes are found drifting south between 150 and 240 degrees and about 80-120 km from the radar. Internet is still unavailable at the radar site. Since echoes are moving away from the radar and no significant change is expected in the next couple of hours, I will be heading to the old airport to get access to the Internet. I will be in contact with Tim Parks (the technician on duty) through the walkie-talkie.



24 August

00Z: Scattered echoes to the S-SW continue to move south. The cells with strongest development seem to be those at 150 km range, 200° azimuth. At the radiosonde office I checked the weather forecast for the upcoming week. Tropical Storm Debbie was 450 nm west of Cape Verde with no expected change in intensity in the next few days according to the NHC. The NAMMA forecast office indicated in their webpage that the GFS, UKMet, the ECMWF and the FSU-Superensemble models have all been forecasting the next wave to pass right over the Cape Verde islands on Sunday. Let's see if the forecast will hold until then. Some Saharan dust may be ejected into the NAMMA domain Friday and Saturday.

02Z: Almost all echoes have disappeared by now. I anticipate that this is how it will be for the remainder of the night.

04Z: My prediction has been correct so far.

06Z: Zilch.

08Z: Prediction still holding.

09:30Z: Prediction correct. Gustavo off.

16Z: Smull on-site. Radar shut down this morning at from 0940-1240Z for routine maintenance/calibration (generator oil/filter changes, solar cals, SIGMET patch installation, re-set of radar system clock to match GPS—had previously been running as much as 1min40sec behind) during present meteorologically suppressed period. System came back up early afternoon w/ Bowie present.

Currently no meteorological echoes within NAMMA_FAR max range of 150 km; surveillance scans show amorphous, extremely weak (gen'ly 20-25 dBZ) returns in NE quadrant beyond 200 km, i.e. E of Sal—not likely resulting in sfc rainfall. Locally, after being dominated by dense (though non-precipitating) low/mid-level clouds this morning, skies over Sao Tiago are generally clear except the most humble of SCu and very limited orographic cloud over higher peaks. The latter is difficult to see as conditions have once again become quite hazy (presumably due in part to Saharan dust).

17Z: Slight increase and slightly more cellular nature noted in activity far to our NE, which has now crept inside 200 km range-ring. Initially wondered about hygroscopic dust, but see little in way of coherent velocity returns, and movement (lack thereof), intermittency etc. makes no dynamic sense—likely some kind of AP, so no further comment.

18Z: No meteorological echoes. Another very breezy (tho less humid) night.

19Z: Ditto.

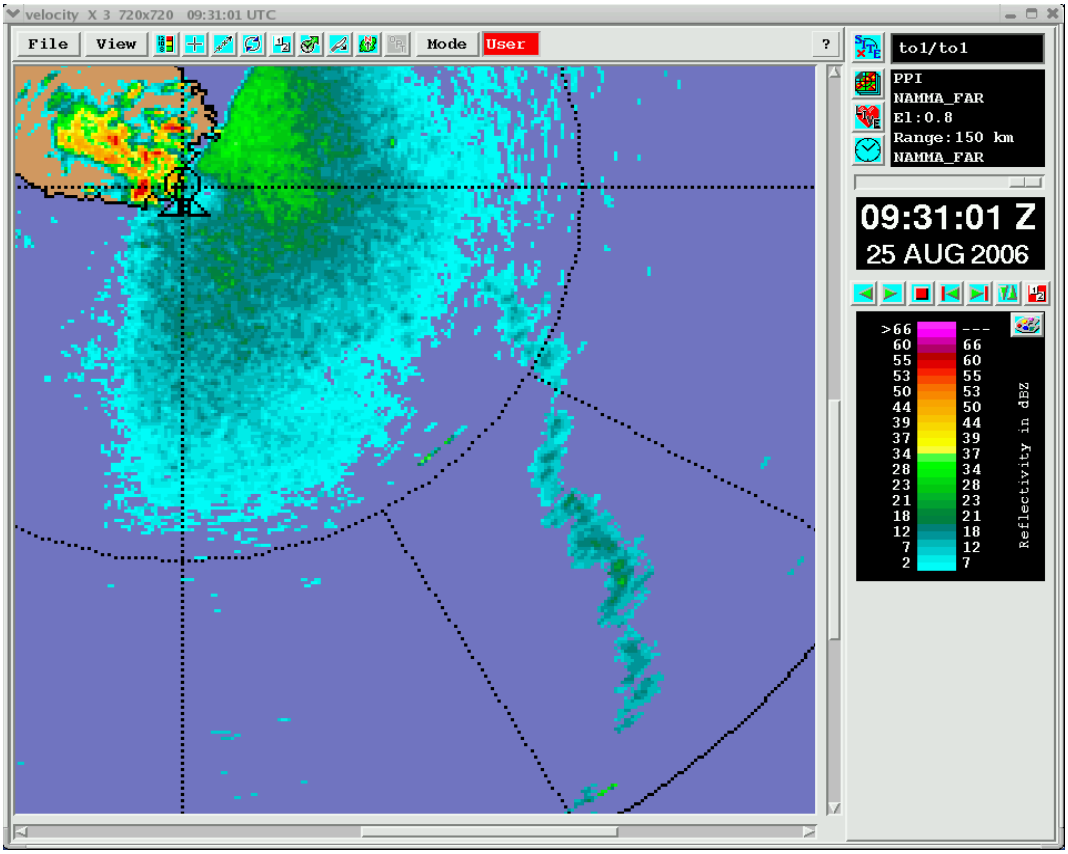
20Z: No echoes outside of local clutter.

2130Z: Clutter—it's not just for the office anymore... B. Smull, signing off.

25 August

0930Z: Smull & Cifelli back on-site. Morning conditions are far less windy and apparently less dusty as compared to late yesterday afternoon. Visual as we approached TOGA site revealed light rainshower immediately offshore. No science log overnight as it was Gustavo's night off. Brief review of overnight scans: Beginning around 0330Z, and in earnest after 0730Z, a narrow banner-like plume of echo began to trail southward from Maio Island. The implication is that low-level N'ly flow interacting with terrain is somehow triggering convergence and ensuing cloud/precip development in the island's immediate wake, and that this has perhaps been aided by BL stratification changes around sunrise (or possibly thermodynamic changes such as gradual flow moistening—tho local soundings would need to be examined to evaluate this possibility). An intriguing property of this echo line is its sinusoidal nature (cf. 0930Z surveillance scan, attached, for illustrative example), suggestive of some sort of barotropic/shearing instability—esp. as it appears this line is

emanating from a point near the eastern edge of Maio where lateral shear might be maximized. Vertical sections across feature (not shown) reveal this feature is <5 km in width (in the cross-flow direction), largely confined below 2.5 km MSL, with reflectivity monotonically increasing toward surface (peak values ~24 dBZ), consistent with shallow warm-rain process. Showers visible locally (and well within TOGA's extensive zone of sea-clutter) may represent equivalent phenomenon emanating from eastern edge of Santiago, but this structure is evidently not as robust as echoes are not extending nearly so far downstream. Visually, clouds outside precip areas are flat SCu, presumably at height of trade-wind inversion. Phenomenon reminiscent of satellite-based island wake studies by Ron Smith.

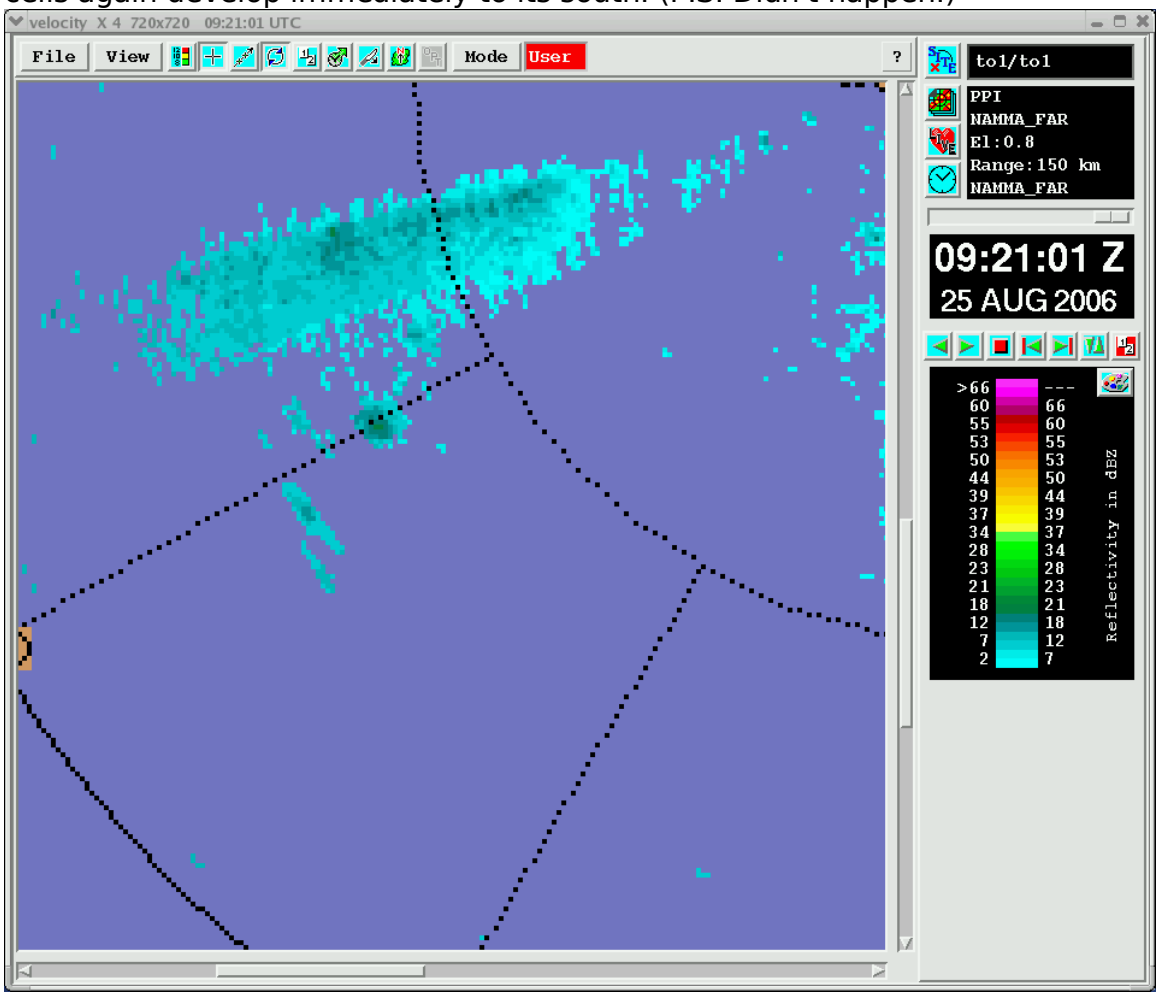


Other interesting patterns to our SW include southward-propagating areas of increased sea clutter (flow speed?) occurring in conjunction with area of potentially channeled flow between Sao Tiago and Fogo (illustrative image attached below).

1030Z: Island-wake echoes (SE quadrant) and purported channeled-flow cells (SW quadrant) continuing to advect southward and weaken.

1130Z: Cellular echoes in zone of possibly channeled flow between Sao Tiago and Maio (SE quadrant) are just now emerging from sea clutter, which extends out to nearly 50 km! In SW quadrant, yet another zone of enhanced clutter has

just begun to form in same spot as earlier; will watch with interest to see if new cells again develop immediately to its south. (P.S. Didn't happen.)



1230Z: Minimal weather echoes; headed to old Praia airport/raob site to upload status reports to NAMMA website.

1430Z: Only very spotty echoes during our absence, located S of Fogo and immed. E of Maio on a line that appears downwind from Boa Vista. First view of Skew-T for local sounding reveals characteristically strong/shallow trade-wind inversion that offers strong possibility for terrain-induced vertical oscillations propagating downstream on stable interface.

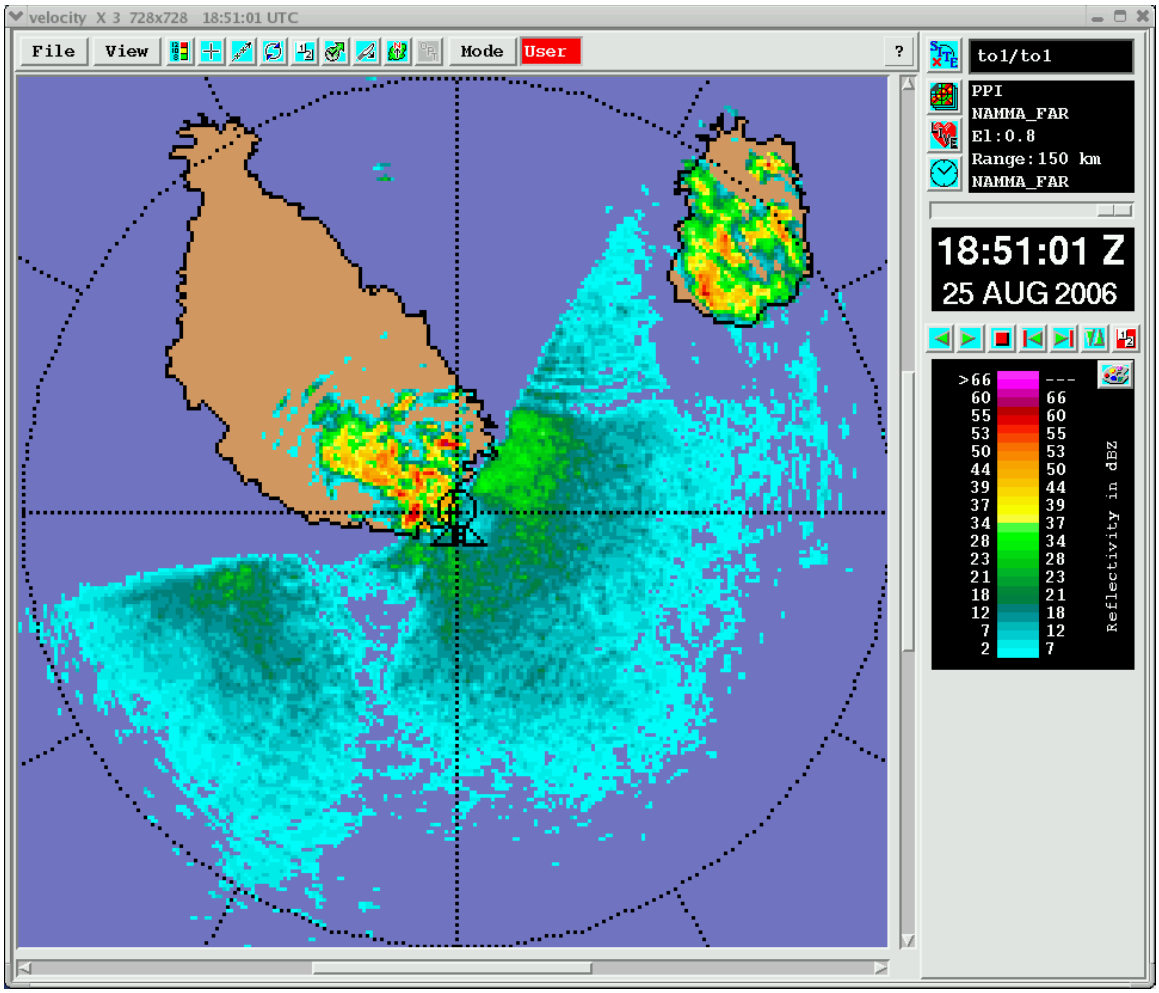
Note for posterity: Existence of extreme stability associated with this inversion may account for some of the anomalous-propagation type echo as observed yesterday.

1530Z: No significant echoes.

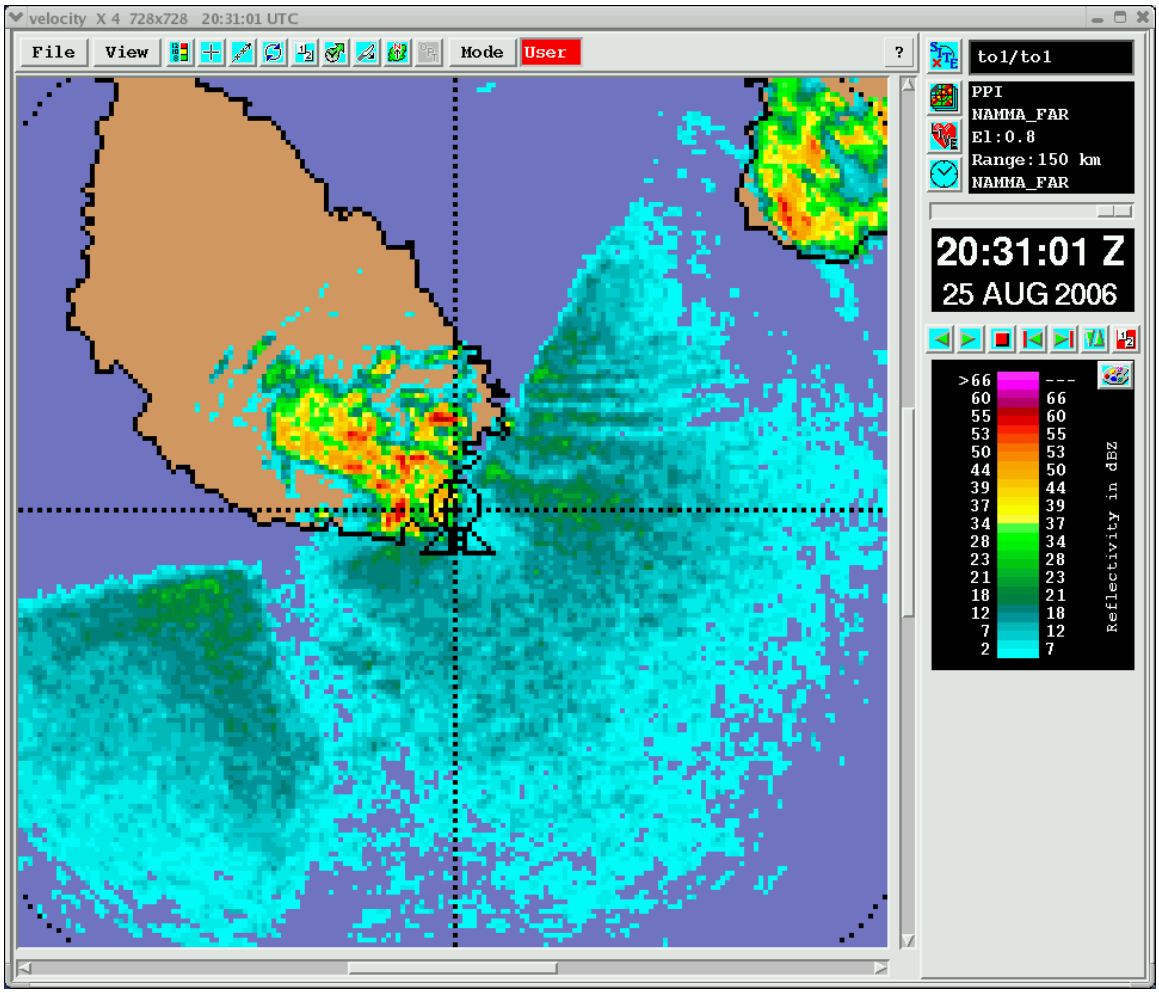
1630Z: Very isolated cells far E/NE, near 200 km range, as well as along narrow broken line extending S of Maio.

1730Z: Banner echo extending downwind of Maio more pronounced now (late afternoon), just as it was in early morning.
1830Z: Banner persists in lee of Maio; not as sinuous as this morning, but still exhibiting quasi-periodic echo spacing along its length. SCu are becoming more widespread with time, with breaks generating nice crepuscular rays through remaining dust/haze.

1930Z: Banner echoes are weakening. Even allowing for fact that sea clutter interferes with echo observations in local area, it's noteworthy that Sao Tiago seems less prone to banner echo development than nearby smaller islands. In other news, within the last hour an odd wave-like clutter pattern has become evident in channel between Sao Tiago and Maio, presumably through modulation of Bragg scattering and/or beam ducting by some unknown process:



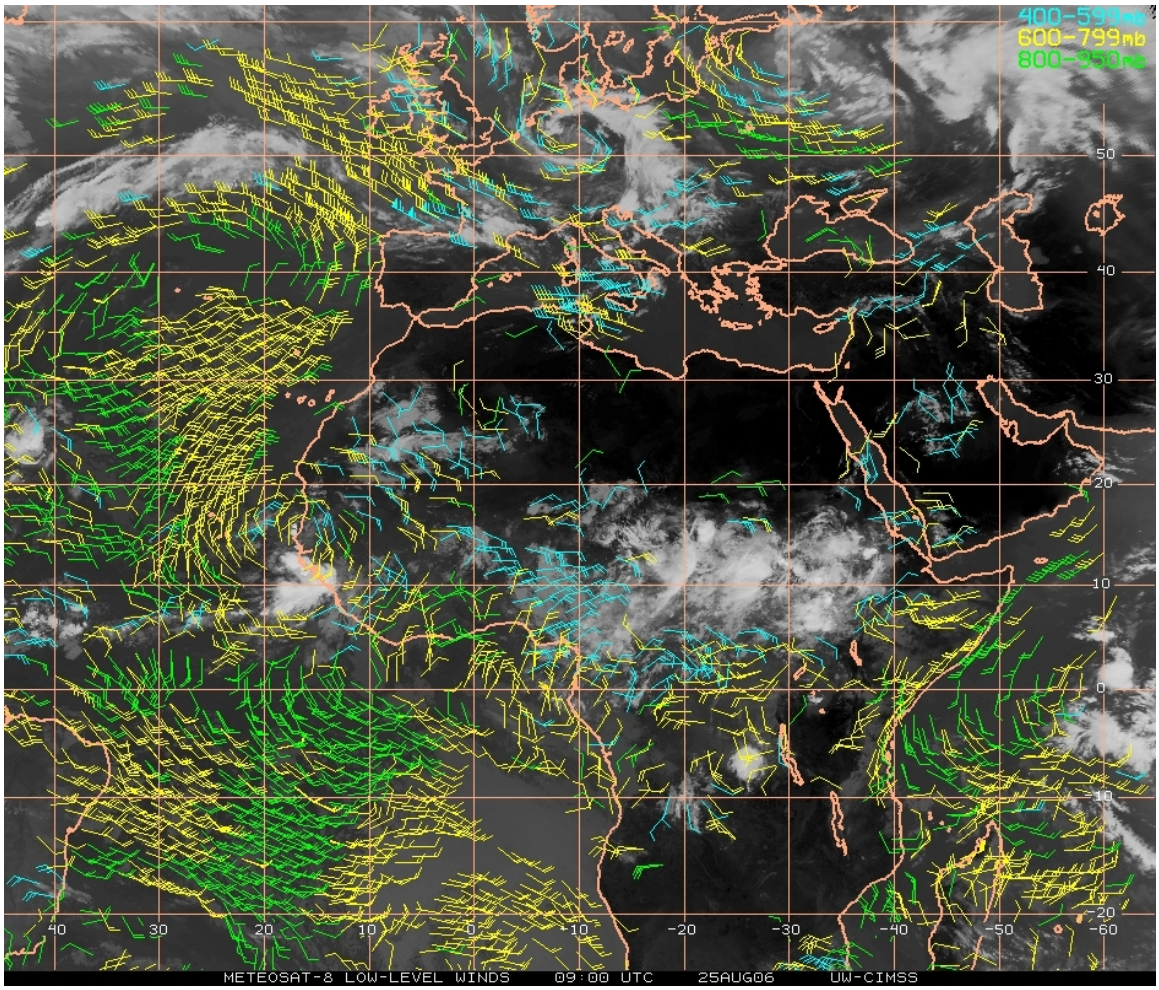
2030Z: Banner echoes continue to weaken. Clutter-field waves continue to propagate southward:



2100Z: Hopefully tomorrow will bring more active convective conditions that obscure (or at least distract) from any further comments on clutter. Smull signing off.

RC note. These banner echoes and their relationship to sea clutter oscillations seems like an excellent Ph.D. topic for a motivated graduate student. Will have to talk with SAR about the possibility of changing Gustavo's thesis research...

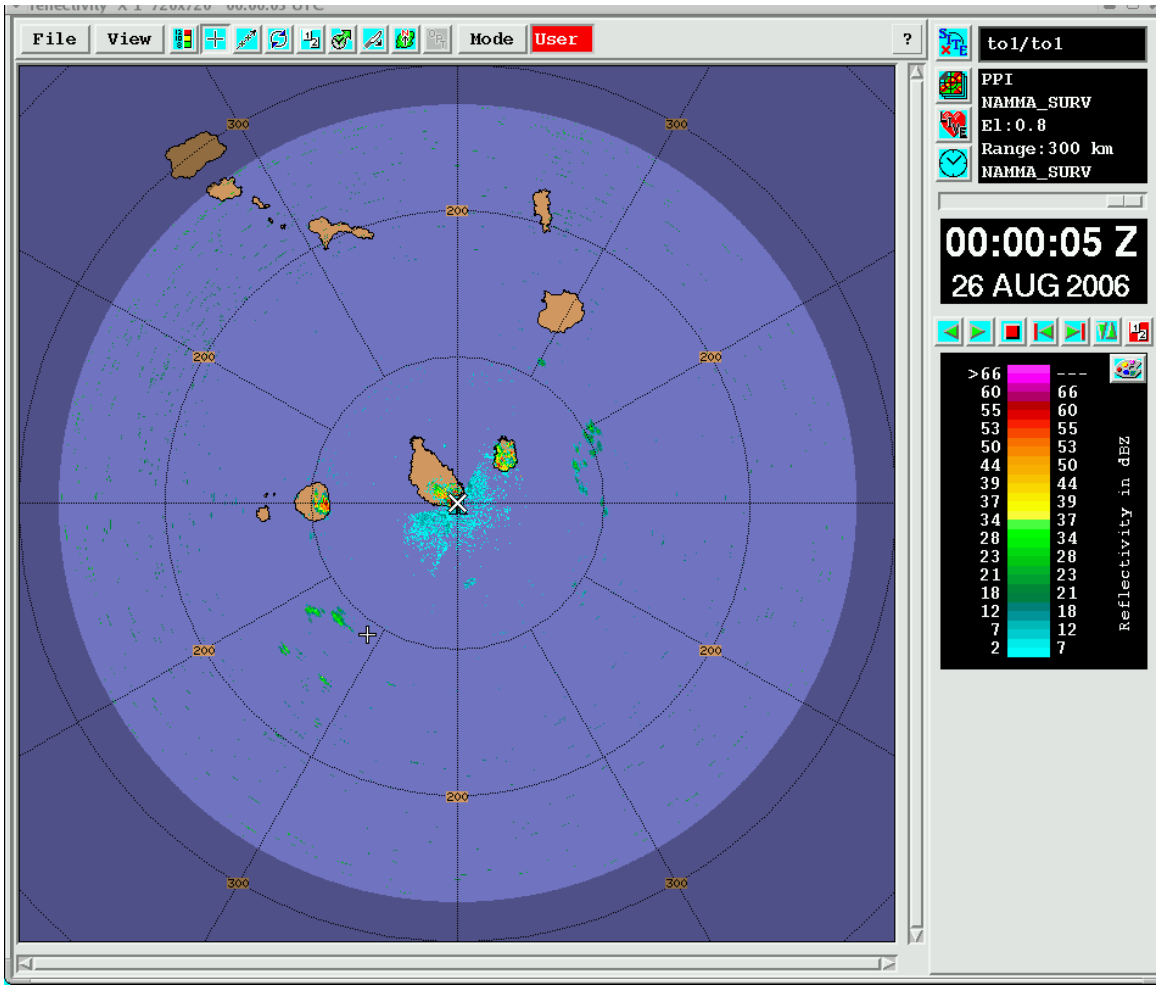
Final, more serious note: Attached cloud-track derived low-level wind product depicts a rather symmetric,~closed gyre that appears to be synonymous with approaching wave. Today's convection in the vicinity of NPOL evidently occurred in the S portion of this gyre.



21:30Z: Gustavo on duty ... and if SAR say yes, Gustavo say Goodbye. He will never finish his PhD if topic was changed at this stage. So, no no.

26 August

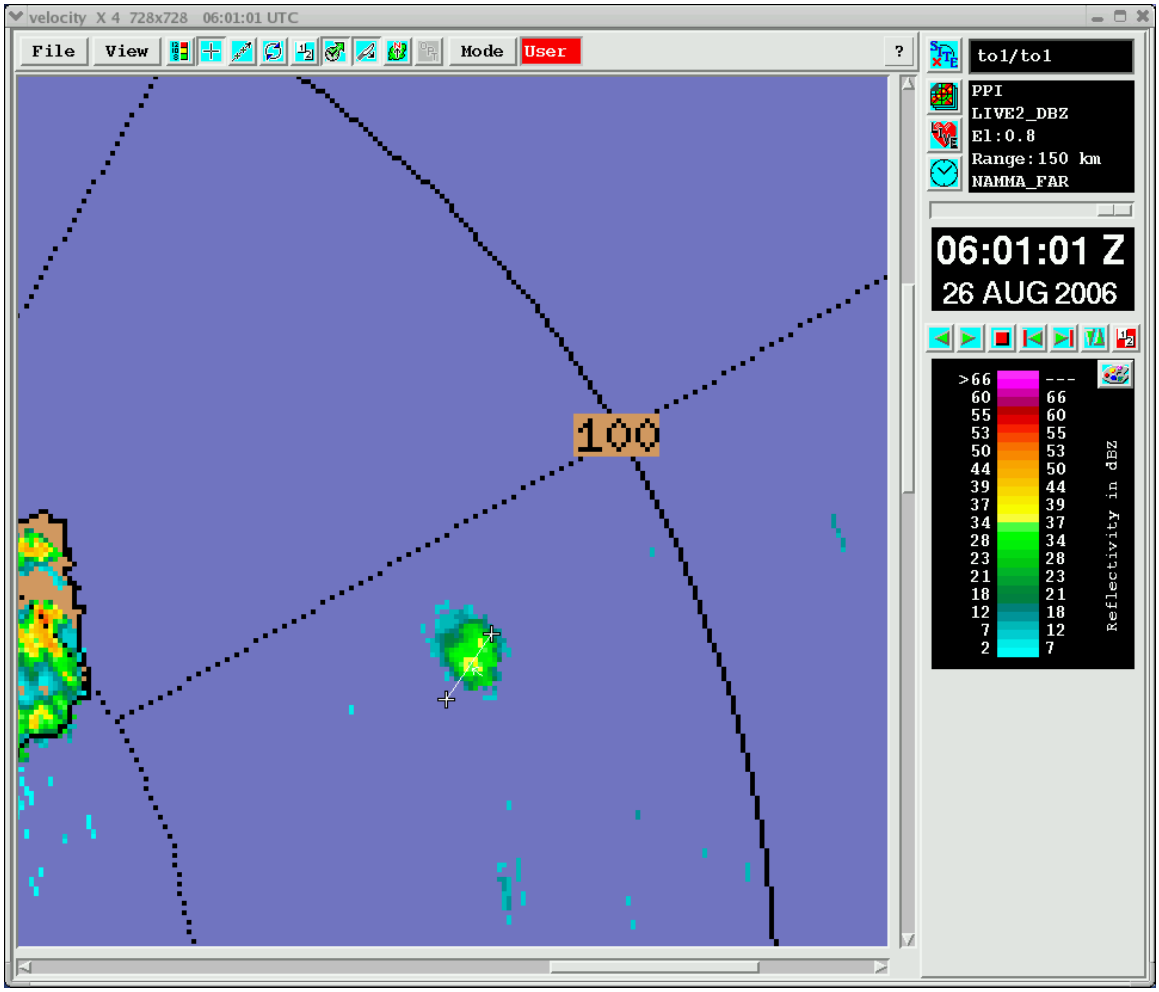
00Z: A few echoes developed about 100 km NE and are propagating S-SE. Reflectivities are on the low side, not exceeding 30 dBZ. A few other cells have developed 120 km SW of Praia, those cells have reflectivities near 40 dBZ and they are also moving on a NW to SE track.



02Z: I went to the radiosonde office to use the Internet, and the NAMMA forecast webpage is down. Ditto for the Cape Verdean National Institute for Meteorology and Geophysics. So, I do not know what the prognosis is for the next wave. I have seen a quick satellite loop and it looks like the wave is exiting the west coast of Africa now, with significant cloudiness associated with it. However, the loop of images seemed to show that the associated convective cluster is dissipating. In addition, it also seems to be in a far south track, so unless something changes from my limited satellite assessment, I would expect us to miss this one out completely. Not much change in the way of the echoes I described previously. The ones to the NE nearly disappeared and then regenerated in the last hour. The wave-like structure in the nearby clutter vanished soon after midnight. Probably turned into a pumpkin. There you have my PhD. I will name this phenomenon Cinderella.

04Z: The echoes 100 km NE of Sao Tiago have dissipated. The ones to the S-SW persist. Clutter near the radar has significantly reduced in the last couple of hours. There are some new echoes that look like sea clutter about 180 km to the S-SE of the radar.

06Z: A shall convective cell developed 80 km E-NE of Praia. Core reflectivities are in the 30 dBZ range and these values do not extend above 2.5 km. Cloud tops are are found near 5 km, hence precipitation is mostly developing due to collision-coalescence.



08Z: Cell to the E-NE moving very slowly. Another isolated convective cell developed 90 km SE of the radar and has core reflectivities of 40 dBZ extending to 3 km ASL.

09:30Z: The convective cells seem to have weakened in. Gustavo signing off.

09:50Z – Cifelli and Smull on-site. Locally, winds are near calm (perhaps only a knot or two at most, out of the NE), and sea state is as calm as we have seen it during this deployment. Taking radar down briefly to print out antenna/RVP7 settings and reset GMT clock for accurate data time-stamping.

09:51 UTC – Radar back up on schedule with all clocks synchronized. Per Gustavo's previous comments, we note isolated bubbling “wet-cloud” echoes are once again exhibiting a west-to-east drift that is probably not suggested by the observed wind profile (tho subject to later verification via local soundings).

11Z: NAMMA_FAR's have not been running since 10Z – not properly scheduled. We need to watch this whenever radar goes down, and double-check to ensure we come back up properly. No significant echoes within range; 1-2 spotty cells far SW, as well as immed. S of Boa Vista. Talked to Zipser in Sal. Plan for DC-8 is to takeoff at about 13Z, do a CLOUDSAT underflight NE of our location, and then sample all quadrants of the wave with drop sondes (the circulation center is apparently just north of Sal at present, which is consistent with the slight eastward movement of echoes at our location) until about 19Z. After 19Z, there will be about 2 hours available to do CCN sampling above and below cloud base. If there are any echoes in our vicinity, these penetrations could be done in our vicinity. Plan is for us to update the mission scientist later today (~ 17Z) on echo coverage in our domain.

12Z: Somewhat more intense cells have appeared along 215deg radial (~210-230 km); peak intensities >35 dBZ. Interestingly, echo motion (and/or propagation) has now switched toward the NNE. Second-trip echo on ~210deg radial indicates more distant activity with same (NNE-SSW) alignment.

Note: This narrow band of activity is evident in 1215 UTC visible shot (see image on next page), within the context of larger AEW gyre apparently centered immed. N of the Cape Verde's. What is also apparent, however, is evidence of a far larger suppressed sector of this circulation encompassing much of the area around TOGA in which virtually no clouds are developing. As such, the circulation evinces something of a “yin-yang” appearance. As illustrated by accompanying IR image, only cooler/convective cloud is confined to far N sector of this circulation. NHC describes this as active convection, which seems questionable.

13Z: Aforementioned echoes moving slowly NNE'ward (now just inside 100 km) and decreasing slightly in intensity/coverage, otherwise no change. Locally, sfc wind is picking up and now has apparent S'ly component. Still, sea-clutter is vastly reduced as compared to last several days.

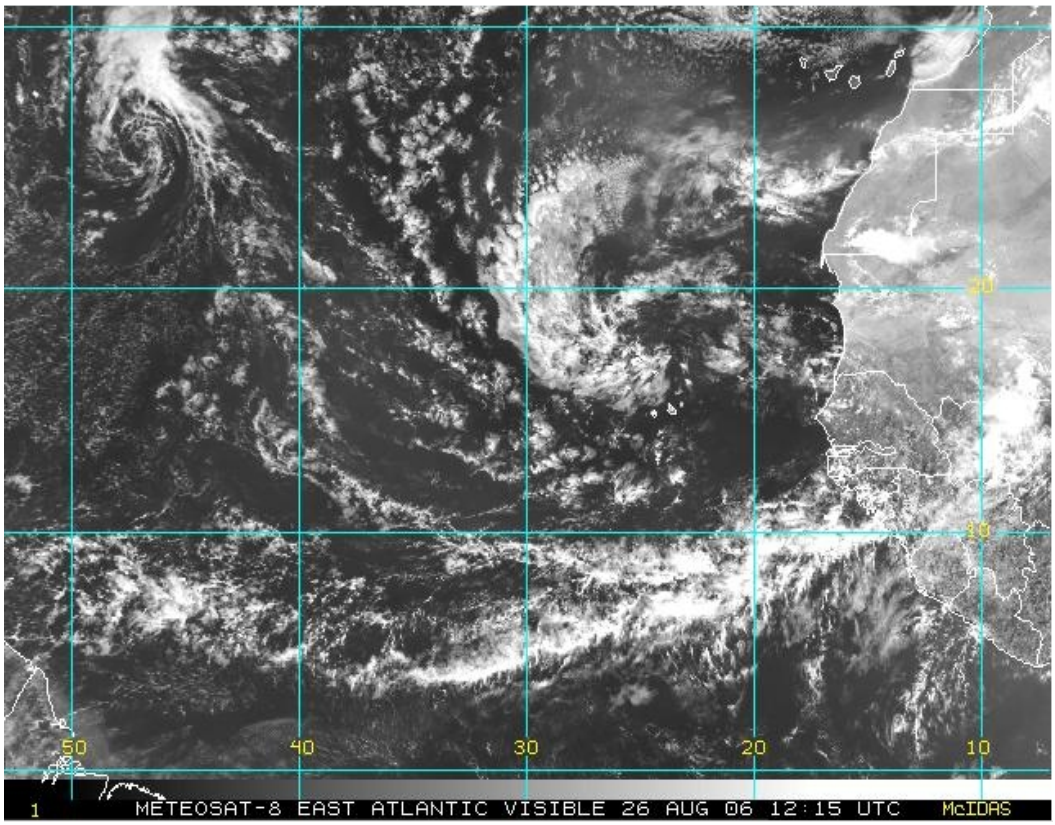
14Z: Greatest concentration of (still rather isolated) cells is now near 180 deg radial, but nothing to write home (or perhaps even here) about.

15Z: All echoes (apart from expanding zone of sea-clutter) have weakened significantly in the past half-hour.

16:30Z – not a blasted echo of interest (outside Gustavo's new thesis work on the appearance and disappearance of sea clutter) in 232,310 km^2....

18Z: Very, very suppressed. Absolutely no clouds visible with exception of those of local orographic variety.

19:30Z: No change. Side Note: TS Debbie was downgraded to TD status at 09Z today, and is likely to weaken further as it is overtaken by baroclinic zone advancing into the north-central Atlantic.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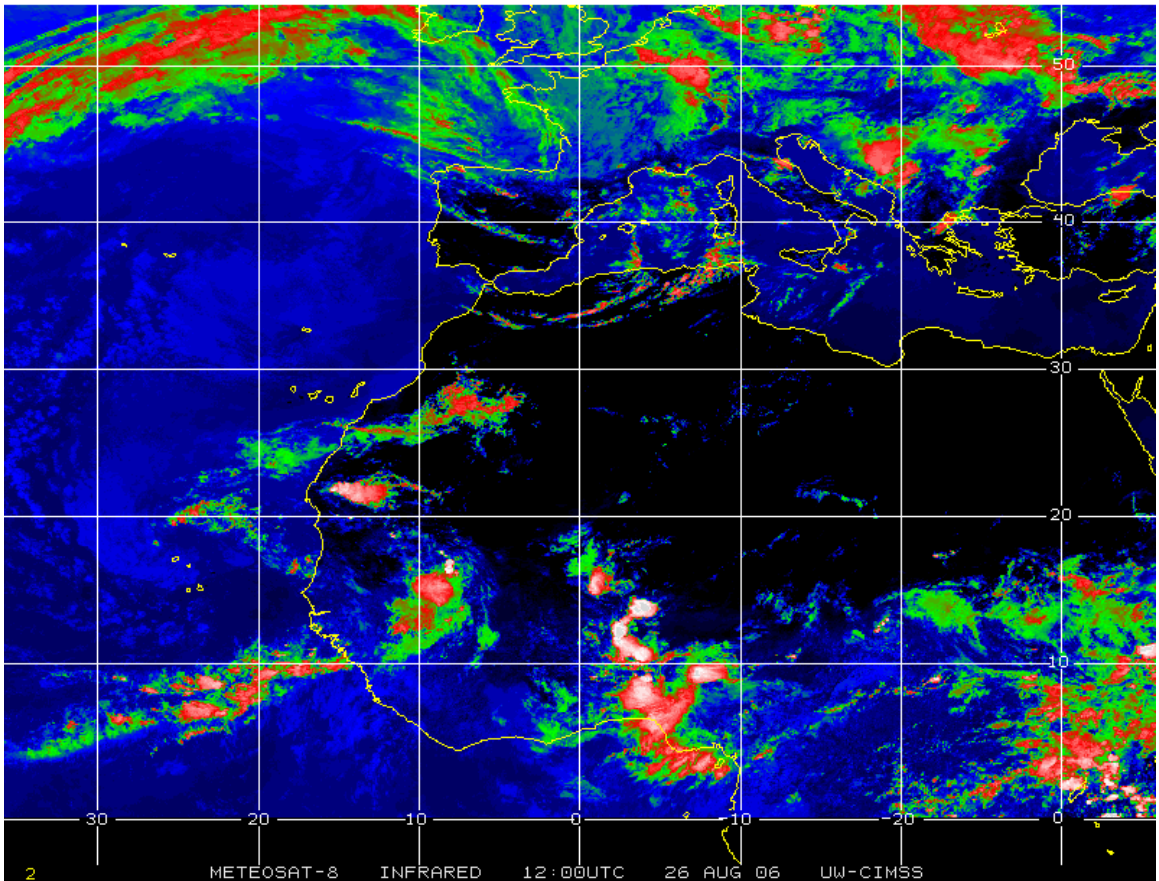
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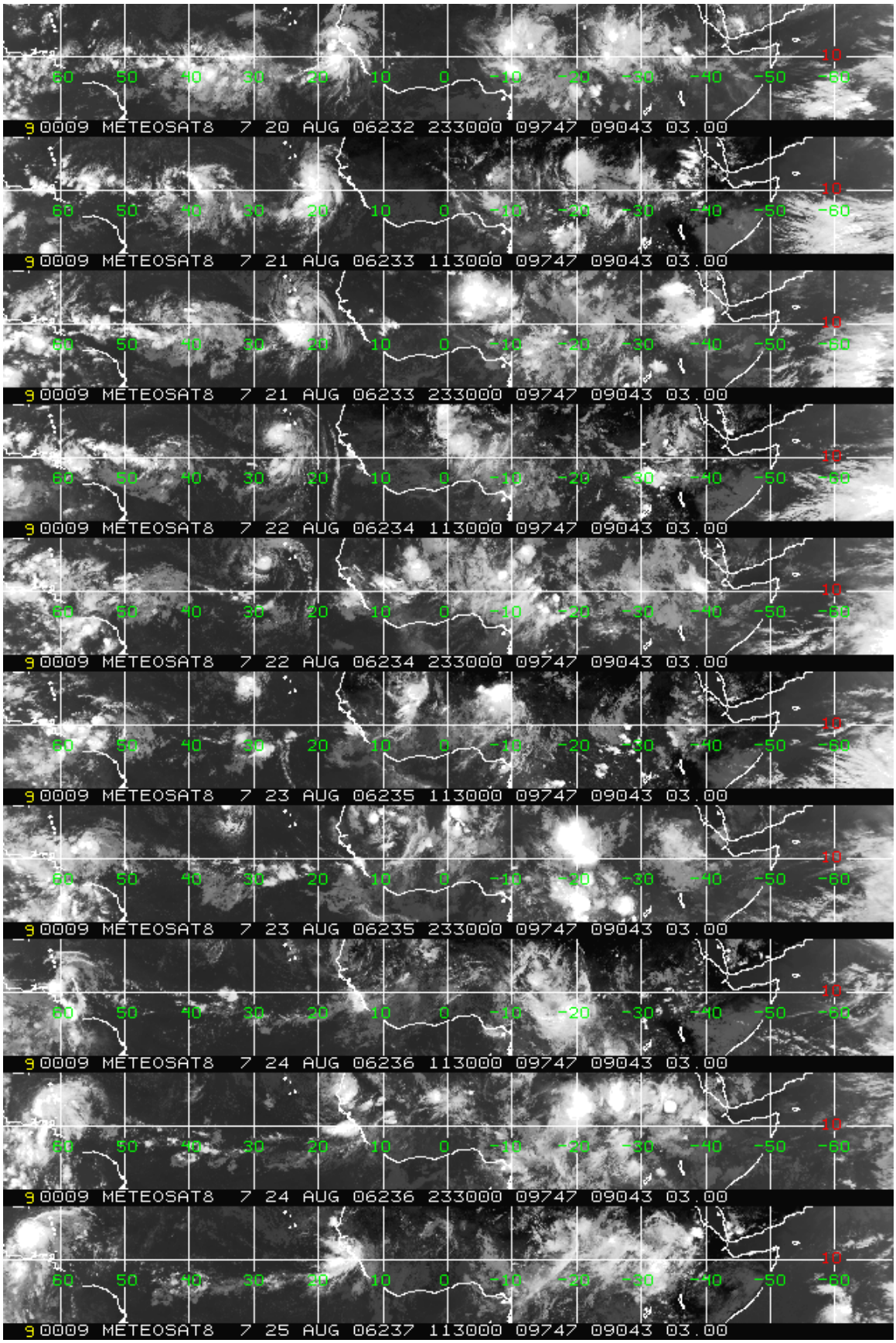
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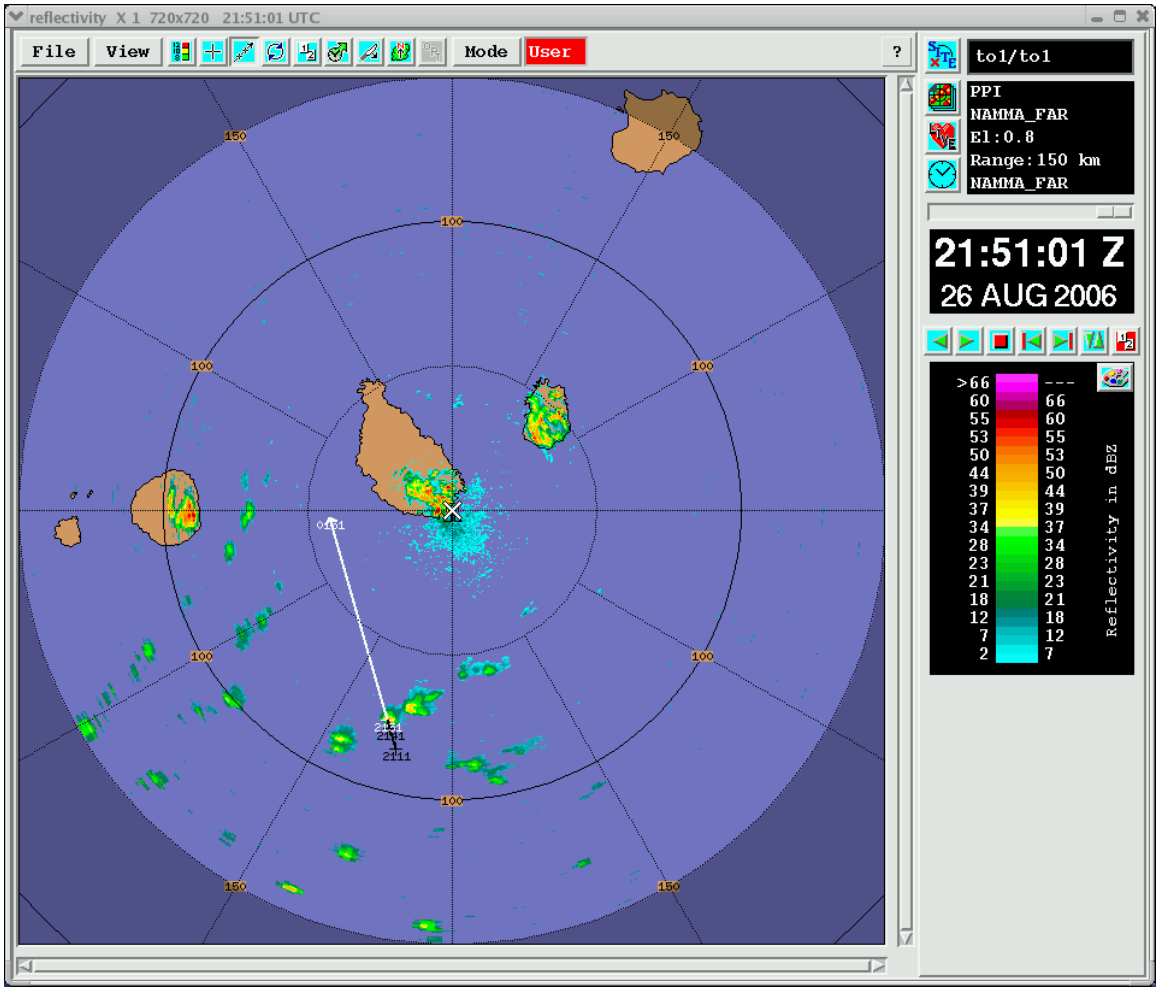
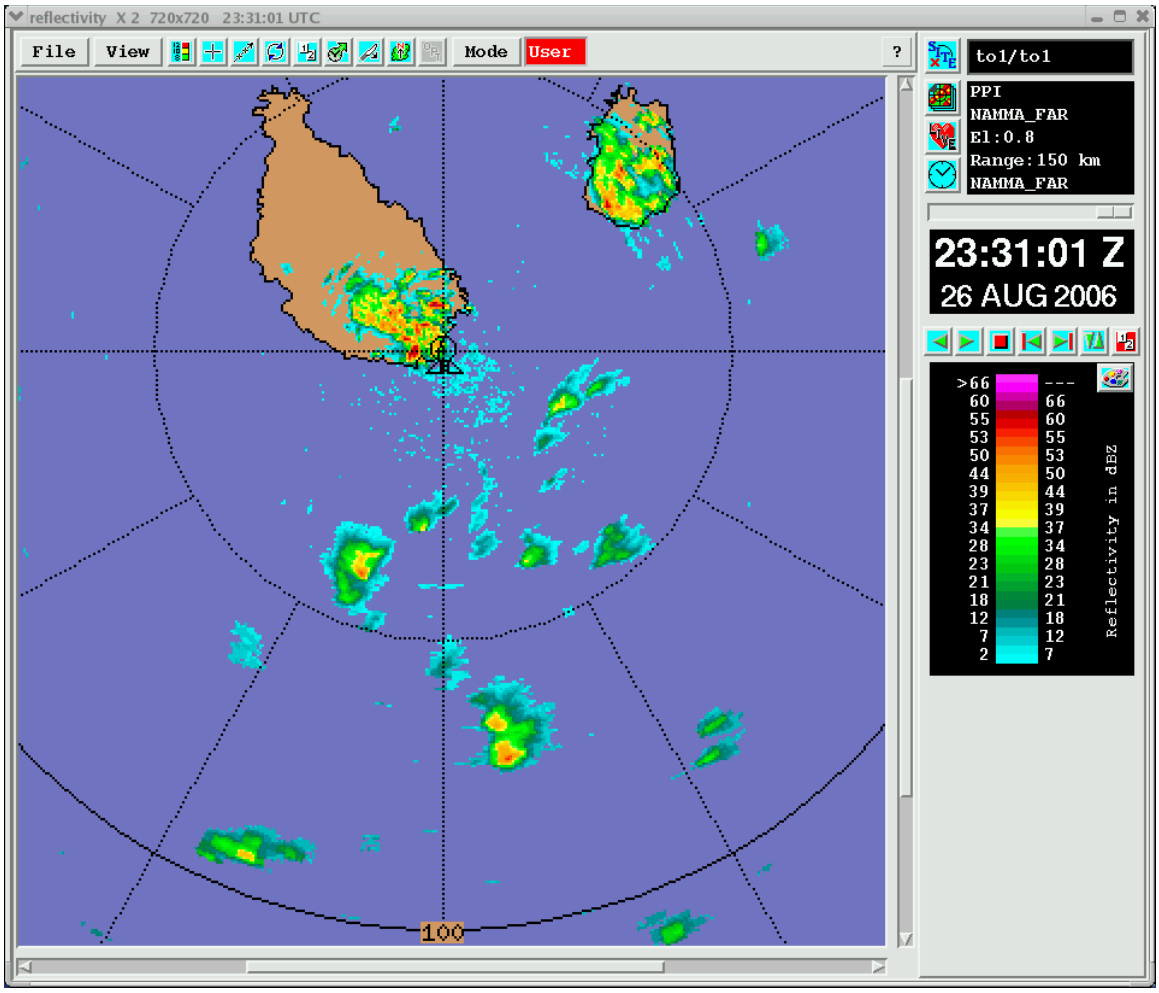
21:00Z: Cellular precipitation is on a marked upswing to our south, though still widely scattered. A few low clouds are scooting N'ward over the radar site (visible against the setting crescent moon), and ambient conditions feel considerably more moist than even just 1-2 hrs ago. Cross sections show tops approaching 4 km, with peak near-sfc dBZ values in the high 30's.

21:30Z: Gustavo on duty. We continue to run the radar on NAMMA_Far scan sequence. Scattered air mass convection continues to develop between 170 and 270 degrees azimuth, but none closer than 70 km to the radar. One cell in particular looks pretty developed, with core reflectivities in the upper 50's, and 30-dBZ echo top near 5 km. If it continues to further develop we may even get a glimpse of lightning. Storm position at this time: range of 80 km and bearing 195 degrees. Cells are drifting to the north-northwest (344 degrees) at 5 m/s (18 km/h or 11 mi/h) according to the SIGMET software. According to the forecasting tool, at the current speed and direction the strong convective cell mentioned before would pass about 40 km to the west of Praia around 01:50Z. Unless new cells develop closer to the radar, the software indicates that the closest cells would be approaching the radar site in about 2 and half to 3 hours ... assuming they do not dissipate.



23:00Z: Echoes continue to develop and move northward. Sea clutter near the radar has reduced significantly. The strong convective cell to the S-SW is now only 40 km (bearing 200) from the radar and moving in a direct path toward Sao Tiago. Core reflectivities in the mid 50s. Cloud tops generally below 6 km, so they are all being easily topped by the 29 degree antenna elevation of NAMMA_Far. The convective cells continue to undergo a cycle of strengthening and weakening in the radar loop.



27 August

00Z: Echoes continue to move toward Sao Tiago. I did not observe any lightning (I asked the guard and he said the same). There is a nice breeze from the south and some low clouds have moved over the radar site, though a few stars are still visible.

00:50Z: Although the NAMMA_Far sequence was still topping the approaching convective cells, it seems that some of them are regenerating near the radar and it is not very easy to keep track of them. Since the most important precipitation features are found now within 60 km of the radar and moving closer to the radar I decided to change the sequence to NAMMA-Near.

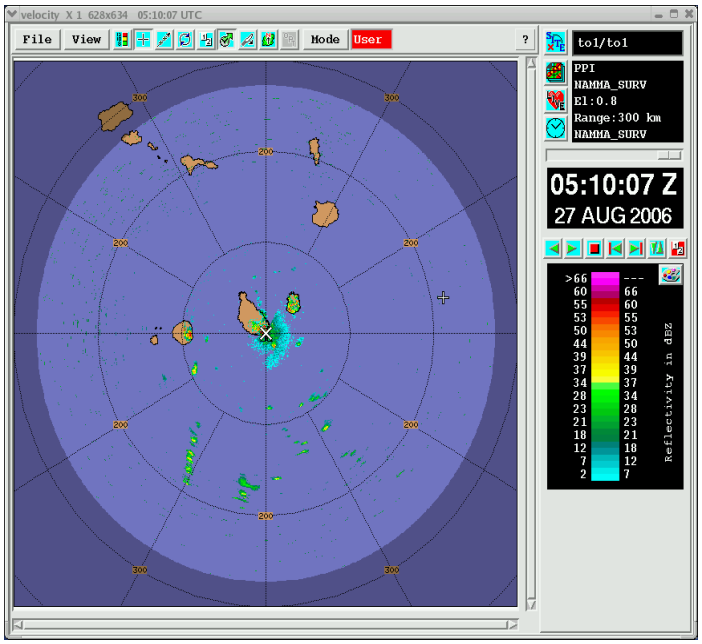
01:30: The core of the strong convective cell I have been tracking since the beginning of my shift is now 20 km from the radar and only 12 km to the southern coast of Praia. Despite the shallowness of the cell (looks like 5 km to me, but the SIGMET product is indicating 7-8 km), reflectivities in the core are reaching an impressive 59 dBZ with a somewhat tilted updraft.

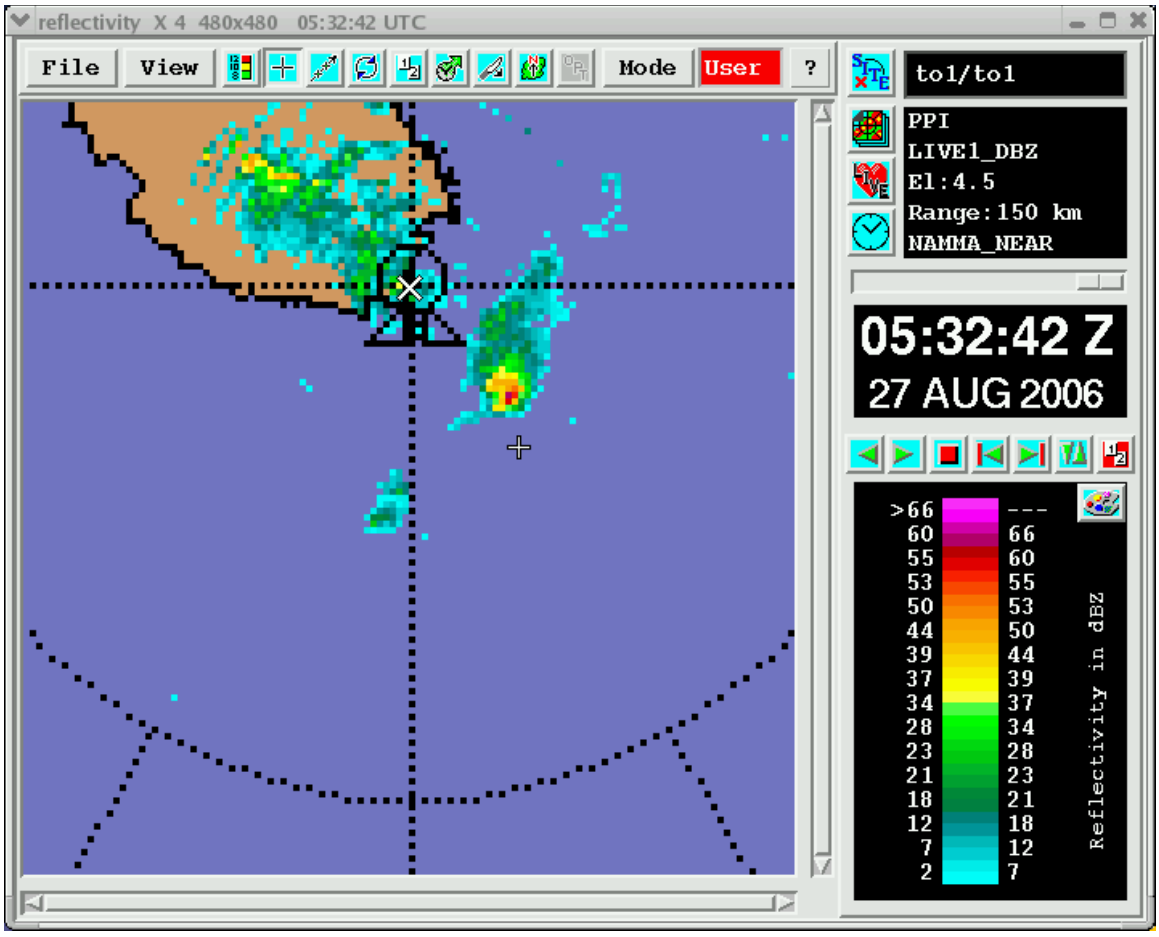
02Z: Echoes have now reaches the southern shore of Sao Tiago, but the ones with strongest reflectivities are found 15-20 km west of the radar site and the reflectivity values has reduced to no higher than 40 dBZ. There were a few sprinkles outside (as evidenced on the car windshield), but no significant rainfall is observed here. However, the air definitely feels muggier.

03:30Z: Despite lack of rain at the radar site, I found the roads near the Port and the old airport tarmac completely soaked. A shower went through the area according to the radiosonde people. In addition, while I was there, we also had some additional light rain. A few other scattered convective cells began to develop 150 km S-SE of the radar site.

04Z: Low reflectivity weather echoes continue to emerge north of Praia. There is a convective cell about 25-30 km S-SE of the radar which continues to move in our direction. Unless it dissipates, if it misses us it will be by little. Another area showing convective development now is 180-200 km S of the radar.

05Z: Another interesting isolated echo appeared in the last few minutes and is found about 100 km W-SW of the radar. Reflectivities were briefly in the 50s. More scattered convection is developing 150-200 km to the SW. Cells are moving to the N-NE. I am debating whether to keep the radar on Near or to change back to Far, given the large number of scattered convective clouds developing near the edge of the PPIs. For now, I decided to keep the Near sequence because we have that one convective cell showing a reflectivity of 62 dBZ in the 4.5 and 5.7 degree PPIs, which is only 13 km away from the radar.





06Z: Scattered convection continues to develop south of the radar. The nearby cell is now only 5-10 km from the radar. However, outside the seatainer I was unable to identify anything. In fact, the skies are currently clear over the radar.

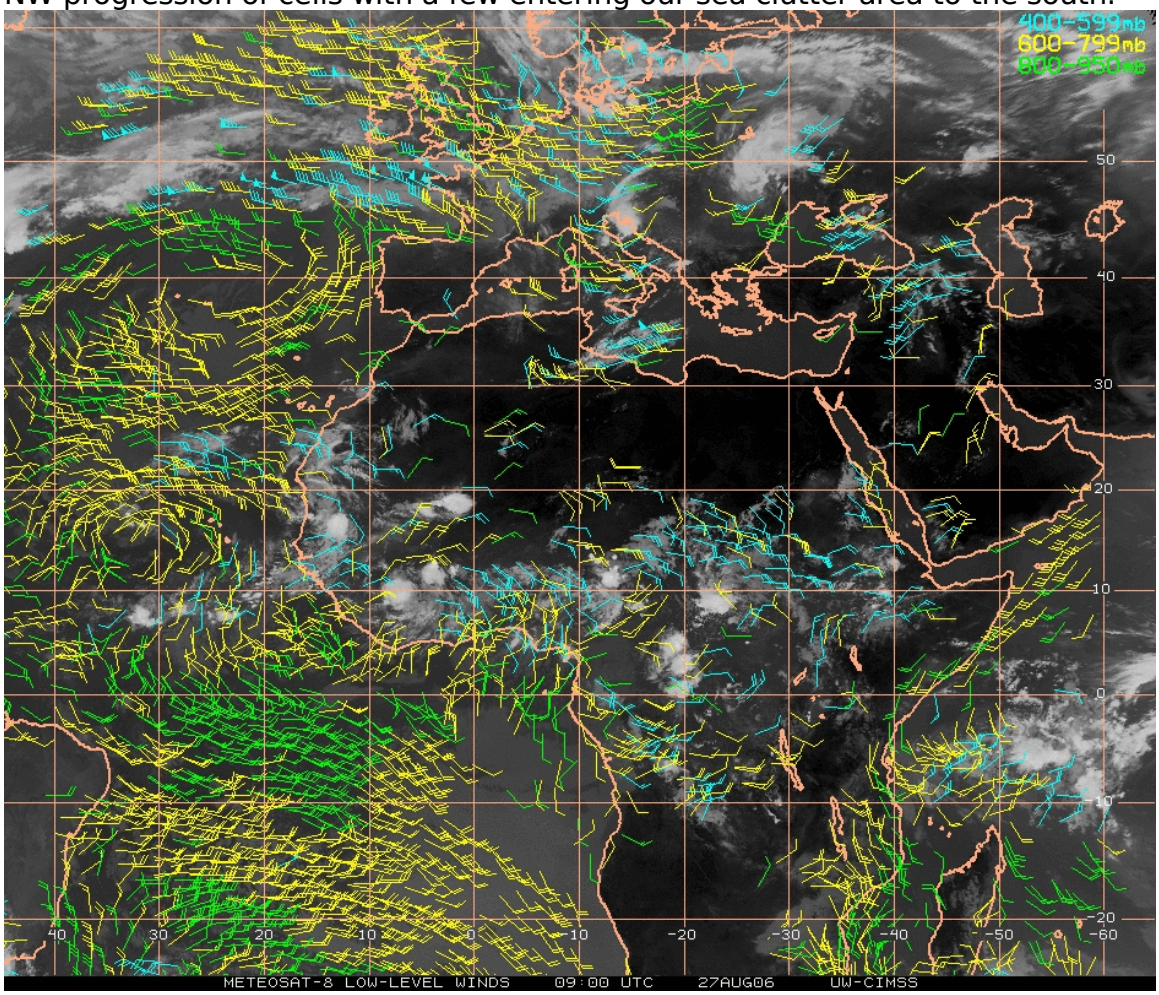
08Z: The cell passed just a few km east of the radar. It looks like it has continue to move northward along the coast of Sao Tiago, perhaps feeding off the dynamics of a land breeze. Scattered convection persists to the south of the radar. However, almost all cells have decayed in last hour, probably because the sun has risen and the usual overnight instability over the ocean is now mostly gone. By the time Rob comes in for the shift we will probably have not much left.

09Z: Switched back to NAMMA_Far. Almost all echoes are gone with the exception of a handful of shallow echoes to the S-SE and the SW. The echo near Sao Tiago continues to move northward away from the radar. There are no signals above 9 degrees of antenna elevation, hence I decided to go back to the Far sequence.

09:30Z: This was quite a busy night. Hopefully things will continue this way. However, I looked at the satellite loop while I was at the radiosonde office and I was somewhat discouraged with the moisture pattern. It looked as though the the moist flow was diverging into a south and north track, and the Cape Verde

Islands would be right in the void between the two tracks. I will be off duty tonight. Gustavo out.

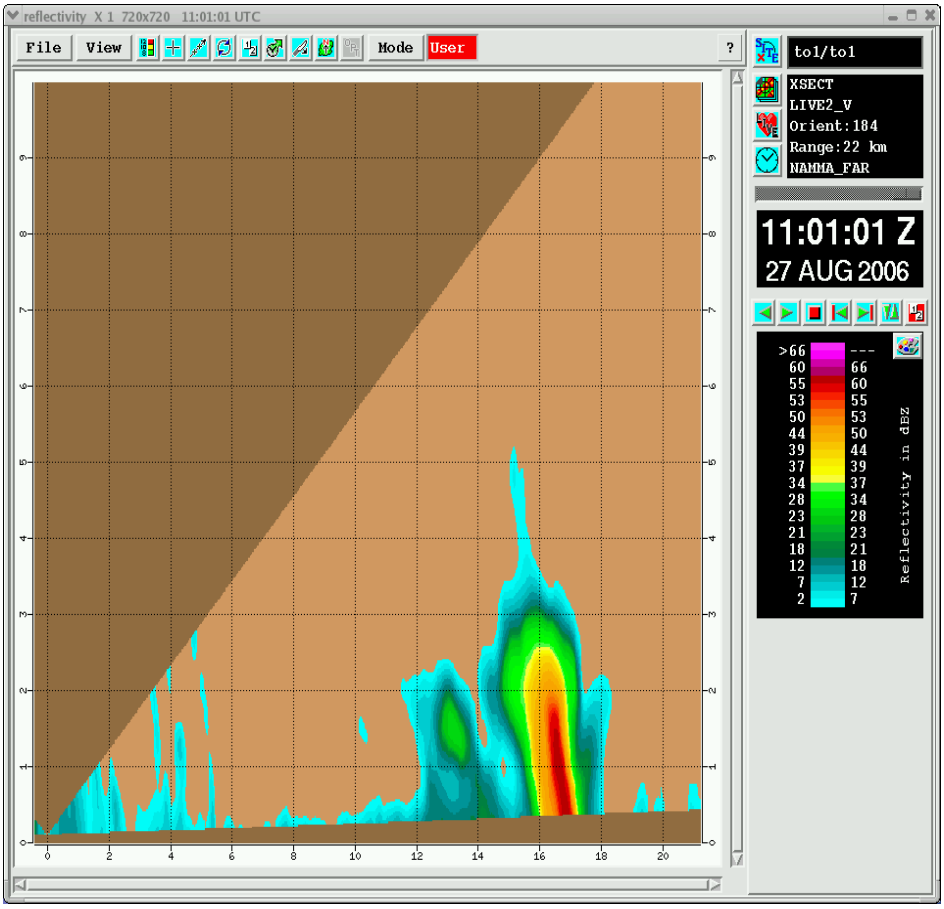
10Z: RC on shift. Definitely more humid today. Currently the site has light E-NE winds with some cu congestus over the island (these seem to be dissipating since we arrived) and some scattered cu over the ocean. Much hazier than yesterday as well. Small group of cells currently south of us (50-100 km range), arranged in a roughly E-W alignment between Sao Tiago and Fogo. These are all congestus, with echo tops < 6 km and max reflectivities of ~40 dBZ (at or below 2.5 km MSL) – warm rain cells. Animation shows continued N-NW progression of cells with a few entering our sea clutter area to the south.



9Z winds and IR showing the wave circulation center W-NW of us (~35W): coldest cloud tops are N. and S. of the circulation center.

10:30Z – talked with Zipser in Sal. Plan for DC-8 today is to sample the wave, now far to our west. This will be the 3rd day on the wave and should provide a good sample of dynamic evolution. Bottom line: no interaction with aircraft anticipated. DC-8 will probably be down next 2 days.

11Z : small group of cells passing S-SW of us about 20 km distant. Individual cores are probably no more than 2-4 km in diameter but maximum reflectivities are now ~ 55 dBZ. Cross sections show some tilt toward the NW above about 1.5 km.



14Z – went to old airport to file yesterday's fascinating report and do some email. Skies are clearing over the site. Some clouds still socking-in the higher terrain on the islands but view out toward the ocean is mostly clear. Sea clutter pattern has increased and white caps on the waves off the coast are visible. Cell activity in the 150-210 azimuth sector continues. Animation shows these features to progress N-NW, with individual elements lasting < 1.5 hours. The cell structure is quite similar to what was previously described: nothing above 6 km in depth and very narrow – like filaments in cross section.

Latest sounding (10z) shows very moist up to about 750 mb with strong cap above this. SW flow between 1-3km, backing to SE at about 5 km. Easterlies aloft.

17Z: The march of piddly echoes to our south continues. Nothing terribly exciting. The new laptop is now hooked up to the network. We just need to get the IDL license to accept the hostid.

19:30Z – Echo march continues. The only discernible change is that weak echoes have formed along the north coast of Sao Taigo over the last 2 hours and drifted out over the water. I do not think these echoes are continuation of cells advecting from the south – this looks like a separate phenomena. Animation hints at some kind of sea-breeze convergence trigger but the echoes are partially blocked to our N, so it's difficult to say exactly what's happening. At any rate, this activity bears further monitoring. The other feature of note is small clustering of cells SE of radar (50-75 km distant). Nothing spectacular in terms of tops (4-6 km) or cores but overall density has increased. We are also seeing an increase in echo density to our south 150-200 km distant.

Today's echoes (in terms of vertical structure) are reminiscent of SCSMEX--dry air above about 600 mb being entrained and evidently preventing cells from growing further.

21Z: Echo activity about the same as before. RC signing off...

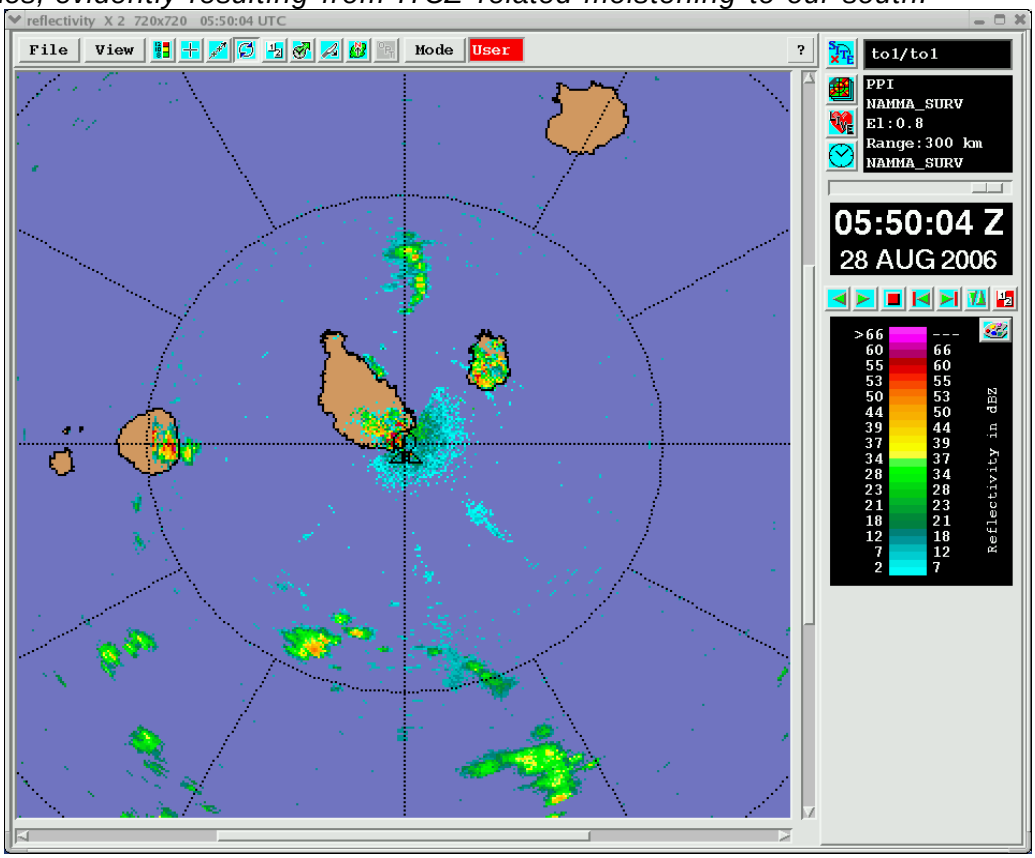
28 August

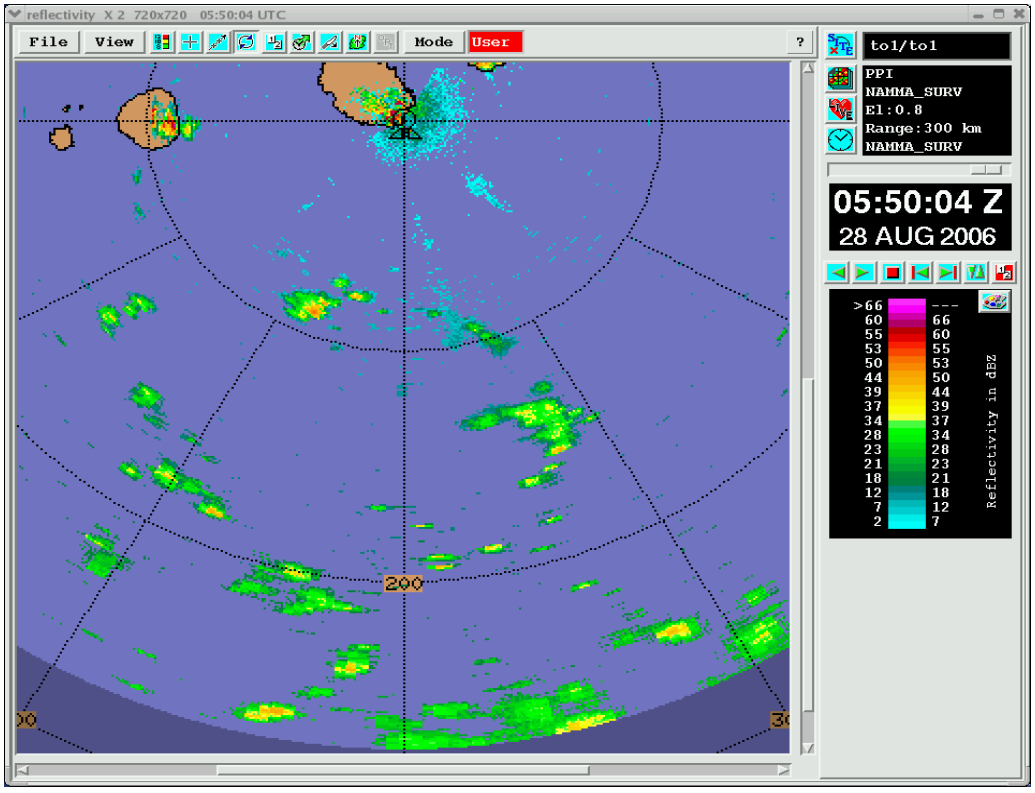
0930Z: Smull and Bowie on-site. Radar has been scanning in NAMMA_Far mode, which still appears adequate. Radar clock is approx. 40 sec too slow, i.e. Scans are commencing 40 sec later than indicated time. All DVD archives appear up-to-date, and no problems were reported by NASA night crew. Overnight period looks to have been a good bit more active in the absence of scientific staff to take real-time notes, so will provide the following brief review:

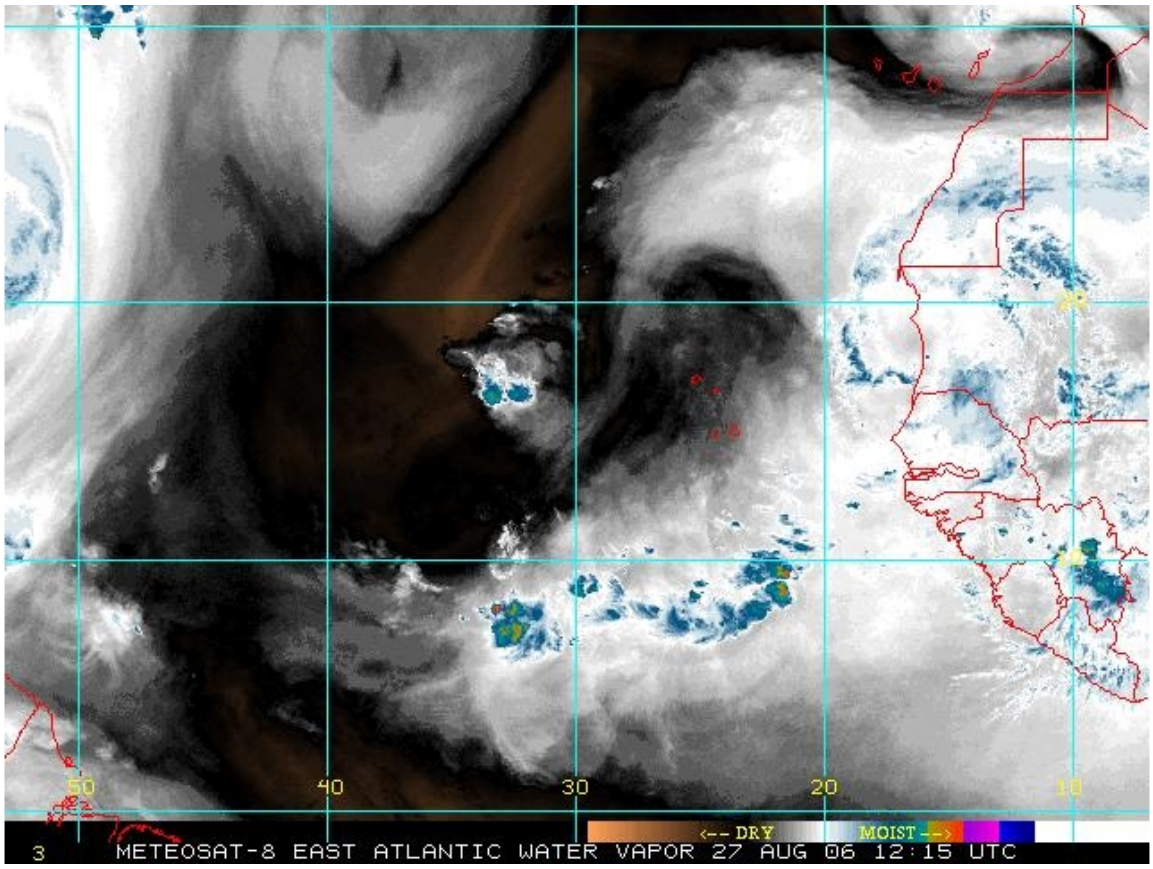
Echo coverage notably increased after 00 UTC. Following-on Rob's previous discussion of cells near the N shore of Sao Tiago, this activity built NNE-ward to form a short (ca. 40 km long) quasi-stationary line, which by 03Z lay close to our 360 radial. Thereafter, this line took on a convex "bow" shape and propagated eastward (esp. after 05Z), with perhaps a hint of small-scale cyclonic rotation associated with comma-head type structure (cf. 0550Z PPI image, attached). This feature dissipated by 07Z. More broadly, after 01Z cellular echo coverage increased markedly both along the 090 radial and within a ca. 90-deg wide sector centered on 180. This activity included what appeared to be an *anti-cyclonically rotating echo centered near 160deg/150km. After 06UTC, echoes to TOGA's south took on a more pronounced east-to-west motion, as if some flow regime shift had occurred. Thereafter, a mix of cellular convection and somewhat broader stratiform areas (mostly <50 km in max horizontal extent) occurred over the S quadrant, albeit mostly beyond our quantitative/volumetric scan limit (150 km).*

Even allowing for range/beamwidth effect, the characteristic horizontal scale of activity appears to vary systematically with N-S distance. Cells nearer the radar (i.e. to the north) are smaller and more widely scattered, while those farther south (near the 272 km range limit for surveillance scans) are significantly larger and accompanied by intervening stratiform precipitation. This gradation is reminiscent of that seen in last night's Meteosat water-vapor imagery (sample

attached), which depicted a sharp moisture gradient in the vicinity of the Cape Verdes, evidently resulting from ITCZ-related moistening to our south.





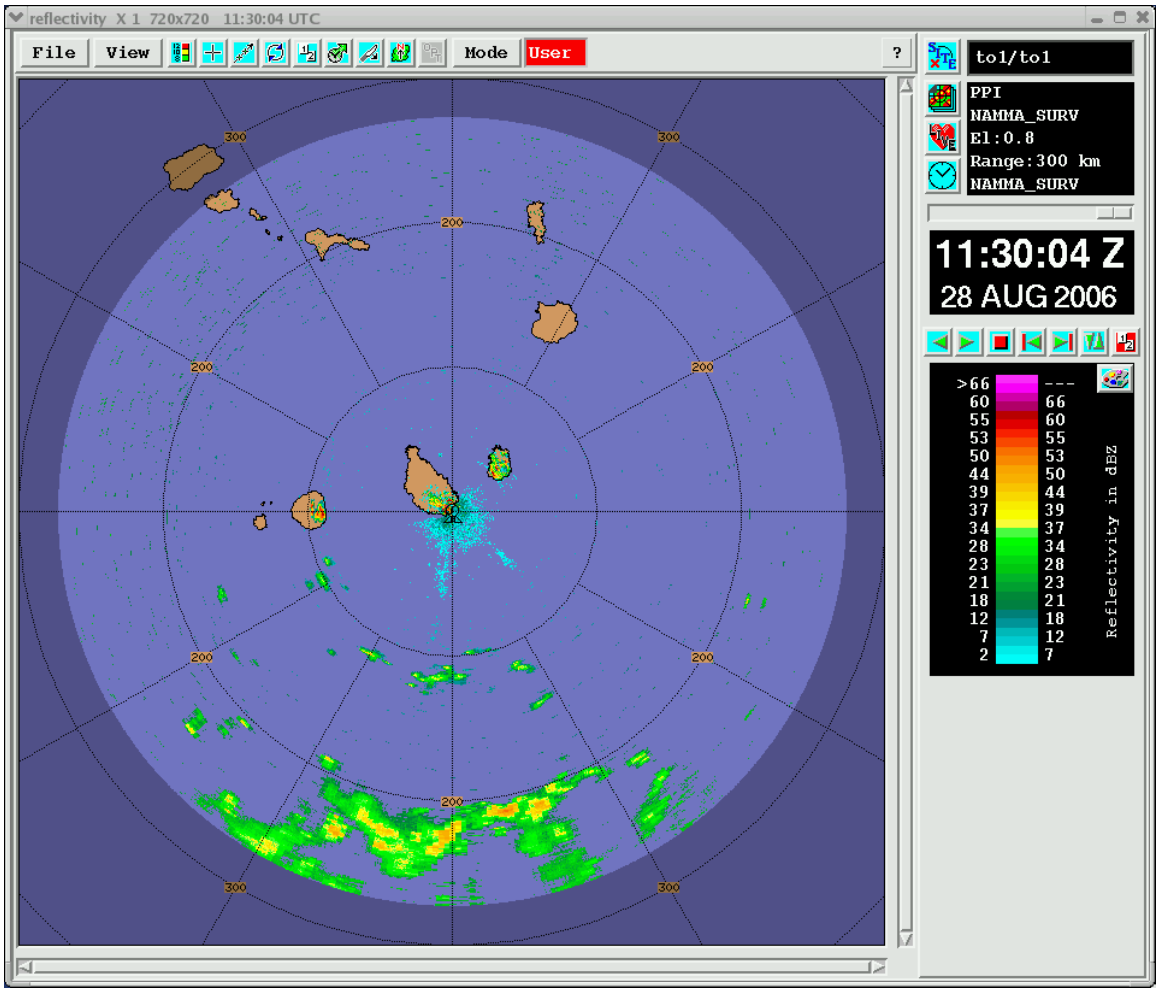


1030Z: Only spotty echoes are indicated near the southern edge of our NAMMA_FAR scans, with more extensive echo evident beyond 200 km range in the S quadrant.

1130Z: Some tendency for organization of convection into E-W bands is noted. One of these within NAMMA_FAR range (centered near 185 deg/120 km) has tops extending to 8 km, with peak reflectivities of 35-37 dBZ. An even larger E-W band is evident farther south, within surveillance range.

1230Z: Considerable 2nd-trip persists within on NAMMA-Far scans for r<100 km. Activity beyond 200 km continues to exhibit MCS-like structure, embodying a WSW-ENE convective line with more stratiform type echo to its S and esp. W. Continued echo movement toward the SW is gradually carrying this activity out of range. Second trip echo pattern suggests more distant activity is shifting from our SE to our SW.

1430Z: Virtually no meteorological echoes within 150 km of TOGA. More organized/widespread echo (still evincing some evidence of elongated WSW-ESE structure), is progressively sliding farther SW and thus increasingly out of range of surveillance scans. A few additional spotty echoes are popping up in the 150-200 km range mainly to our SE, with one narrow arc-shaped echo near 75 km in the 180-210deg sector.



1530Z: Quasi-linear system exited SW edge of surveillance coverage ~1500Z, but a new, less clearly organized “knot” of convection is now entering SE edge of domain.

1630Z: Meteosat imagery (accessed on brief visit to radiosonde facility) suggests we are on the northern fringe of ITCZ, a frustrating arrangement but one clearly favored by climatology (e.g., Steve Nesbitt's mean IR plots). Very few echoes within 150 km.

1730Z: Quasi-circular echo mass continues sliding WSW-ward; peak intensities at 1700Z approached 49 dBZ—not bad at 200 km range, where estimated beam height exceeds 5 km MSL. At 1730Z, a very few isolated cells are leaking into r<150 km domain, mainly along/near the 130deg radial. Tops of this activity are uniformly <6 km, irrespective of range, suggesting some sort of thermodynamic/entrainment control is at work.

1830Z: Distant echo (one amorphous blob, one broken line) largely confined to 120-160deg sector, and noticeably weaker than an hour ago. No analyzable echo within 150 km.

1930Z: Off to the SE, a bit of anvil-type precip (just inside the 200 km range mark) is all that remains.

2030Z: Weak stratiform echo remnants approaching 150 km range marker.

2130Z: Few echoes remain in the 120-150deg sector. Otherwise, the radar display gives new meaning to the phrase “clean sweep.” Smull signing off...

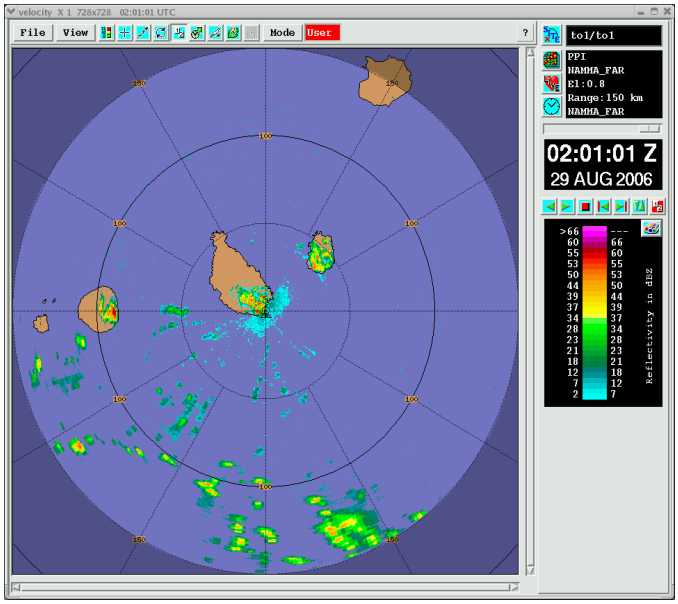
21:45Z: Gustavo in. Nothing out there, with the exception of a second-trip echo to the W-SW and a couple of small echoes 150 km to the SE.

29 August

00Z: Nighttime boundary layer destabilization is evident with the scattered convection that appeared within the scanning domain approx. 120-150 km S-SE of the radar. Some cells have reflectivities in the 50s and general motion of cells is towards the W-SW. Therefore, unless new cells develop close to us (I doubt it) we will not see these echoes any closer to the radar. NAMMA_Far remains the scan sequence of choice.

02Z: Echoes have grown in size and number in the last 2 hours. In addition, they are now widely scattered between 150 and 270 degrees and continue to drift toward the W-SW. The majority of the echoes are found beyond the 100 km range ring. There is also a relatively small, E-W oriented, weak reflectivity echo that is now found between Sao Tiago and Fogo. No echoes are moving toward the radar.

04Z: Echo motion has turned more toward the SW now. Most echoes are moving at approximately 20 km/h (5-6 m/s) and are now approaching the outer limit of surveillance PPI scans. Thus, by 06Z the PPI domain will likely fairly clear. However, we should be able to follow the progress of convection through the surveillance scans for a bit longer.



06Z: Indeed not much is left in the range of the PPI scans. However, there are a few weak echoes about 50 km SW of the radar. Now that the strongest convective cells have moved beyond the PPI range, some second-trip echoes are appearing near the 195 degree radial.

08Z: A few weak echoes have expanded in size in the hour approx. 100 km south of Praia. Direction of propagation is still toward the SW.

09:30Z: In the surveillance scans some of the earlier echoes are still observed moving southwestward at 24 km/h. In the higher PRF scans we still see the weak echoes 50-100 km S-SW of the radar. Throughout the night the northern quadrant of the radar was free of any weather echoes (as usual). Sea clutter has also increased in the last 3 hours. The sunrise beam is currently visible in the lowest scan around 07:20Z and visible at the other tilts until around 09Z. Gustavo out.

10Z: Smull & Cifelli on-site. We note that the preferred axis of echo orientation shifted between night-before-last (i.e., early on 28 Aug), when it was WSW-ENE, and the night just finished, when it was and in fact continues to be more WNW-ESE). Moreover, the characteristic mode of line propagation has also changed. Echo motions early on 28 Aug were more nearly parallel to the preferred line axis (in what has sometimes been termed a “shear parallel” mode, though this has NOT been confirmed in the present environment), whereas this morning echo motions are more nearly perpendicular to the line orientation axis. Based on PPI animations, Barnes' “slow-moving” vs. “fast-moving” terminology may be more apt in describing these two nights, respectively. Today's propagation speeds aren't spectacular, though, presently being toward the SSW at 6-7 m/s.

11Z: Only widely scattered cells are now being detected in our SW sector, mostly beyond 200 km. There is no further evidence of linear echo organization.

12Z: The trend of echoes moving SW-ward out of TOGA's range continues.

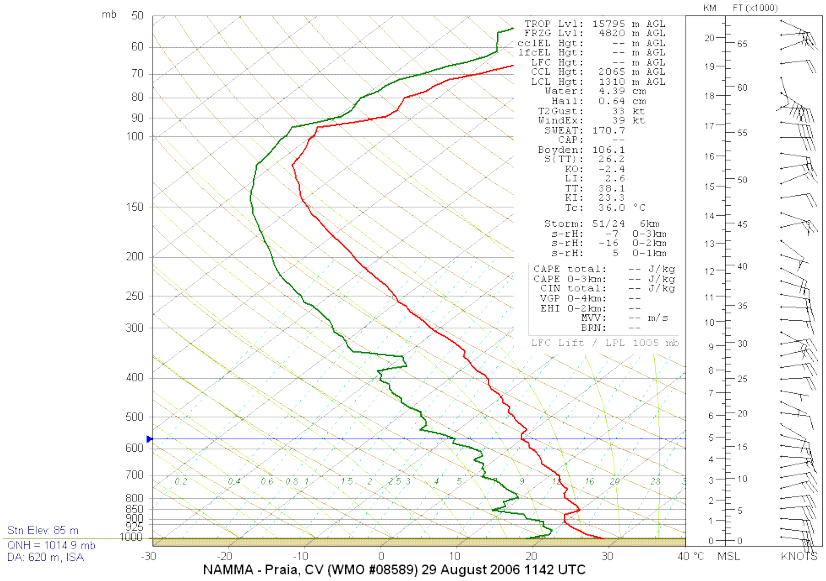
13Z: No change. Ambient conditions at TOGA site include a stronger N'ly surface wind component than experienced yesterday (when flow appeared to be more from the E), with far less cirrus visible overhead and to the south.

14Z: Few echoes remaining, now mostly confined beyond 250 km.

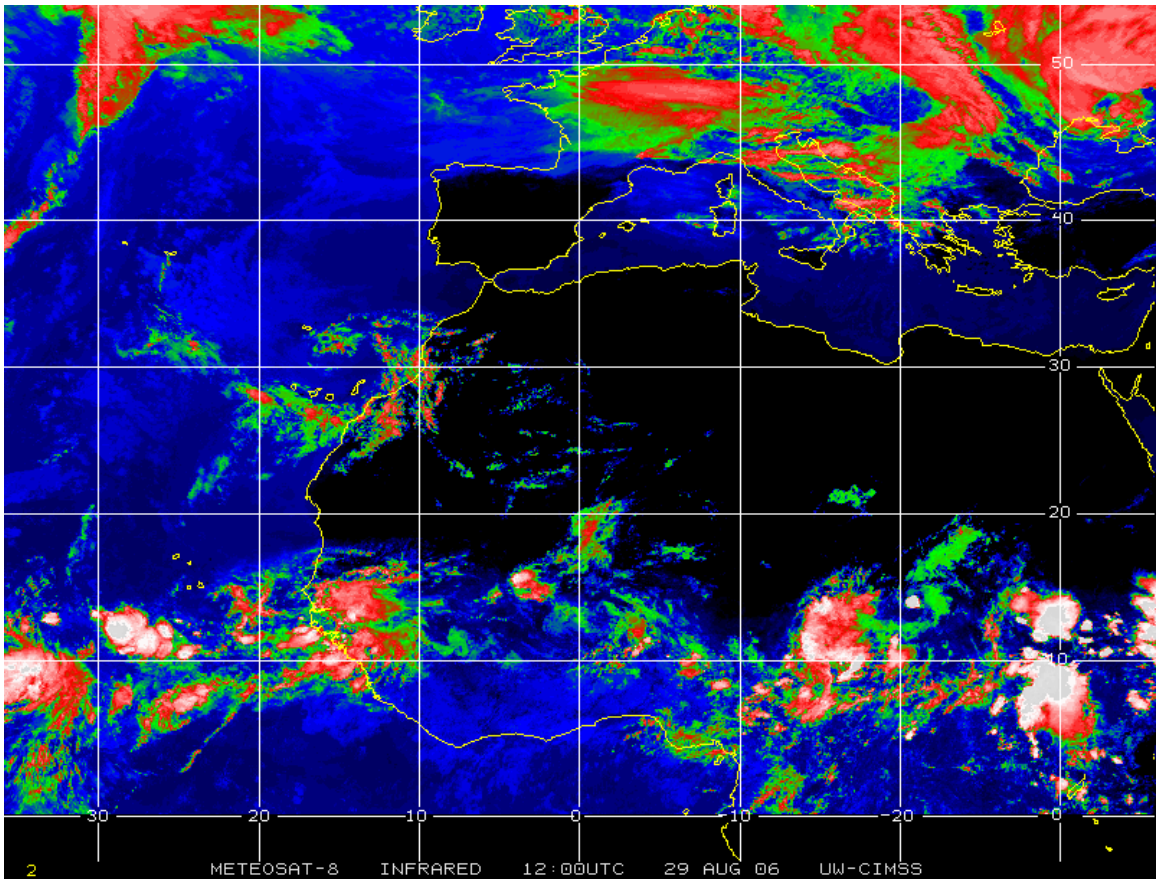
Call from Zipser: DC-8 microphysics mission is planned for tomorrow, they would like to fly vicinity of TOGA. We will call Sal between 9:30-10am CVT. tomorrow. Thursday (31 Aug) is a potential down day, in preparation for the period Fri-Sat-Sun when a major wave is forecast to come off the African coast.

15Z: Scope virtually free of echo. Gave Bowie OK to bring system down for solar cal and other maintenance. Fuel also being delivered today. System went down at 1550Z.

Following two images (provided by Mike Douglas) added after the fact. The first nicely illustrates the tendency for island “wakes”, as evidently observed on 29 August, while comparison with the 2nd illustrates problems with displayed winds in Skew-T's that were posted to NAMMA/Wallops webiste during the project:



1840Z: TOGA back online after encountering some problems w/ restart. Radar system clock is approximately 1-min behind GPS time; will attempt to get this corrected tomorrow. Scope essentially devoid of echo with exception of isolated echo near 200deg/250 km. Considerable 2nd trip inside 100 km in 150-240deg sector of surveillance scans points to considerable distant echo to our S-SW, as evident in Meteosat IR image showing fairly classical tropical cloud cluster in that general direction.



2030Z: PPINE

21:30Z: Gustavo on duty. I don't like to see PPINE before my shift begins. Let's just hope I won't have to PPINE every entry through this shift. Currently, we are pretty close to PPINE. There are two echoes near the SW edge of the PPI scan.

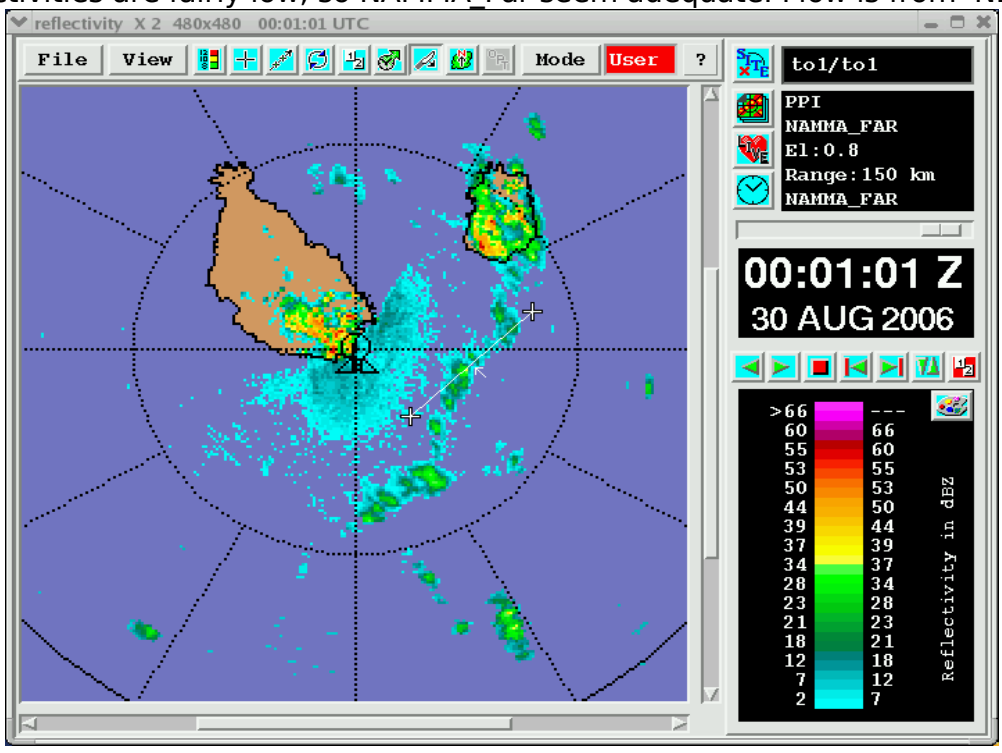
23Z: I retrieved the following Forecast discussion for NAMMA:

"Two waves are present in the NAMMA domain - one is located at 28W and a second over the Guinea coast. The wave sampled over the weekend continues to contain a significant amount of dry air with dust entrained. Currently located at 40W, it has been slow in movement and slow to develop - very little convection has been seen in Meteosat-8 imagery. Overnight, convection has significantly increased in the waves

at 28W and 15W, as seen in Meteosat-8 infrared imagery. GFS forecasts initialized at 00Z today indicate wave passage to the south of the Cape Verdes tomorrow, while intensifying to the southwest tomorrow afternoon - seen on the 48 hour forecast valid at 00Z on August 31 for 850mb vorticity. Dust is currently being ejected into the Eastern Atlantic (off of Mauritania) ahead of the wave currently on the West African coast. As the wave passes to the south of the islands, dust will stay farther to north of the wave, over and north of the Cape Verdes. As the ridge passes on Thursday, another wave - more intense than the one currently exiting the coast - is forecast in the GFS to exit the coast on Friday, Sept. 1 - seen in the forecast valid at 12Z Sept 1. The GFS develops this wave off the coast and takes it northwest over the Cape Verdes. Prior to the wave exiting the coast, a dust event can be expected off the coast of West Africa as winds at 700hPa are favorable ahead of the trough. Other models such as the UKMet, ECMWF, and NOGAPS have similar timing and tracks, however the UKMet shows the wave to be stronger as it exits the coast while the ECMWF and NOGAPS have similar strengths as the GFS".

30 August

00Z – In the last hour several echoes began to appear near Sao Tiago and Maio. These echoes are to the NE and SE and, in fact, almost all of the cells are within 50 km of the radar, an unusual sight here (at least compared to what we have seen during NAMMA so far). The clouds seem to be shallow and reflectivities are fairly low, so NAMMA_Far seem adequate. Flow is from NE.



Note: TRMM-Linux1 crashed around 02Z. Brad is not unique anymore. I guess I need a chaperone too. Well, all I tried to do was to add the figure above. Anyway, nothing was working on this machine so I called Nathan, who came to the radar to take a look. The machine was booted multiple times. It was back up probably around 04:30Z. The radar was operational

and recording data throughout this period. At any rate, raid is unavailable for now, until Nathan finishes checking it out. Gif files are to be saved on /usr/iris_data. Ditto for this log. Data is not being saved on raid for now, but is still being recorded in several other places.

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02Z: The pattern has not changed much. More cells are seen developing between Sao Tiago and Maio. One of these, close to the NE coast of Sao Tiago, began to develop a more linear organization, suggestive of possible land-breeze involvement or some other form of terrain-related forcing. Echoes are still mostly weak, with the exception of one echo 50 km directly south of the radar where the reflectivity is peaking at 45 dBZ.

02:50Z. This feature is better viewed at higher antenna elevations (i.e. 1.8 degrees) or in the 2 km CAPPI. Other that that, almost all other cells have significantly decayed in the last 2 hours. Looks like we are heading towards PPINE again.

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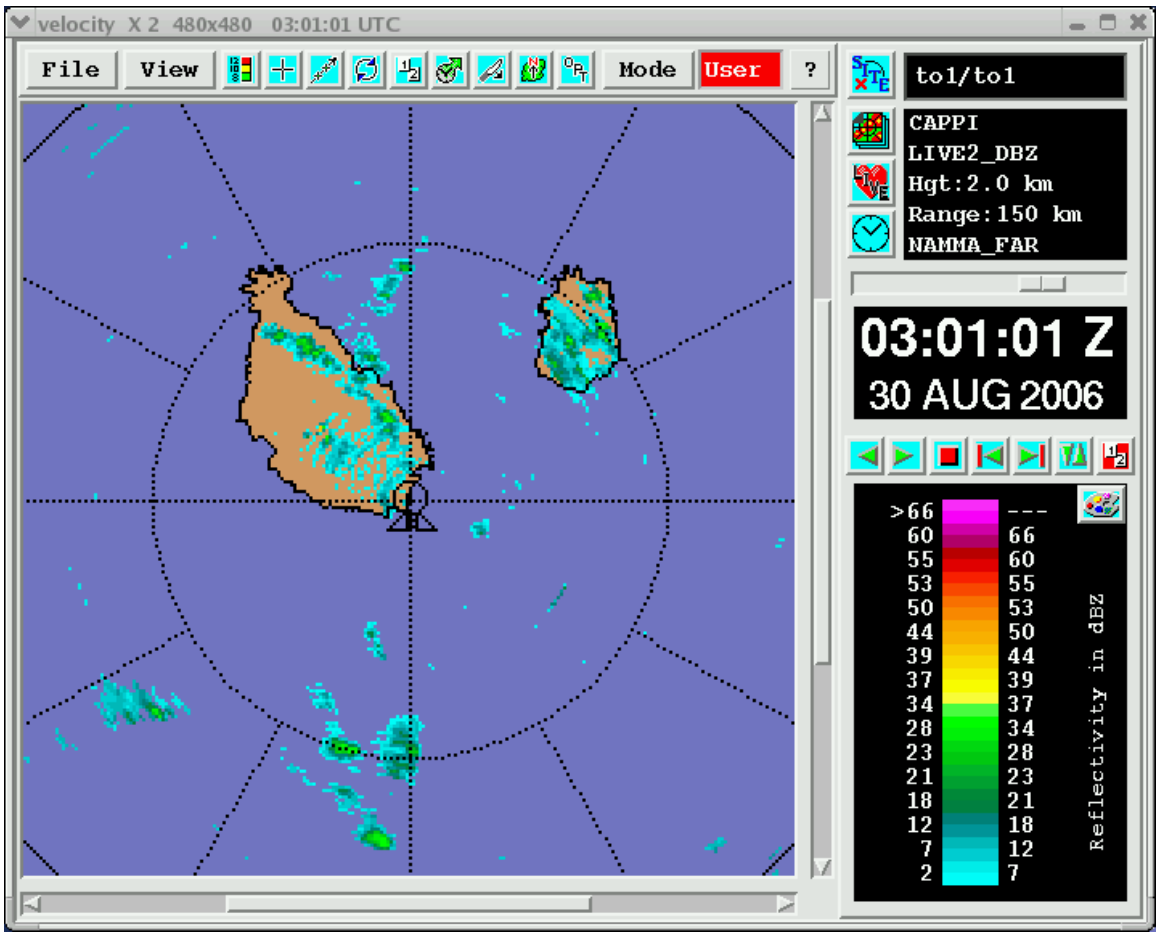


04Z: The light band of precipitation NE of Sao Tiago entered the island around

06Z: Here we go - PPINE.

08Z: PPINE worthy of a comment here.

09:30Z: I have completed running the script UF and GIF files through Aug 28. I could not pull Aug 29 or transfer the other files to the laptop because raid is down. Tonight I am off duty. Therefore, I will not be here to make log entries tonight. Gustavo out. Smull and Cifelli on-site.

10:30Z: Surveillance scans have shown spotty distant echo on 030 radial beyond Maio, likely AP; otherwise PPINE. Call to Zipser: DC-8 plans Noon-local Takeoff, 6-7 hr mission. Likely focus of mission will be along ITCZ @ 10N. Toward end of flight DC-8 may proceed N (presumably adjacent to African coast) to penetrate dust layer. Outlook for next few days is generally more active, with a series of smaller-scale waves that could impact convection in the vicinity of the Cape Verdes.

11:30Z: Only echo is second-trip in 150-170 deg sector.

14Z: Some increase in activity well to our south (150-200km) since about 12Z. Few isolated cells moving toward the SW. Do not think this is worth alerting the mission scientist in Sal (yet).

16Z: Lots of 2nd trip showing up to our south. Called Ops center to give them a heads-up that activity increasing (a few cells at 100-150 km range from us are real – weak, with 20 dBZ max but real) and may be useful for CB penetrations. DC-8 currently at 11.5 N and heading north.

16:20Z – antenna shutdown. Not sure what the problem is but we stopped scanning. Waiting for Bowie to return. Called ops center to tell them we're down.

17:40Z: With Bowie's/Gears' help, did a reboot of toga1, which reinitialized scsi bus contact w/ RVP7. According to Bowie, error symptoms today are rather similar to those that interfered with quick restart of scanning after solar cals yesterday. Re-scheduled both SURV and NAMMA_FAR scans. Appears everything is operating fine now. Considerable 2nd-trip echo is present inside 100 km range on surveillance scans. Some tendency for this spurious echo to jump from SE to SW quadrant during the ~1hr we weren't scanning, suggesting that distant activity is translating W'ward with time. Only genuine 1st trip echoes are a few isolated blips beyond 225km range in SW quadrant. These spotty echoes continue to drift SW'ward.

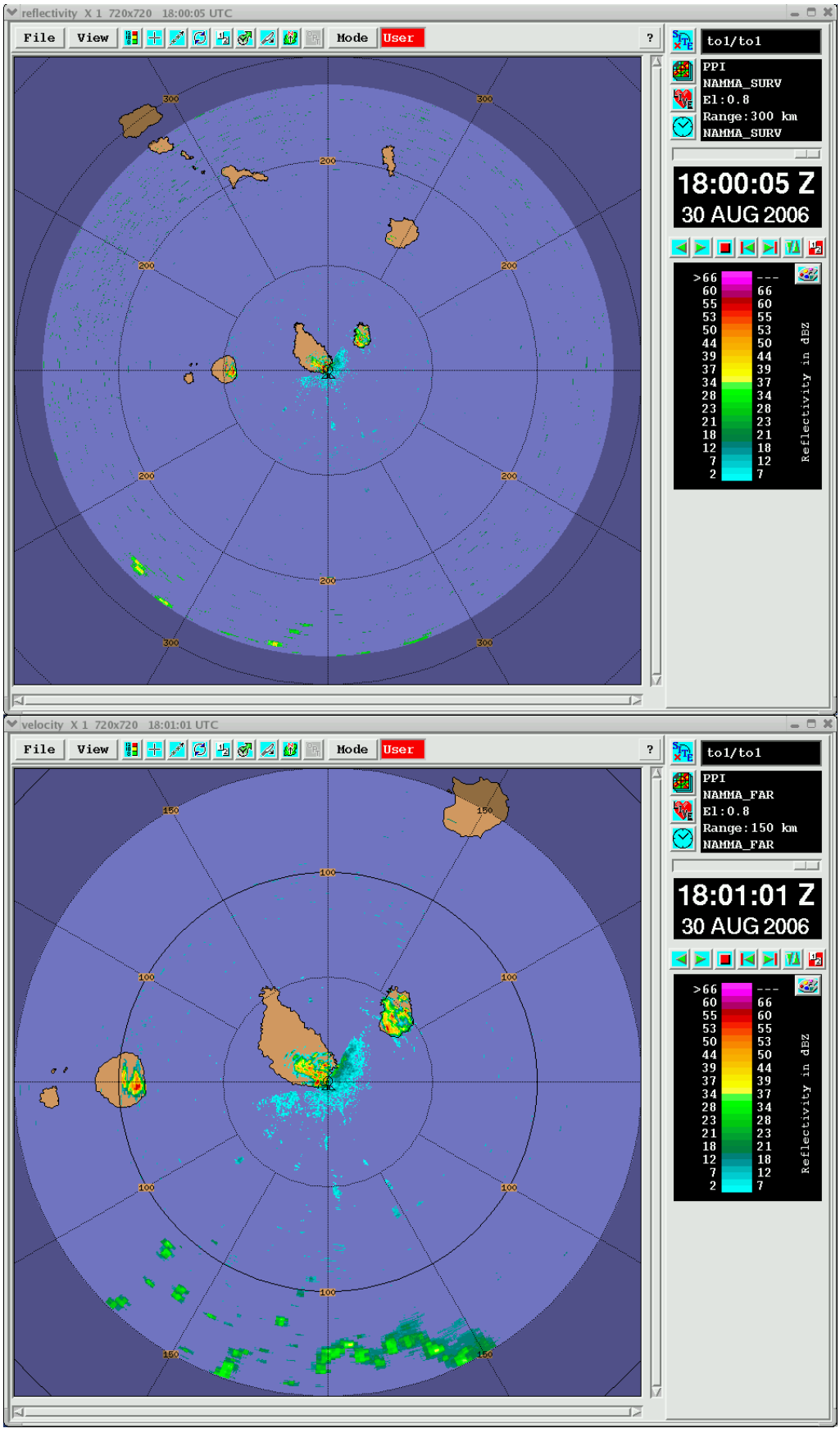
1810+ Z: Both PI's & tech are having serious concerns about interpretation of radar displays, both in real-time & via quick-look products. Concern centers upon inconsistency simple reflectivity depiction between low-PRF (Surveillance) and high-PRF (NAMMA_FAR) scans. Examples of both are included on next page. Ground clutter targets (combination of local & distant island returns) look reasonable in both displays. Apparent inconsistency centers on the following:

(1) NAMMA_SURV displays combination of non-first-trip returns (2nd? 3Rd?) inside 100 km, and only very spotty echoes peaking near 35-40 dBZ at

ranges >250 km, which for 0.8deg elevation at observed slant range for these cells (e.g. 267 km) corresponds to beam centroid height is 8.0 km, suggesting some pretty impressive updrafts barely within 1st trip.. Note range interval 100-200 km south of radar is basically devoid of echo.

(2) NAMMA_FAR displays combination of echoes that are obviously beyond 1st trip (based on their ellipsoidal shape and indicated dBZ values in the single digits to at most low teens) and what APPEARS to be 1st trip returns in the upper-20 to mid-30 dBZ range displayed near 125 km range at azimuths mainly between 150 and 190deg. The physical conformation of this echo (including its appearance in vertical sections, not shown) and its behavior when animated had us all readily believing it was 1st trip return—until the radar was brought back up after ~1-hr gap and discrepancy with respect to NAMMA_SURV scans was noted

Comparison of ~simultaneous (within 1-min) Surveillance (Rmax=299.8 km) and NAMMA_FAR (Rmax=150 km) scans follows:


reflectivity X 1 720x720 18:00:05 UTC
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El:0.8
Range:300 km
NAMMA_SURV
18:00:05 Z
30 AUG 2006
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28 34
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21 23
18 21
12 18
7 12
2 7
Reflectivity in dBZ
velocity X 1 720x720 18:01:01 UTC
File
View
Mode
User
?
to1/to1
PPI
NAMMA_FAR
El:0.8
Range:150 km
NAMMA_FAR
18:01:01 Z
30 AUG 2006
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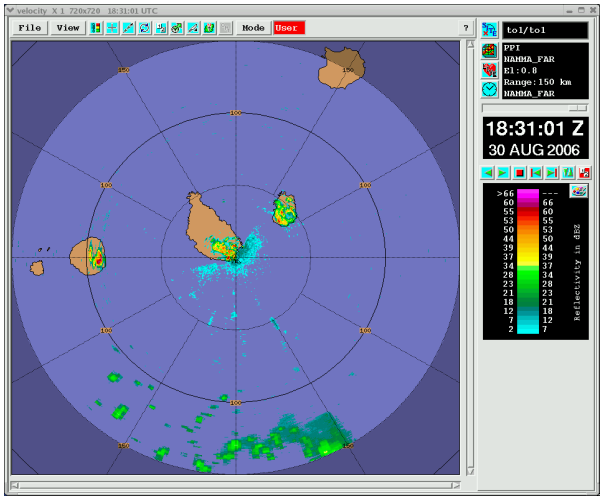
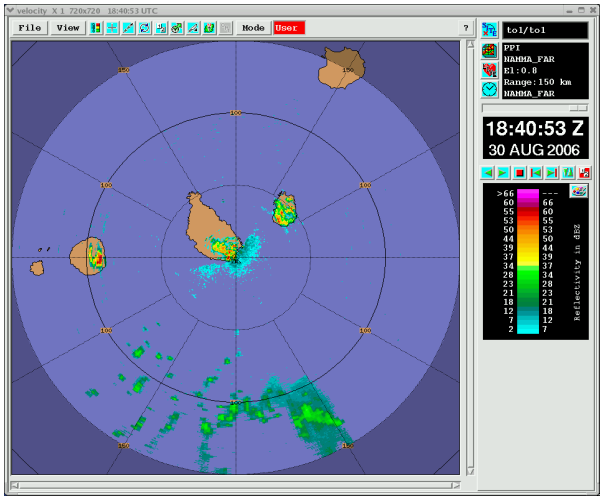
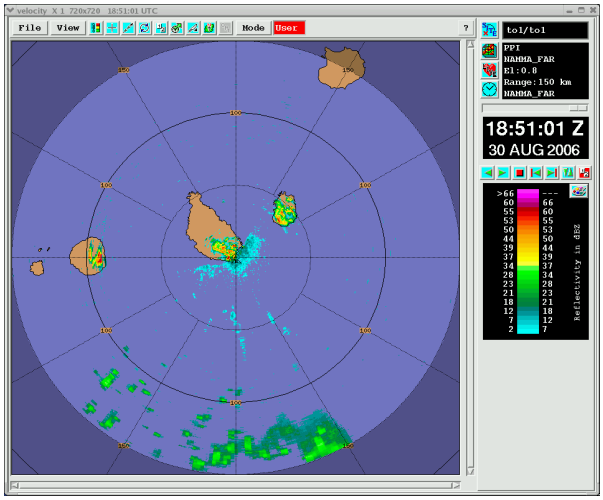
60 66
55 60
53 55
50 53
44 50
39 44
37 39
34 37
28 34
23 28
21 23
18 21
12 18
7 12
2 7
Reflectivity in dBZ

This led Bowie to suggest an alternation between standard PRF (1000, Rmax=150km) and test PRF (900, Rmax=166 km). Results of that alternation conducted over the interval 1831-1851 UTC are shown below. (Images have been scaled; use View/Zoom for clarity):

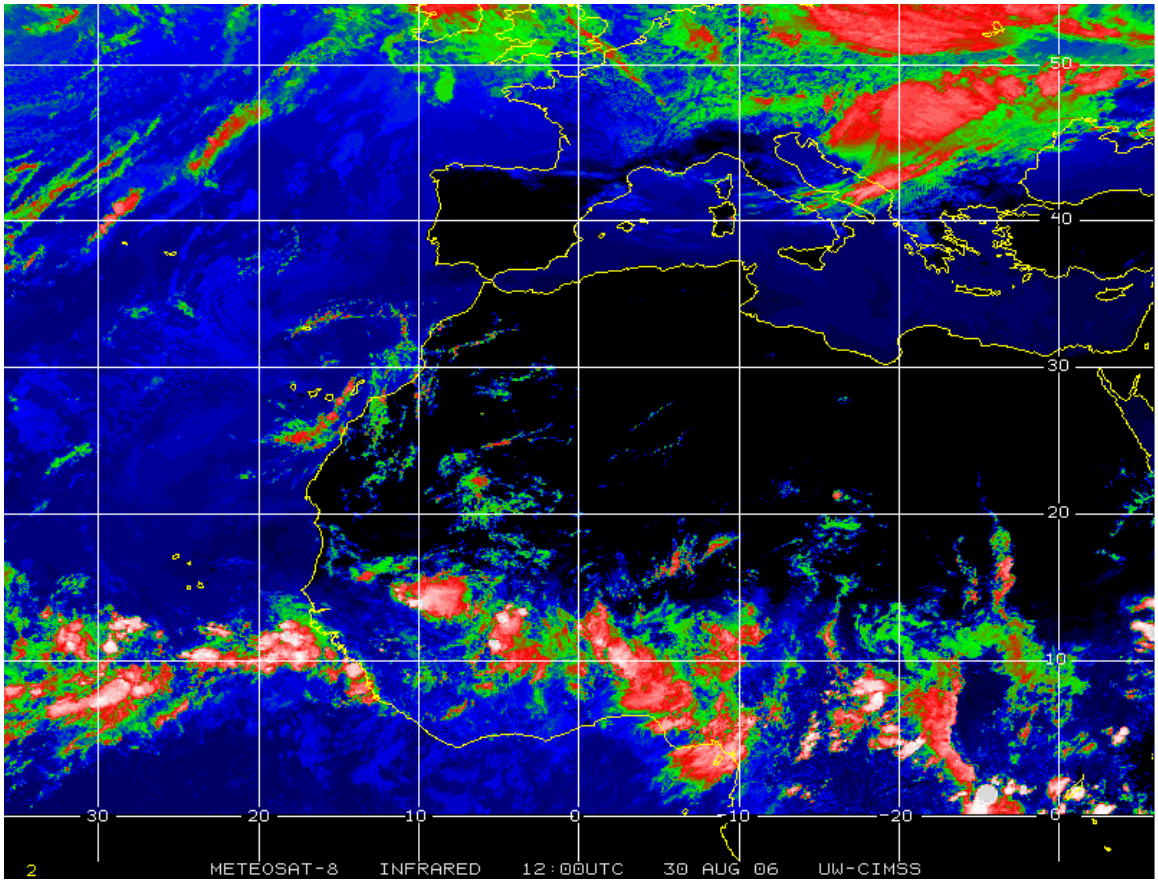


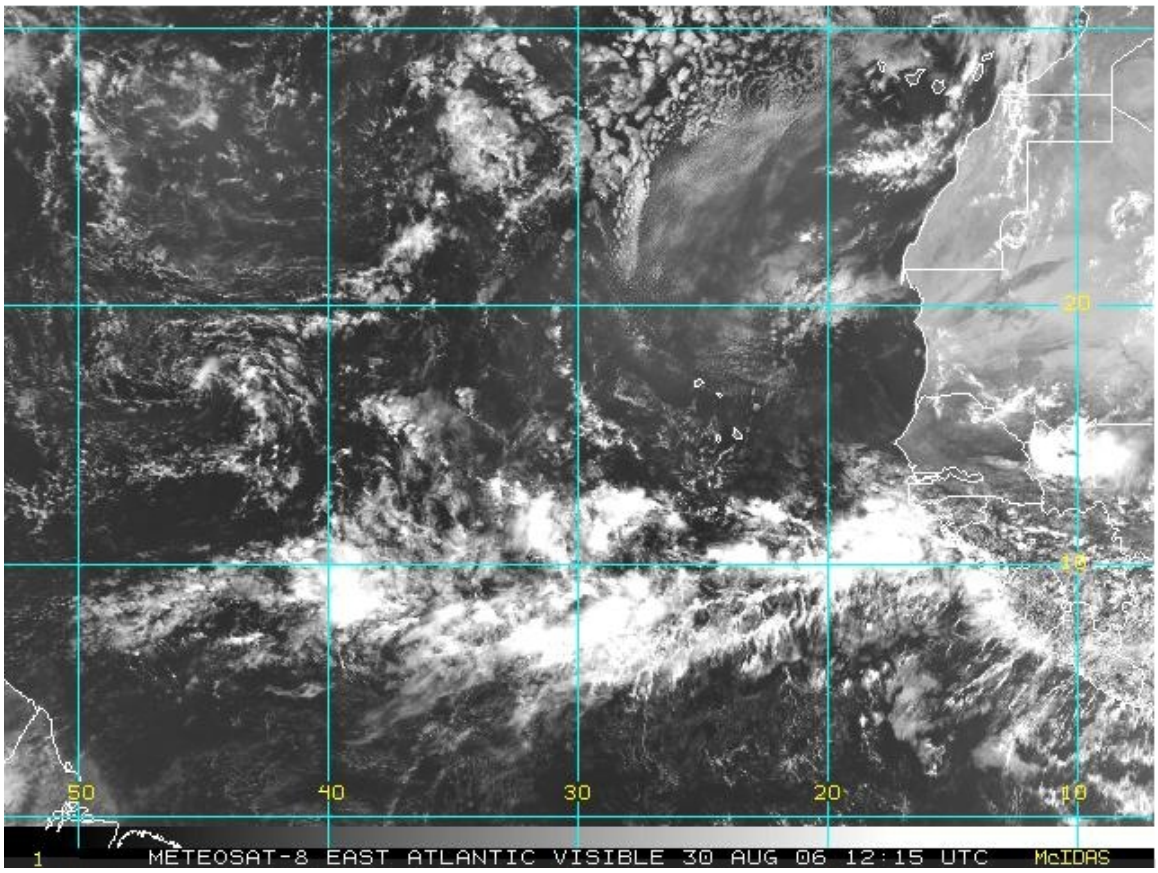




The resulting “range-jitter” conclusively proved that the echo shown in higher-PRF (“NAMMA_FAR”) scans is NOT 1st trip return. Evidently it's true range is closer to it's displayed range R + Rmax (150 km), = 280 km, i.e. Just barely beyond the display limit of our surveillance scans. Moreover, the implication is that those echoes being displayed at ranges surrounding 50 km are in fact THIRD trip, which for the NAMMA_FAR PRF would correspond to a true range closer to 50 + 150 + 150 = 350 km. This implies some hellaciously tall, intense echoes 350/111 = 3.15 deg latitude S of TOGA's location, i.e. Near 12 deg N latitude. The most recent Meteosat images we have accessed (18 UTC, inserted below) showed little if any activity in that vicinity, so apparently things blew-up rapidly there this afternoon. The fact that these echoes also had Bob Bowie baffled at least gives us a little comfort, and it was Bob's suggestion to alternate PRF's that helped us to sort this out. Kudos to Bob!

Meteorologically, this evidence for very strong echoes during the afternoon to our south is supported by the large degree of instability and more limited inhibition that Rob & I noted in this morning's Praia soundings, as well as apparently lower LCL's (viz. mountains to our north are almost totally socked-in at current time, 2030 UTC).





Meteosat 18UTC IR image (obtained after the fact, not shown) depicts line(s) of cold tops vicinity 12 degN that produced remarkable 2nd trip. IR doesn't look particularly impressive, tho tops do reach the coldest (white) threshold shown.

2030Z: Valid 1st trip anvil echo (and a very few cells) barely creeping into surveillance scans, beyond 225 km, mainly in 150-190 azm sector. NAMMA_FAR scans continue to display what we have confirmed to be range-folded echo beyond 100 km; current appearance is more suggestive of this.

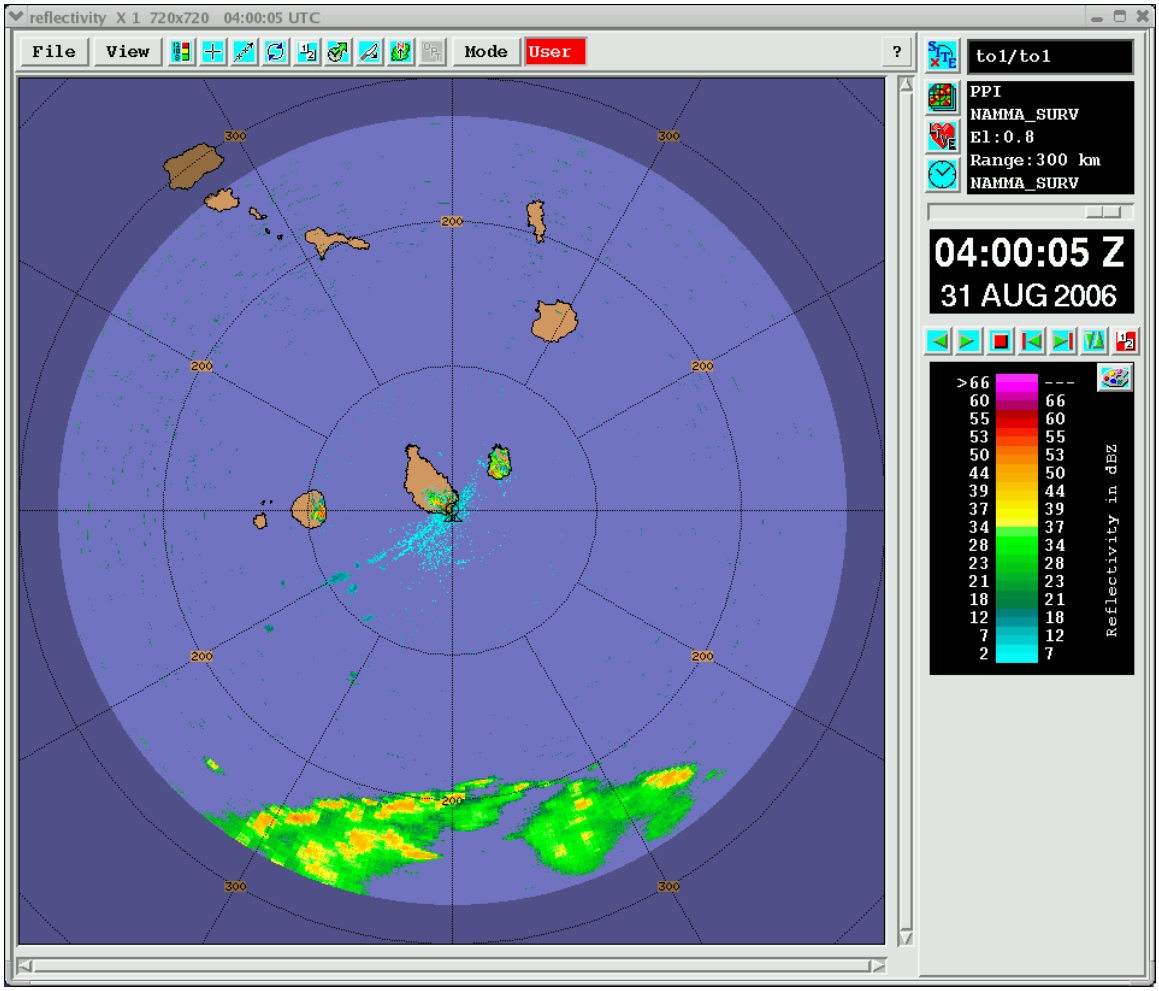
2130Z: Main remaining 1st trip returns are confined to an area of anvil-like precip entering the 150-180 deg sector, confined to outermost 30 km of surveillance scan. Smull/Cifelli departing, and schedule calls for no scientific scanning overnight. Techs Gears & Parks will run radar overnight.

31 August

0930Z: Smull & Cifelli on-site. Local conditions relatively clear and calm, i.e. Nearly flat seas. Note that last time this occurred was with passage of wave (actually closed cyclone) over Cape Verde's back on 26 August, tho our knowledge of current synoptic situation is limited (hotel internet difficulties).

Review of overnight echo activity: ITCZ-related convection crept somewhat closer to TOGA, advancing far enough north to be located solidly within our

surveillance scans from 01-07 UTC. This echo took form of a northward marching arc of convection > 300 km in length, with more stratiform precipitation to its south. Unfortunately, these returns did not come within 150 km range limit of our quantitative volumetric NAMMA_FAR scans.
Example of most organized/well-sampled state of overnight convection follows:



Echo motions were toward WNW. Tendency after 0400 Z was for convective line to “outrun” (or at least break-away) from trailing/adjacent stratiform echo to its south. Very little convection persisted after 0630 Z, and last remnants of stratiform echo dissipated around 0730 Z. Immediately thereafter, a few very small convective cells appeared mainly to the immediate south of the old stratiform echo. Some of these cells congealed into a short W-E line by 0930.

1100Z: Cifelli & Smull to old airport to file daily reports. At 1110Z, tech (Watson) called to report some beams dropping out, evidence of dirty slip-ring connections. Hence gave our permission to take radar down for slip-ring cleaning. Last NAMMA_FAR scan commenced 11:01 UTC. At this time, aforementioned short W-E line was in process of dissipating.

1200Z: Bowie reports there was considerable “dirt” (essentially flecked silver/graphite detritus) in the slip ring assembly. This may have accounted for voltage drops (dropouts?) and associated errant antenna behavior of past few days. Radar was taken down between 11:10-13:01 UTC to clean the slip rings.

13:50Z – RCP02 display was fuzzy since radar back up at 13:01 but this was due to loose connection in the port and did not affect actual data collection. Continuing to observe echoes 200-270 km to SW, probably associated with ITCZ convection moving closer to our proximity. Echo motion appears to be toward the W-SW. NAMMA_FAR scans are showing significant 2nd trip near 80-100 km range, presumably associated with “real” activity at 150+80=230 km range (this jives with what we see on surv. Scans). Both the SURV and FAR scans are showing 2nd trip to the SE, which may indicate echoes starting to migrate toward TOGA from the E-SE. Cifelli departing to pick-up Lang & George at Praia airport.

Review of morning IR imagery indicates cold cloud has made rapid W'ward push (jump?) across Dakar (NPOL), and seems to raise odds that we will see more significant activity in the next 24h or so. Current NAMMA forecast discussion indicates that “wave” activity in our vicinity today is weak with little or no convection. It is a no-fly day for the DC-8 aircraft. Forecast still calling for intensification of next wave as it moves offshore and toward the CV's on Saturday-Sunday.

1400Z: 1st trip echo in Surveillance scans is limited to scattered cells beyond 200 km (locally exceeding 45 dBZ) mainly in 190-240deg sector.

1440Z: At techs' recommendation, scanning was interrupted 1440-1450 to obtain updated receiver noise sample in anticipation of more active weather. The effort here is to re-establish threshold that might reduce to some degree amount of “speckling” seen at long ranges, esp. in Surveillance scans.

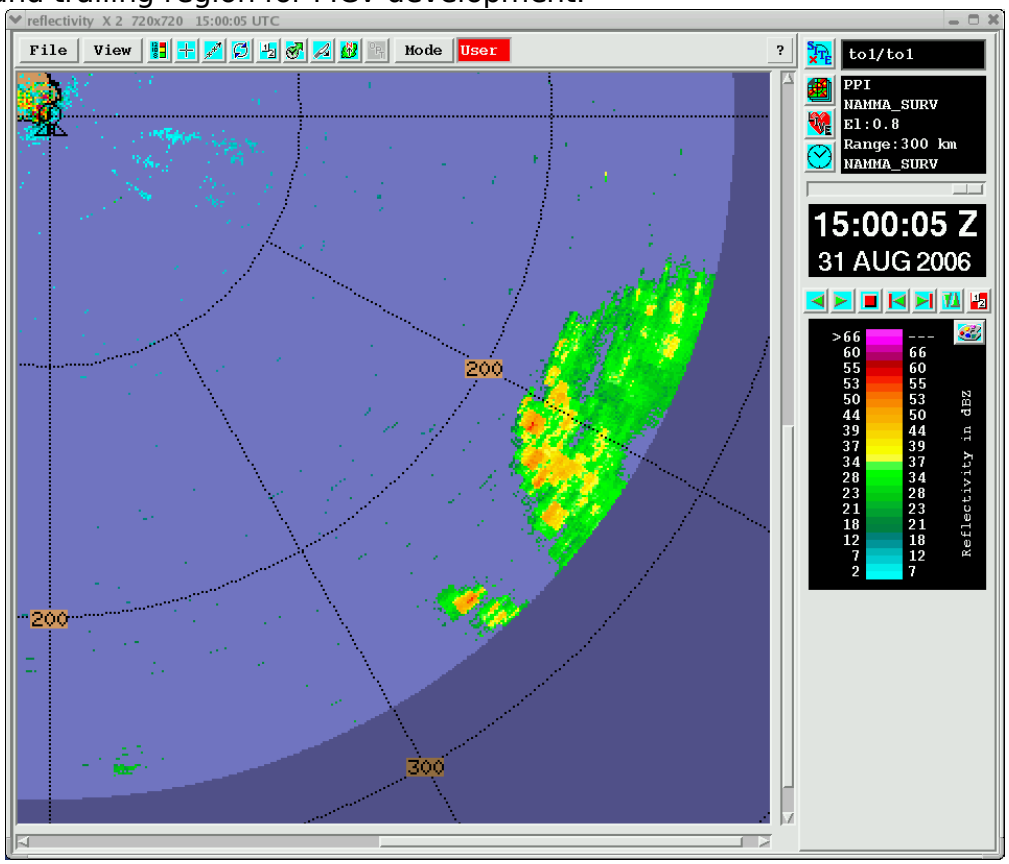
1500Z: Based on techs' report of relatively minor change in diagnosed noise level, lack of discernible change in speckling in surv. Scans not too surprising. Meteorologically, one last WNW-ENE oriented line of cells has yet to exit SW sector. More interestingly, new feature to SE is “half-donut” shaped echo centered on 120 deg beyond 220 km.

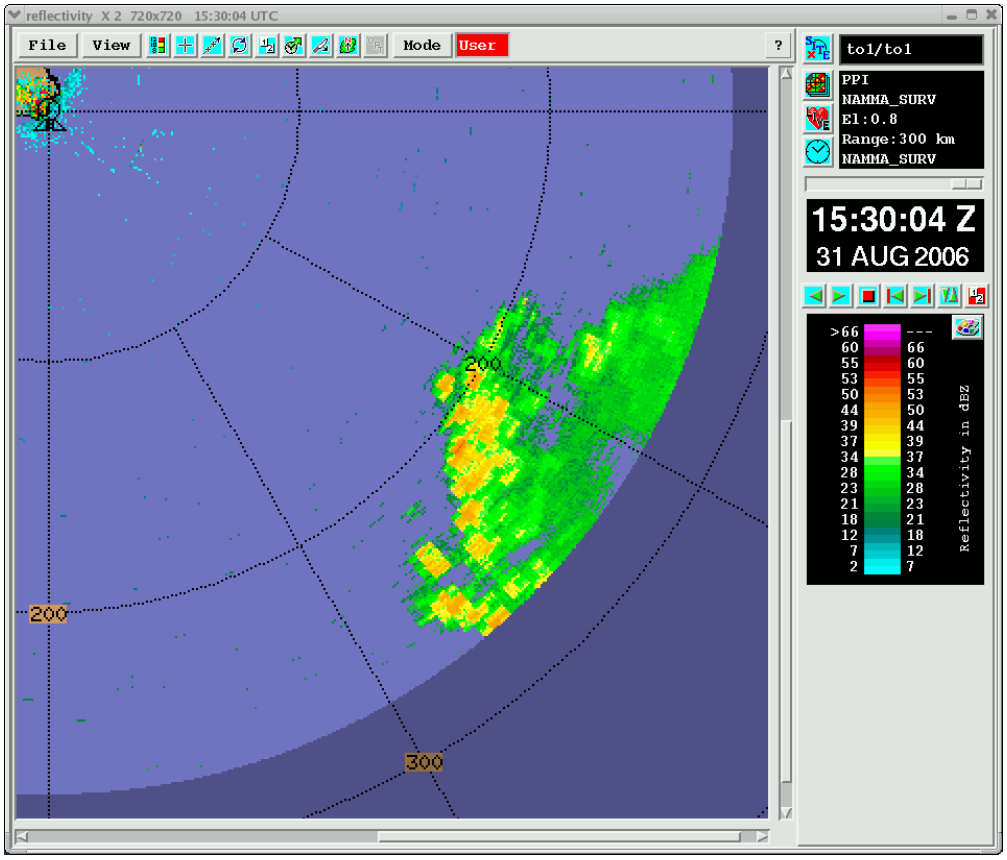
1520Z: More clarity as echo comes farther into surveillance range. Feature is a fast-moving arc-shaped squall line (approximate propagation speed over interval 1420-1520 is westward at 50 km/h (13.5-14 m/s). This is by far fastest moving echo I have seen since arriving in CV on 21 Aug.

1530Z: Discrete new-cell development is evident.

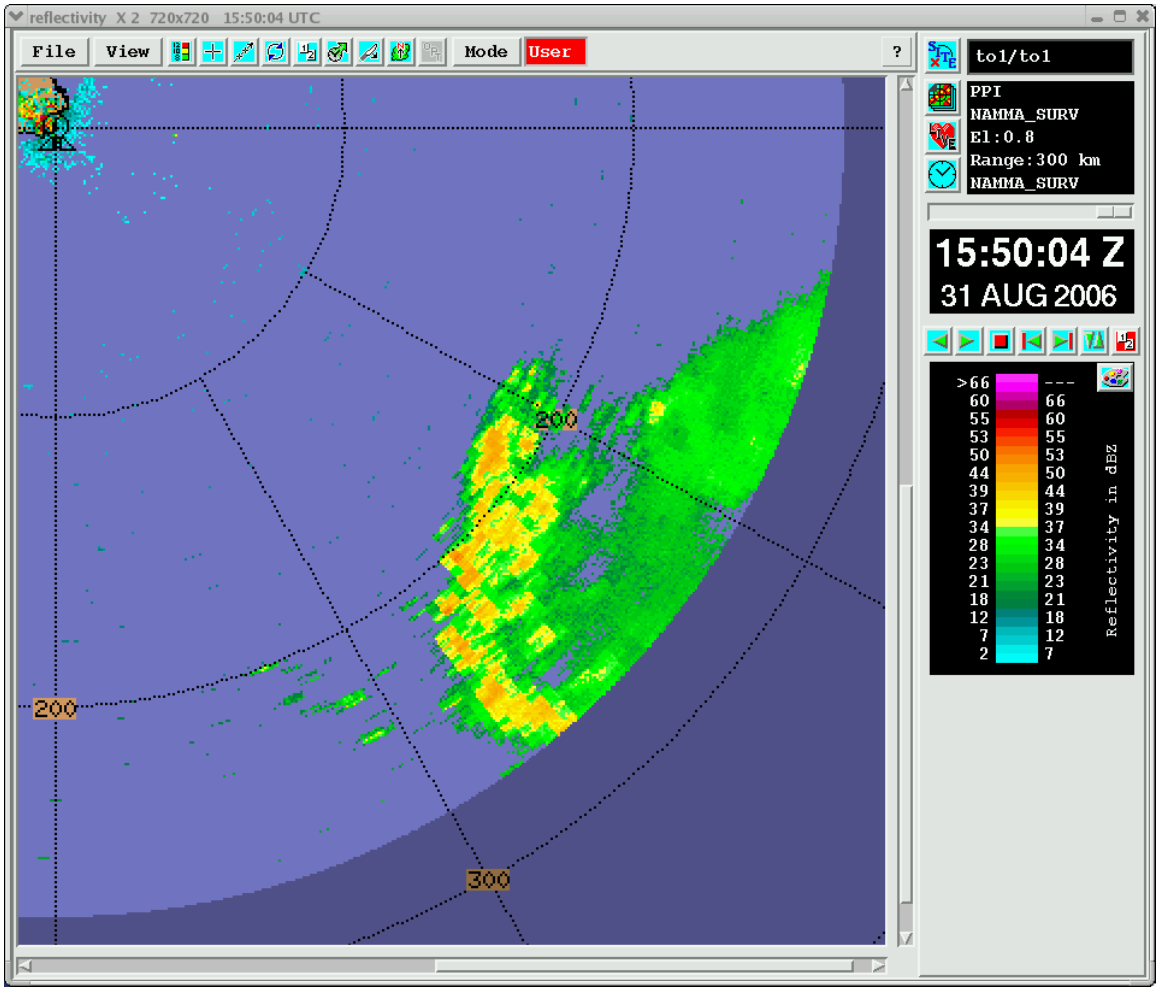
1540Z: Velocity coverage still remains a bit spotty (which has been characteristic of TOGA during NAMMA) at lowest elevation, but convergent transition between leading outbounds and trailing inbounds (latter indicative of flow behind squall front) is obvious. Likely passage of squall to south of radar

site should provide good opportunity to scrutinize northern (poleward) end of line and trailing region for MCV development.

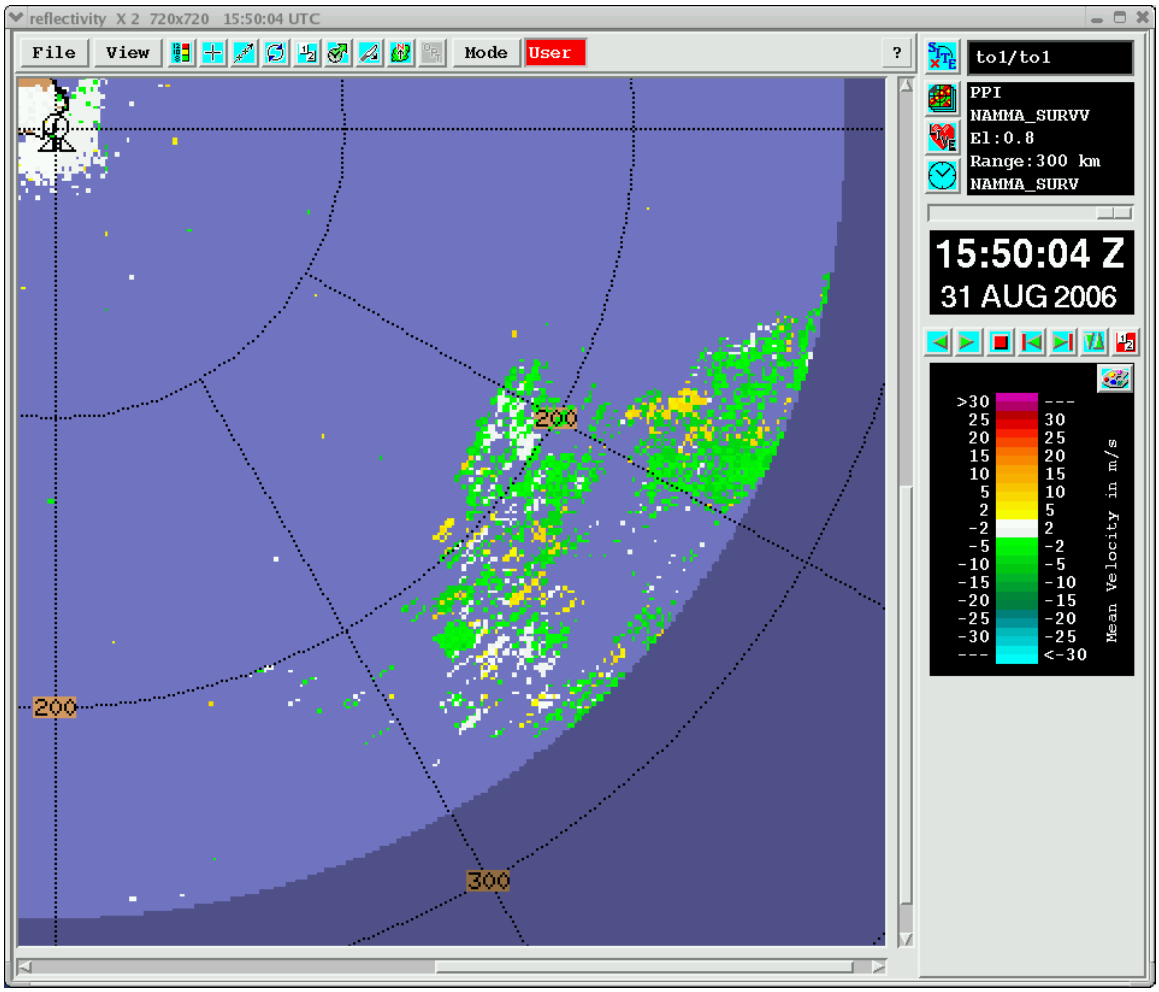




1550Z: Note that what initially appeared to be transition-zone like dBZ minimum between leading-line and trailing-stratiform echo is now opening up into a ca. 10-20 km wide gap. Discrete new cell development appears to be occurring much farther ahead of line, i.e. Clockwise of 150deg azimuth (and hence 25-30 km ahead/west of line's leading edge). All raw data archival double-checked and appears to be proceeding normally.

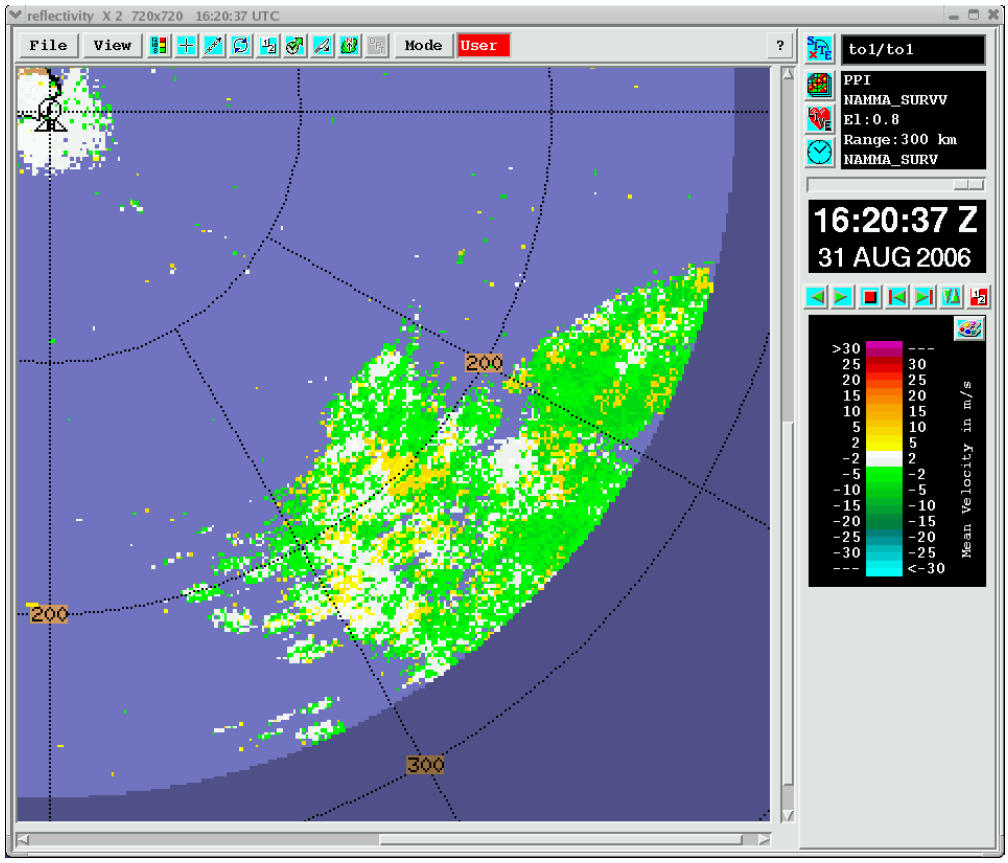


Velocity coverage continues to be rather spotty (per image below), and this is still a major concern. Not acceptable performance for a research-quality radar; apparently we are using setup files imported from recent operations at Wallops (apart from mods that Rob & I already did over one week ago to NAMMA_NEAR & NAMMA_FAR that were intended to address this same problem at somewhat closer ranges.) Feel this needs to be addressed for surveillance scans if Vr data are to be of any use.



1600Z: Starting to see even more folded inbounds in trailing region, designating inbounds > 7 m/s (trying to contain my excitement about that factoid...) Line motion (e.g. as defined by N edge of region being swept out by convective line) appears to be toward WSW.

1615+Z: Still disturbed by degree of velocity dropouts within moderate echo (30+ dBZ line) at 150-200 km range. Elected to test following change to NAMMA_SURV: Vr thresholding will be changed from SQI to LOG, and CSR threshold will be increased from 25 to 30. The resulting pattern is shown in the next image (below). Will review this decision w/Cifelli upon his return from airport, but have adopted these updated thresholds for scans commencing at 1630Z. Far more critical issue is velocity behavior in volumetric (NAMMA_FAR & NAMMA_NEAR) scans, but believe this change is providing far better coverage of useful velocity info in base surveillance scans. Sample Vr & dBZ fields follow. Note new ability to sample couplet (folded-anticyclonic? i.e. folded approachings SW of/clockwise from cursor adjacent to weaker approachings to NE) couplet centered near 136deg/185km. Additional pair of images saved for 1640Z with cursor at center of indicated gyre. Est. beam height at that point is 5 km MSL Interpretation needs to be checked, but Vr's look more useful now.


reflectivity X 2 720x720 16:20:37 UTC
File
View
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User
?
to1/to1
PPI
NAMMA_SURVV
El:0.8
Range:300 km
NAMMA_SURV
16:20:37 Z
31 AUG 2006
>30 25 20 15 10 5 2 -2 -5 -10 -15 -20 -25 -30 ---
--- 30 25 20 15 10 5 2 -2 -5 -10 -15 -20 -25 <-30
Mean Velocity in m/s
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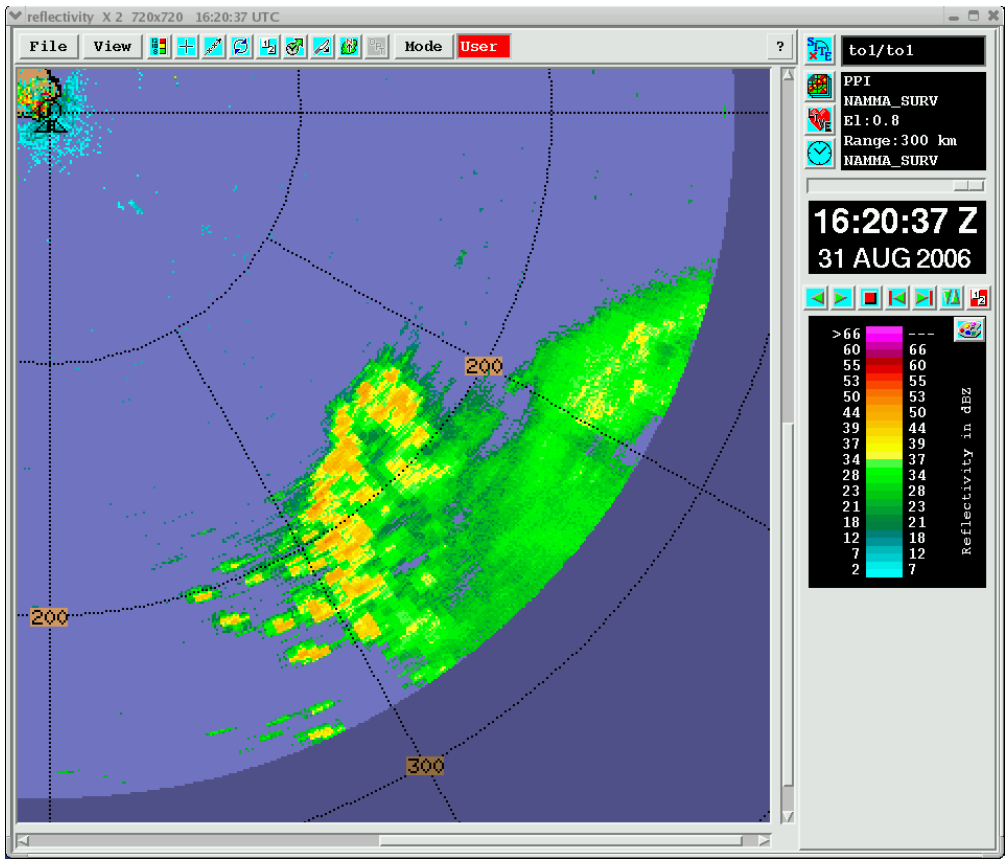
200
300


reflectivity X 2 720x720 16:20:37 UTC
File
View
Mode
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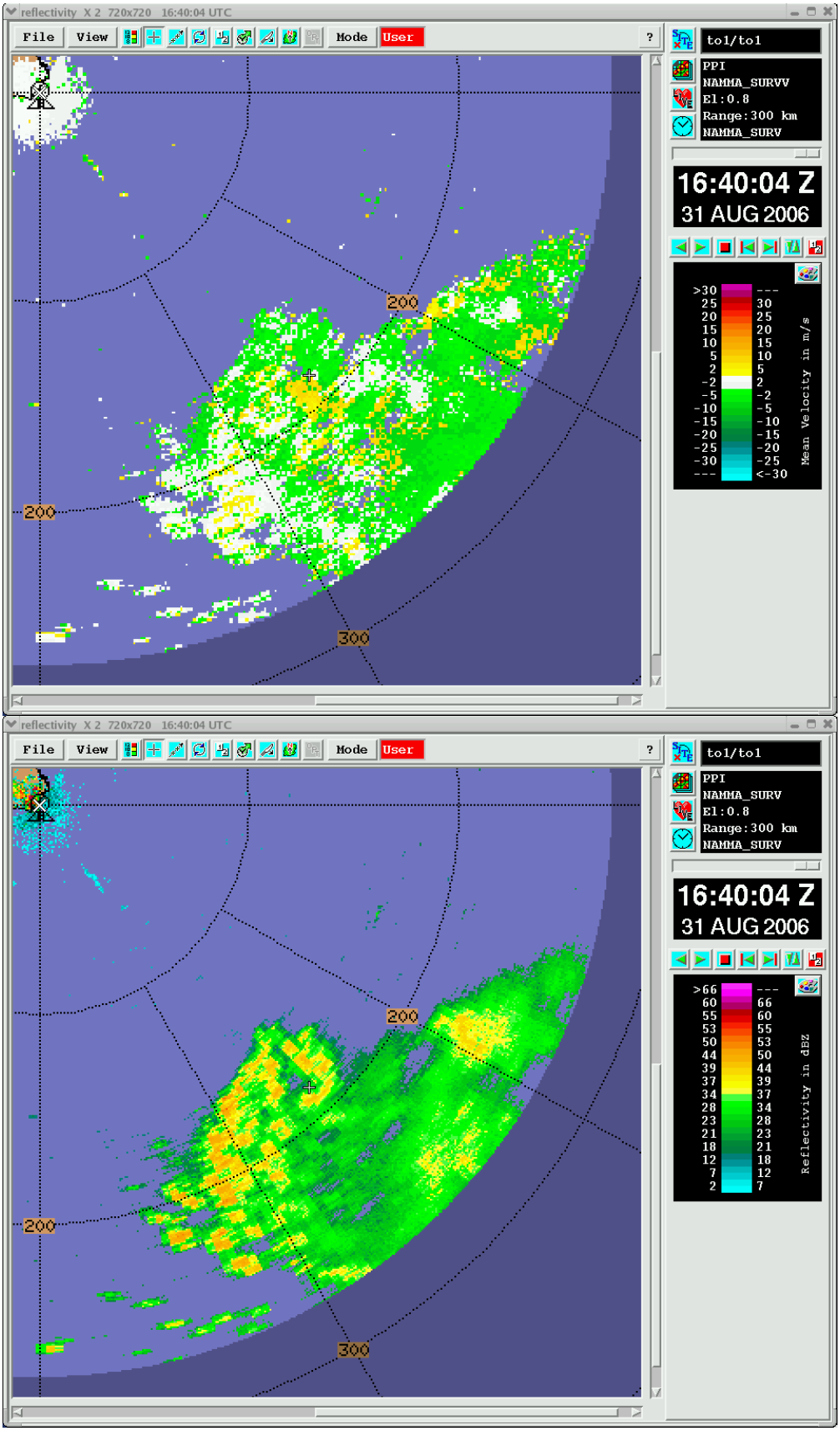
to1/to1
PPI
NAMMA_SURV
El:0.8
Range:300 km
NAMMA_SURV
16:20:37 Z
31 AUG 2006
>66 60 55 53 50 44 39 37 34 28 23 21 18 12 7 2
--- 66 60 55 53 50 44 39 37 34 28 23 21 18 12 7
Reflectivity in dBZ
200
200
300


reflectivity X 2 720x720 16:40:04 UTC
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El:0.8
Range:300 km
NAMMA_SURV
16:40:04 Z
31 AUG 2006
>30 25 20 15 10 5 2 -2 -5 -10 -15 -20 -25 -30 ---
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reflectivity X 2 720x720 16:40:04 UTC
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Range:300 km
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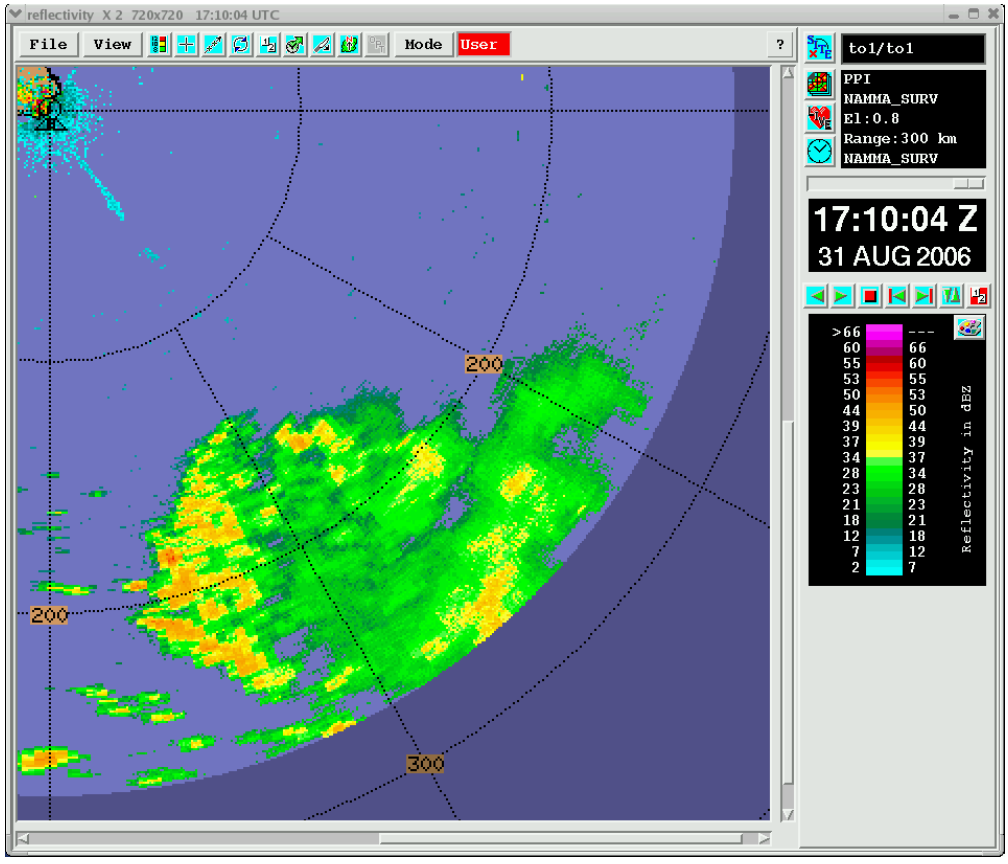
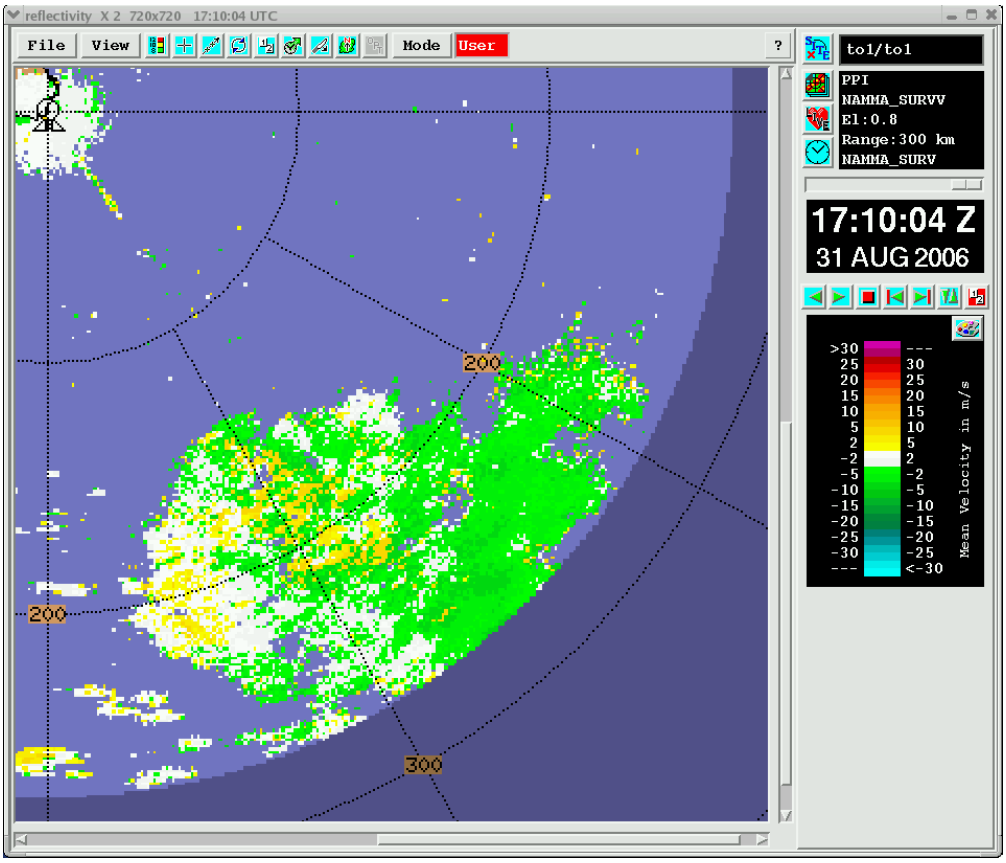
16:40:04 Z
31 AUG 2006
>66 60 55 53 50 44 39 37 34 28 23 21 18 12 7 2
--- 66 60 55 53 50 44 39 37 34 28 23 21 18 12 7
Reflectivity in dBZ
200
200
300

1700Z: Still no echo inside 150 km. From Surveillance scans, squall appears to be developing (and filling-in) trailing stratiform area through incorporation of discrete cells. No wholesale “jumps” of the line's position noted, but continued triggering of cells are so far ahead of leading convective line so as to be almost certainly unrelated to gust-front forcing (more reminiscent of Mapes' “gregarious convection” concepts) has probably been a factor in the line's net westward translation.

1710+Z: Latest motion estimates based on position of line apex over 1600-1700Z interval (x1=125, y1=-170, x2=46, y2=-197) yield motion towards ~250deg at ~85 km/hr (23+ m/s!). Appearance of line in animations is fascinating.. effectively appears to be leaving a “wake” composed of decaying cells/stratiform echo. Another way of describing this is that previously, strong reflectivity gradients were confined mainly to leading and trailing edges of leading-line echo. Now, the appearance “elongated cells” (i.e. Reflectivity maxima elongated in the front-to-rear dimension) has induced equally strong gradients in what was originally the along-line direction. Incorporation of cells originally well ahead of line has led to pronounced “wedge shape” at 1720Z.

Appearance of Surveillance Vr field appears to show a convolution of convergence (i.e. inbounds increasing with range) and cyclonic shear (i.e. Inbounds decreasing with azimuth) across trailing stratiform region. Estimated beam height within heart of stratiform region is 6-7 km MSL. Viewed on a broad scale, system-wide Vr pattern seems rotational. Sample image pair attached:





1740Z: Small extremely intense cores occasionally appearing within line. At 1740, 59 dBZ near 175deg/183km (est. beam centroid height 4.6 km).

1800Z: Convective region is once again exhibiting some tendency to “outrun” stratiform echo, resulting in echo-free gap between the two. Echo is just barely skirting 150 km limit—frustrating! Convective line is once again losing clean, arc-shaped structure. Previous evolution has involved rebuilding to more upright-looking convective structure, but approach of sunset raises question of possible imminent dissipation.

Summary comment: Review of morning satellite imagery (jumpdrive-interface problem prevents its insertion here...) and observation of extremely rapid squall motion suggests that this event may be very closely related to apparent squall cluster that likely passed over NPOL during the 06-08 UTC interval.

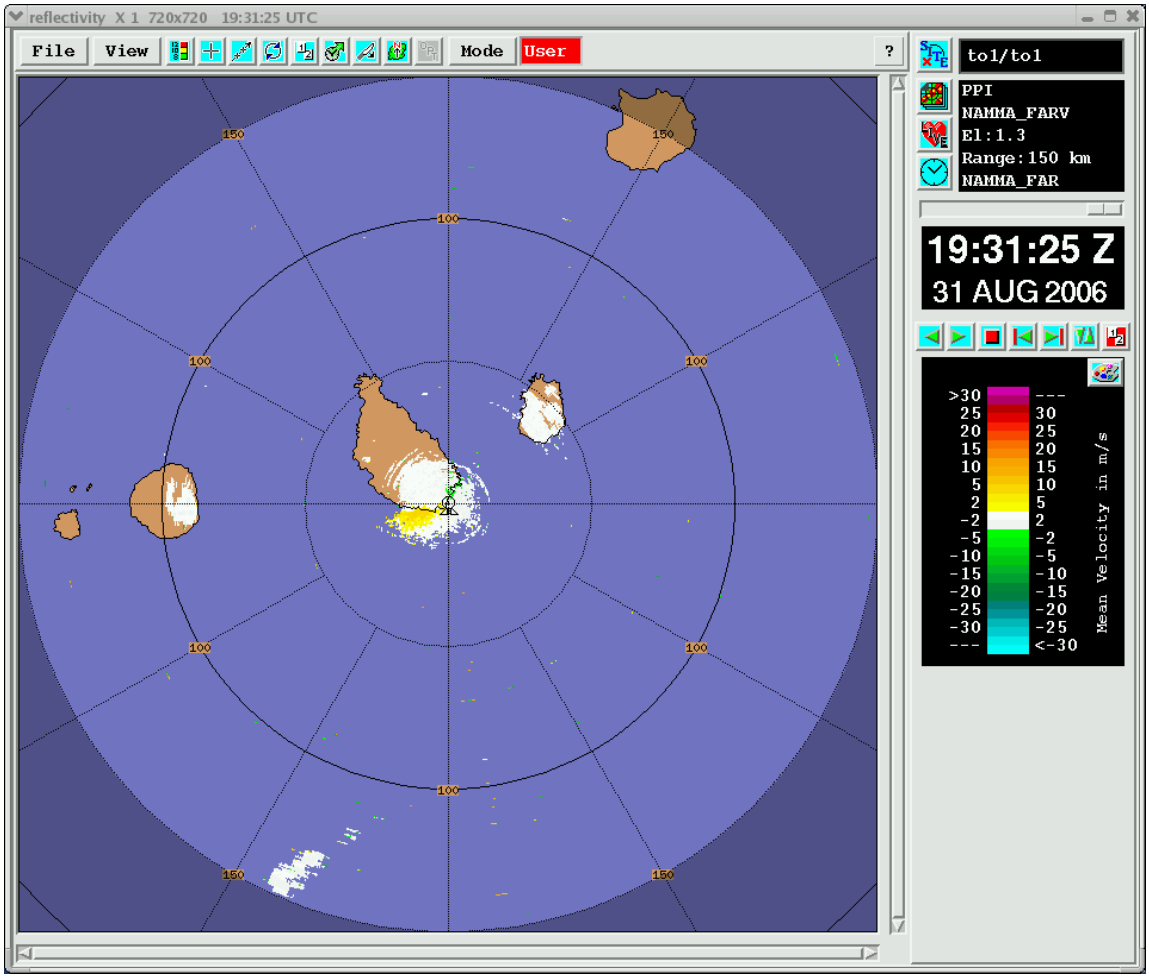
1830Z: At this point, cells developing ahead of

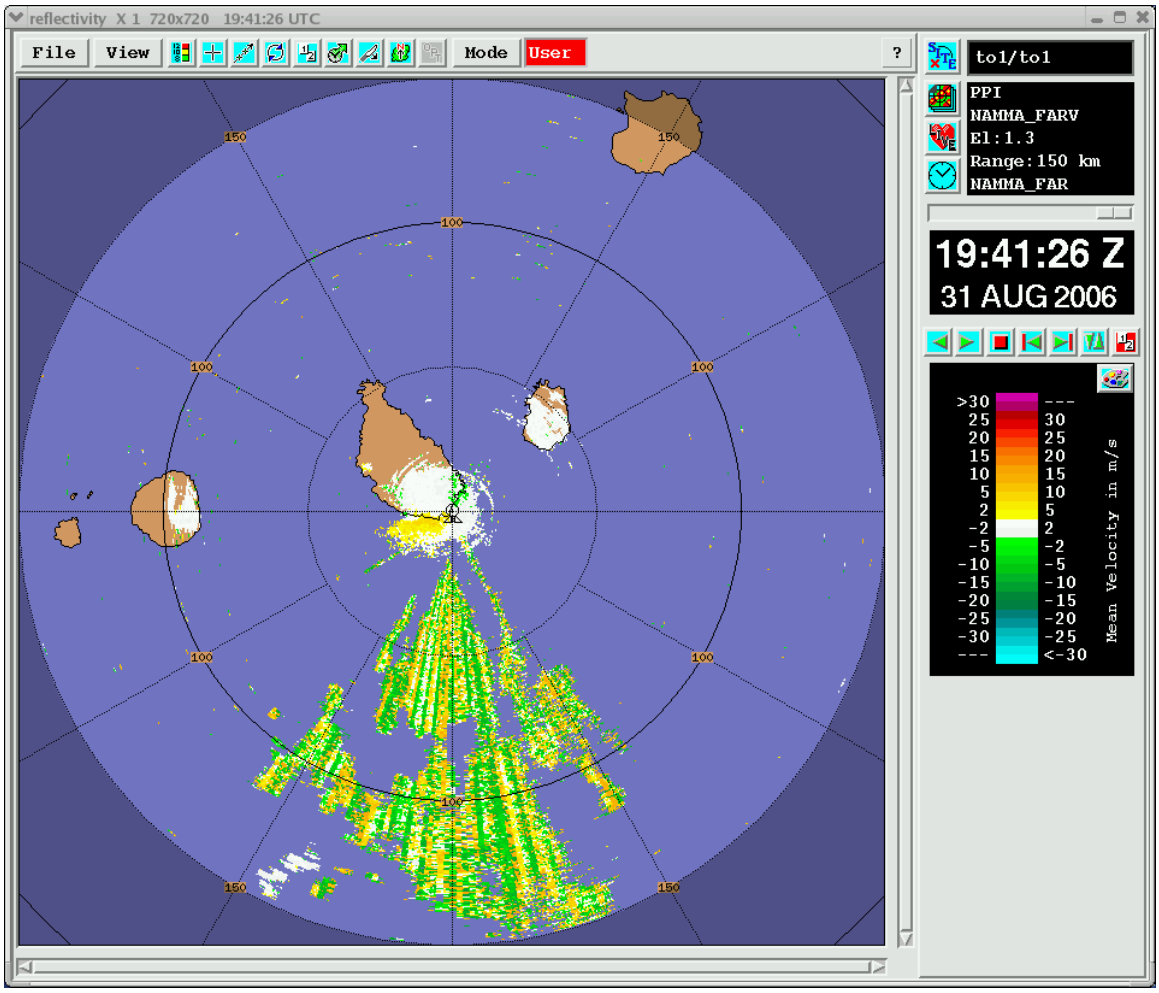
19:15Z – Interesting development over the past hour. Previous orientation of the leading line was quasi N-S; however, new growth has occurred south of the “feature”, forming a roughly NW-SE line of convection with a moat separating it from a more amorphous stratiform/decaying convective region to the north (~200 km range). Given the distance to the region of interest, it's difficult to determine if the moat is real or a consequence of beam geometry at this far range. Cursor tool indicating reflectivities in the E-W line of 45 dBZ in pixels –

seems suspicious, given the height of the beam (~6.5 km). Noticeably drier outside with somewhat increased NE winds at the site.

19:40Z Changed VR thresholds to LOG and CSR (changing from 25 to 30 dB) for NAMMA_NEAR, EVAD, SECA, SECB, and FAR to be consistent with SURV changes.

19:50Z – changed the FAR, NEAR, EVAD, and SEC VR thresholds back to SQI and CSR (keeping CSR at 30) as the high PRF scans seem to require SQI thresholding to properly filter 2nd trip (see 1931 [SQI and CSR threshold] and 1941 [LOG and CSR] UTC images below). Note that the SURV VR (thresholded on LOG and CSR) does allow slight amount of 2nd trip through; however, improvement in velocity signatures at long range outweigh this.





20:30Z – echo mass continues to move SSW, now at the edge of the SURV scan (> 250 km distant). Animation suggests that feature may be weakening but this may again be due to beam geometry at that distance. Note – some weak echo showing up over Sao Tiago to our NW (most prominent in 1 km CAPPI).

21:15Z watching a pulse of weak outbound velocities immediately SW of radar, moving south over time. Assume this reflects increase in sea clutter (and winds out of NE). Suggest that Gustavo look into it as part of his thesis material...The echo, far, far to the S-SW shows evidence of cyclonic shear in the velocity pattern (as well as viewing echoes in animation). Am puzzled at the high reflectivities at such long range in SURV scan (presumably 1st trip) as well as 2nd trip in NAMMA_FAR (presumably 2nd trip with dBZs of 35+ at 125km + 150km = 275 km range....). Would like to have some solar cal data to check our calibration.

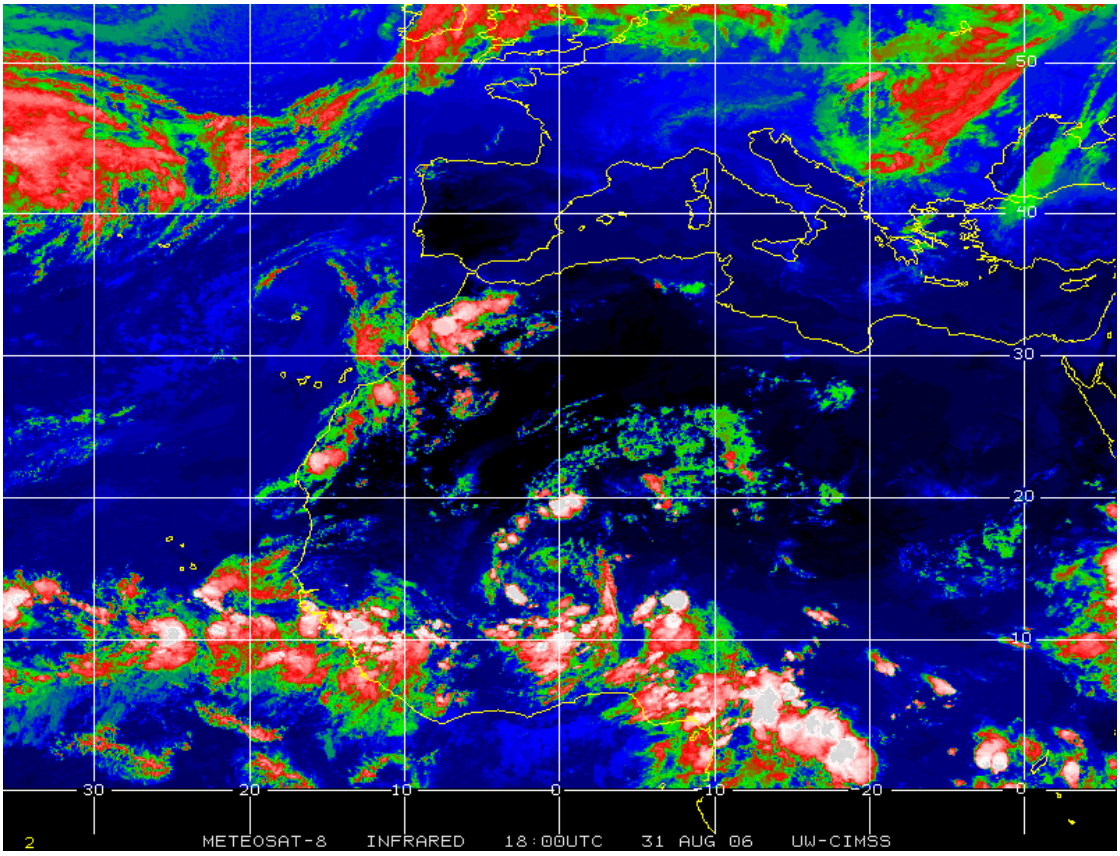
21:35Z: Gustavo on radar for his last shift. Hooray! Currently radar is running on NAMMA_Far. PPIST (I am sure you can figure this one out, and no, it does not mean the radar is upset). Surveillance scan indicates a suspiciously intense echo (as mentioned by Rob) near the SW edge of the domain ... a remnant of today's squall line - 50 dBZ at 8 km ASL does not seem realistic to me at this location. Discussed this with Rob and Bob, our senior scientist and technician (otherwise known as R&B), and they believe this could be a SIGMET display issue.

22:17Z: Bizarre cracking fan noises began again. I have determined that it is not trmm-linux1 that is doing the noise, but the computer right next to it instead. I would suggest Immodium to it. It has worked for me in the past.

22:31Z: Bizarre fan noises ended. The computer must have followed my suggestion.

1 September

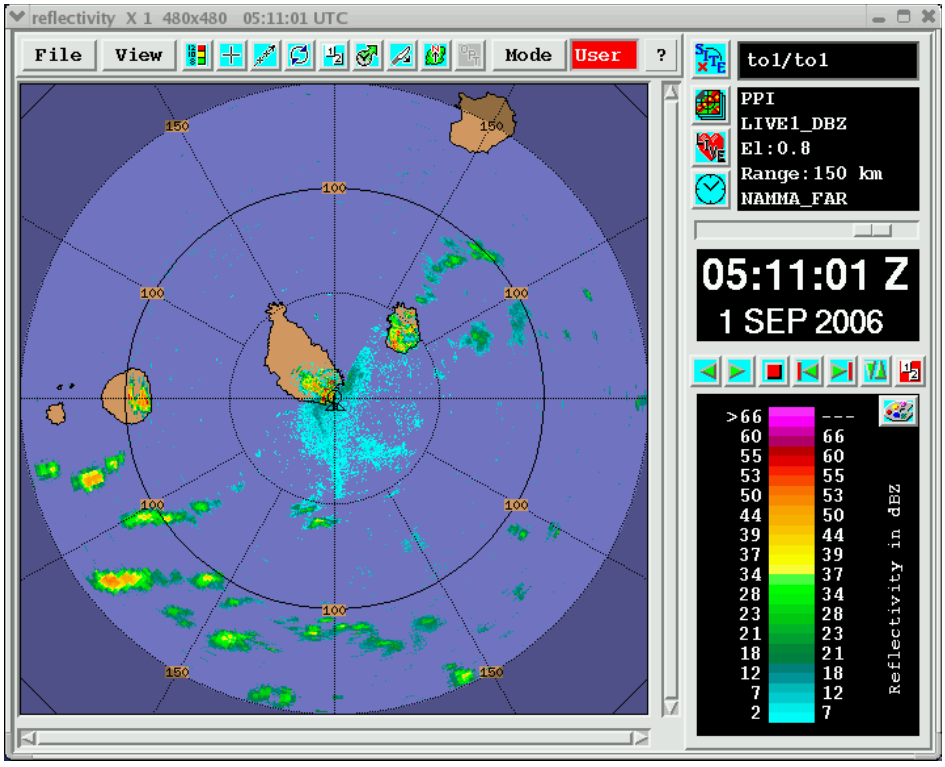
00Z: Still PPIST, now to the E-NE. Nothing else of significance. At the old airport I tried to check the NAMMA forecast, but their webpage was down again. The 18Z IR image from Meteosat did not seem to indicate anything in the immediate premises. The less trustworthy forecast from Weather Underground indicated a 90% chance of precipitation on Tuesday.



02Z: PPINE. Again.

04Z: A few weak echoes appeared near the edge of the PPI toward the S and the NE.

05Z: In the last 30 minutes, a few cells started to developed approx. 100-150 km SW of the radar. The strongest cells have reflectivities in the 50's. That is unusually strong for the region, however, not outright absurd because at the range where they are found we are fairly close to the bright band. Moreover, the reflectivity values are holding at different PRFs as there is consistency between the surveillance and PPI scans. I have to say though that the one thing that is raising my eyebrows here (and making me somewhat suspicious) is that the echo tops are the highest I've seen. In fact, 30 dBZ tops are at 9 km. This is way too much power return for that height and it would invariably be associated with a large amount of liquid water injected in the mixed phase region and enough charge separation to break the electrical field multiple times. As the storm is well beyond visual sight I cannot confirm if copious lightning is, indeed, associated with that storm. Additionally, one such storm would require a rather intense updraft ... one that I would not expect to see in such an isolated cell without any dynamic-enhancing organized structure. Anyway, maybe I am just thinking way too hard about this one. Perhaps it is just a freak storm, but it certainly captured my attention.



06Z: Echoes continue to propagate from NE to SW at 7.5 m/s (~26.5 km/h). Looking into the other surrounding cells, they all seem to have tops higher than those observed so far.

08Z: Almost all echoes are found between 170 and 250 degrees and between 100-200 km. The strongest echo (~ 56 dBZ) is found at 150 km bearing 207 degrees. Since it is just at the edge of our PPIs, we will likely start seeing more second trips, which have increased in number in the last hour.

09:30Z: I am glad I had some weather towards the end of this shift because it was looking like it was going to be dead the whole night. As I am being honorably (I'd like to think) discharged now, I wish the science team good luck with the remainder of the obs. Hopefully we will be able to capture a few more decent “wave” passages. Gustavo signing off from NAMMA field operations.

1030Z: Smull & Cifelli on-site. Remnant overnight echoes continue marching SW'ward.

Call to Ed Zipser revealed today's plan is for a 6h DC-8 flight (13-17 UTC), proceeding S from Sal to a point near TOGA (no anticipated coordination unless echoes rapidly develop) then proceeding E to African coast to begin sampling E'ly wave coming offshore w/ series of dropsondes. Planning this to be Day 1 of 3 of coordinated DC-8 sampling of this wave (which is forecast to develop strongly in the vicinity of the CV's, with some models even calling for tropical cyclogenesis). DC-8 hopes to to work in our vicinity tomorrow (2 September). Plan to contact Ed Zipser earlier tomorrow (say 0830 CVT), as they are planning 8-hr flight. Hopeful for more interaction tomorrow.

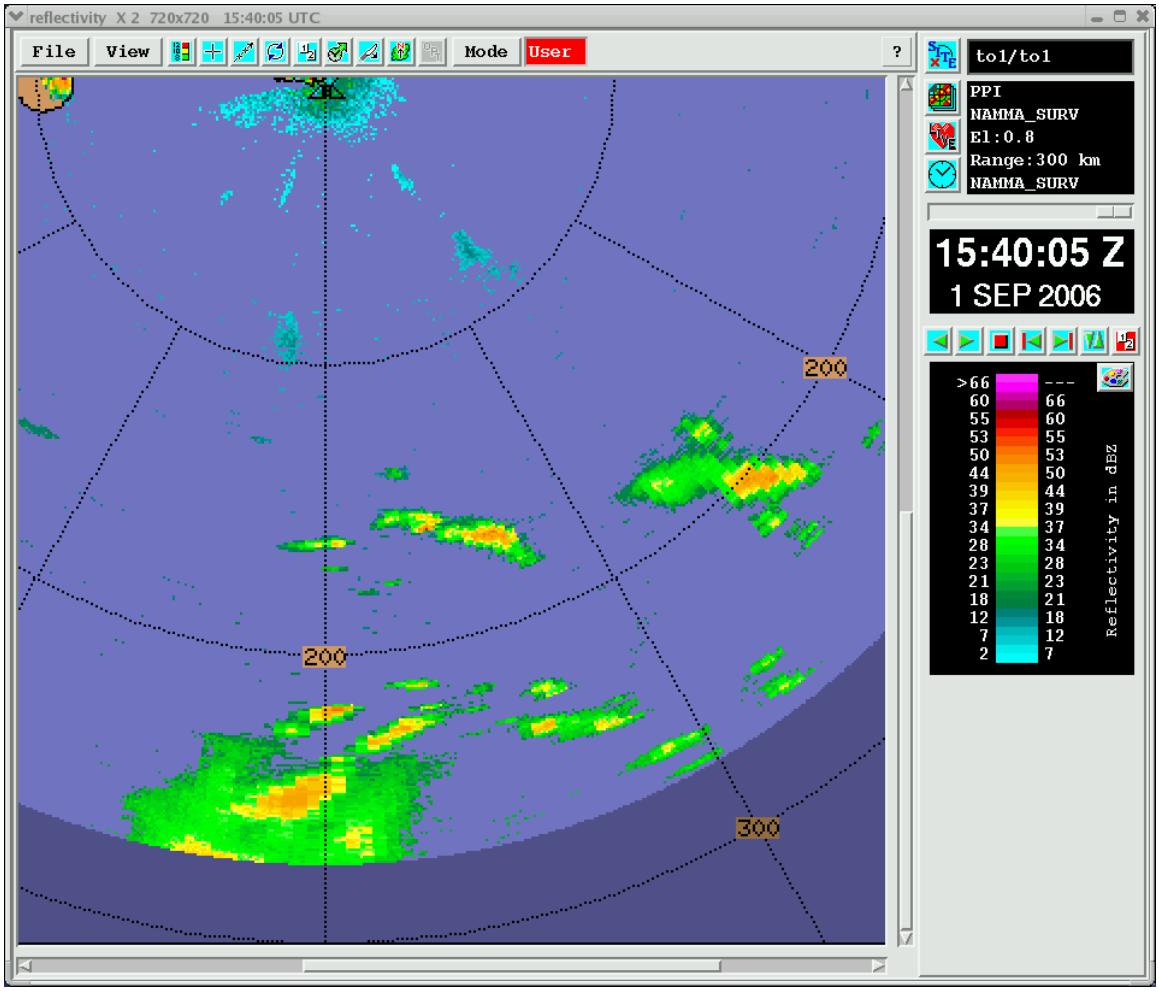
Remainder of morning spent w/ Smull & Pereira at old airport to post TOGA reports/do email and Cifelli doing orientation with Lang & George. Cifelli/ Pereira, George/Lang departed ~13 UTC for departure preparations/post-travel crew rest, respectively. Smull remaining on-site.

GFS model review .ppt obtained from NAMMA Forecast webpage depicts striking cyclogenesis immediately SE-S-SW of TOGA over the next 24hours. The progression of 925 mb maps from model run initialized 00 UTC 1 September shows N/NE'ly winds freshening over TOGA later today. By 12 Z, western end of cyclonic shear axis (essentially along ITCZ) where cyclonic curvature is maximized is located near 11degN/21degW, i.e. well SE of TOGA. By midnight tonight (00UTC 2 Sept), a closed cyclonic circulation is forecast at 11N/25W which implies that the center has moved W'ward across TOGA's 180deg azimuth during evening hours (albeit at a range of ca. 400 km, well beyond our sampling limit), such that our winds locally should have shifted to more E'ly. During the day tomorrow (Sat 2 Sept) and Sunday (3 Sept), the GFS rapidly intensifies this circulation. An eye-like wind minimum appears near 12.5N/25W at 00Z 3 Sept, and by the time GFS brings the intensifying circulation center NW'ward across TOGA's latitude (at a point some 550 km to our west, viz. near 15N/28W) the circulation appears to have reached TS strength. We'll see, but certainly the depicted evolution is very interesting.

1330Z: With exception of isolated cells near 215deg/150km, all echoes are beyond 200 km. Largest area corresponds to what appears to be N edge of (apparently) broad echo centered near 170deg) beyond limit of NAMMA_SURV

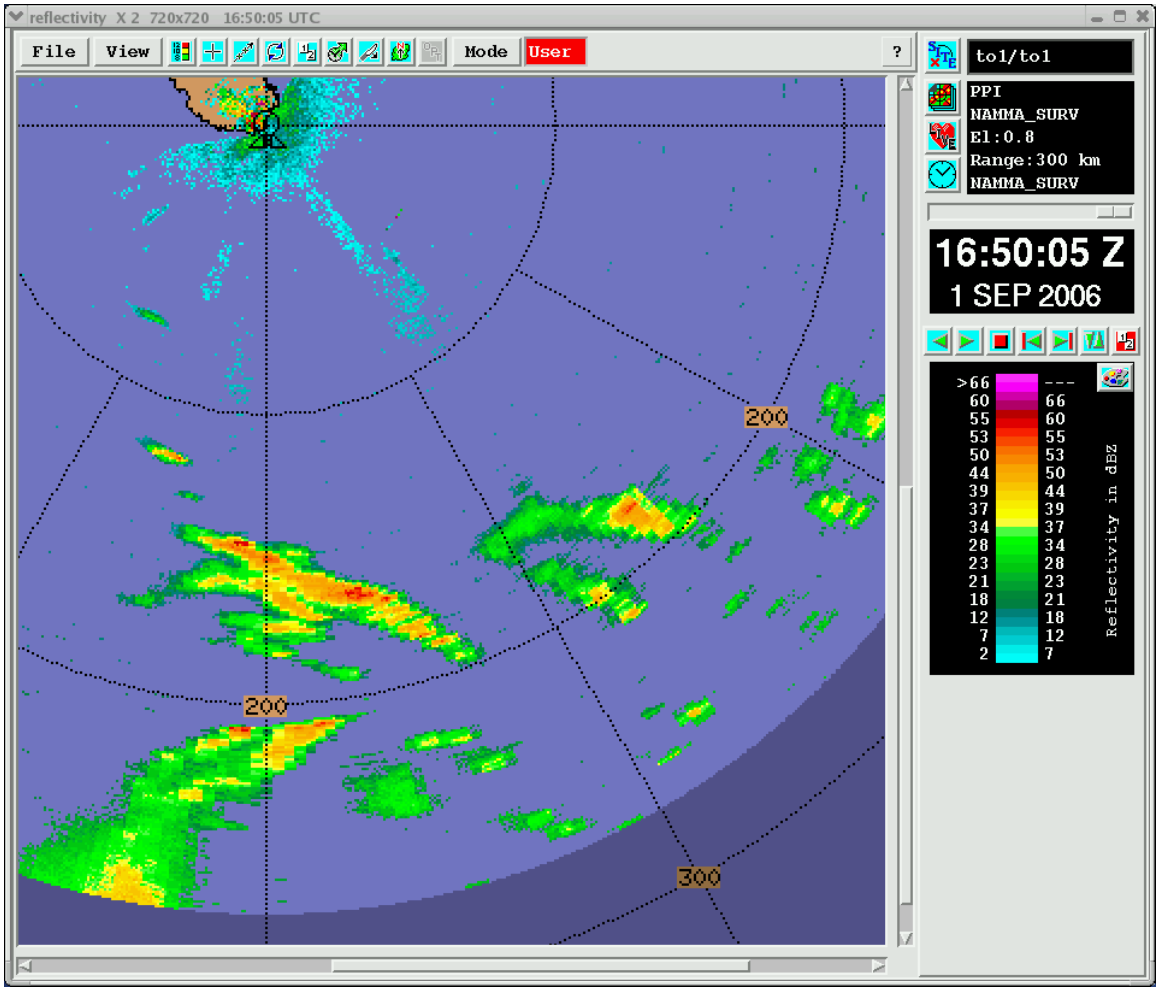
1430Z: More convective banding suggested in distant echo area, now centered near 180deg at surv scan edge. Animation suggests of some degree of cyclonic motion in conjunction w/ slightly curved bands, but at risk of imagining this on basis of GFS forecast summarized above.

1530Z: Definitely some suggestion of cyclonically-curved banding feeding into larger echo area, which is slowly slipping W'ward, along with development of discrete new short echo bands just beyond 150 km mark:



1630Z: Curved, intense bands are on the increase in SE sector and just beginning to graze 150km range limit. This evolution [i.e. development of cyclonically curved bands preceded by a squall (yesterday pm) traveling ~W'ward somewhat to north of zone in which they develop) strikes me as broadly similar to that which was observed back on 21-22 August (albeit with somewhat shorter time separating squall & curved rainband development in that earlier case). Perhaps an over-simplification, but curious nonetheless.

1650Z: Upwind (E) ends of cyclonically curved bands are exhibiting apparent quasi-periodic multicellular structure on a fine scale (possibly a data discretization issue):



1729Z: As toga1 system time was slow by >1 min, attempted to follow tech instructions for updating system clock. In doing so, year was mistakenly set to 2030. Tech (Gears) was already enroute to radar, and corrected problem beginning with 1800Z scan sequence.

DESCRIPTION OF PROBLEM IN TODAY'S (1 SEPTEMBER) DVD DATA ARCHIVE: All scans at times before 1730Z appear to have been written out normally. The 1730 surveillance scan (time tag 1730:21) appears to have been written out twice—once with the correct year 2006 and a second time with year = 2030. The NAMMA_FAR scan in the 1730-40 interval was completed and apparently written out (time tag 1738:39) with year = 2030. Scans in the interval 1740-1800 were not collected Iris had to be halted, which interrupted data recording.

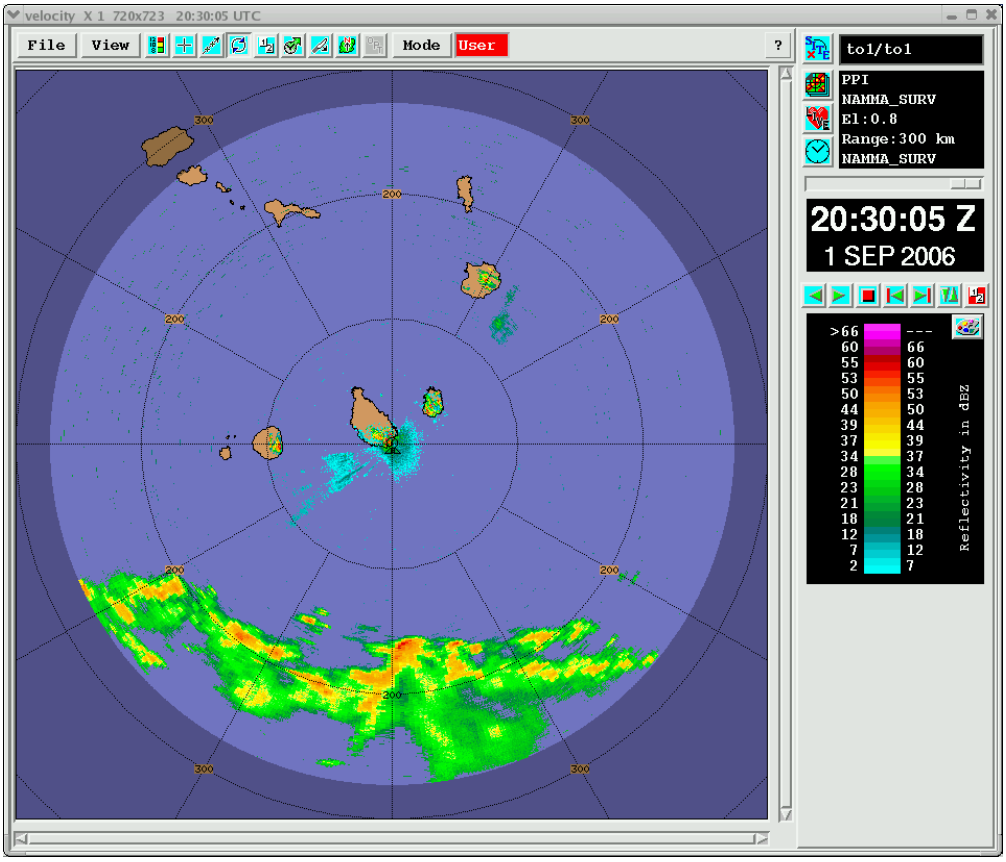
Most likely the final result (after techs are finished) will be a data gap in the 1730-1800Z interval. This gap are Smull's responsibility, and procedures will be followed to ensure this problem does not arise again.

NOTE: Despite tech's instructions on-file (now with correct syntax), IN THE FUTURE it would be best to ask tech to come to science trailer (where GPS time is located) to periodically perform this function.

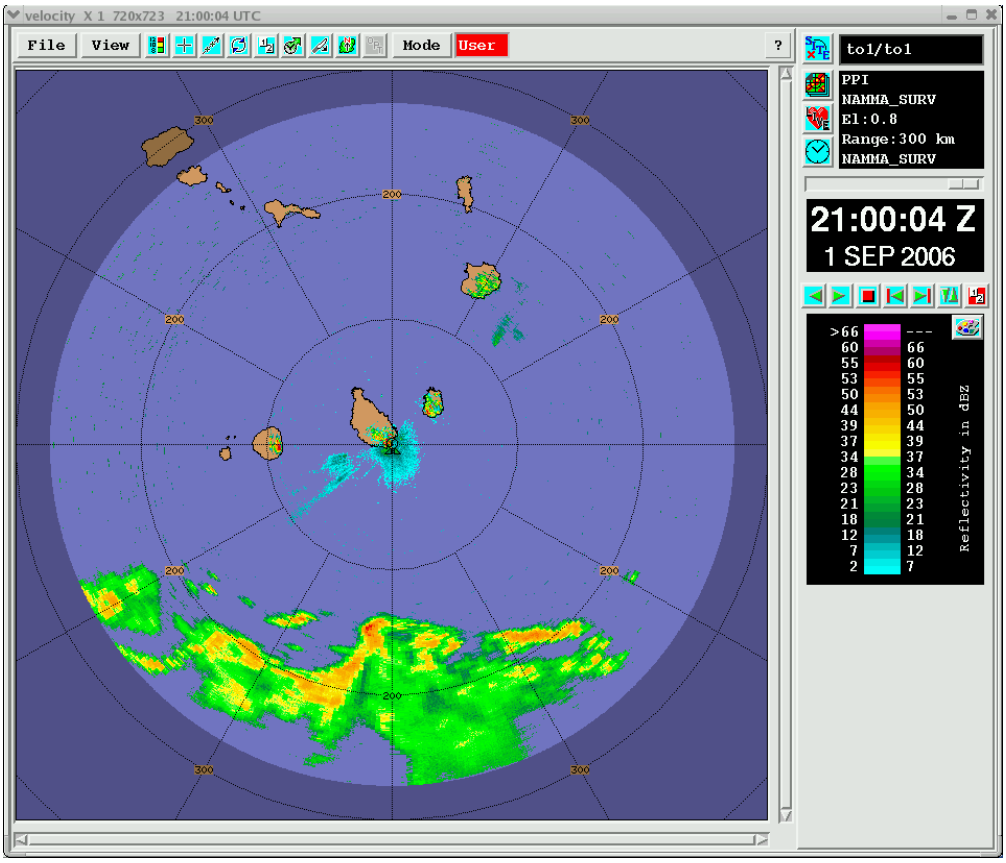
1830Z: Data presently accumulating in ingest queue (i.e. Being recorded on toga1), but apparently not yet being written out to archive. Problem is being worked by techs. Meteorologically, virtually all echo is staying just beyond our 150-km volumetric scanning range, but its morphology is nicely described by surveillance scans. What had been individual (shorter) bands have congealed into a single 300+ km long WNW-ESE oriented “ITCZ-type” band.

1930Z: Long band continues to maintain strongest reflectivity gradients along its northern edge (presumably where updrafts are located), but has taken on a weakly sinusoidal shape. Still oriented WNW-ESE on average. Interesting evolution in 150-180deg azimuth sector after 1830Z, where NW'ward propagating squall-like segment collided with pre-existing ~W-E band and continuing on to the NW, leaving a zone of stratiform echo in its wake and generally morphing convection into a far more complex shape overall. Corresponding velocity field fails to show corresponding strong inbounds, presumably because at these long ranges beam is overshooting any related gust-front flow.

2030Z: All time-hack related problems have been corrected, i.e. all scans are being archived normally to both DVD's & RAID. Interesting (tho distant) echo:



2100Z: Weak echo SE of Boavista may be AP, uncertain. To our south, squall-like segment continues to bulge NW'ward across 180deg radial; also looks as if we're seeing the E end of this band out along our 135deg radial:

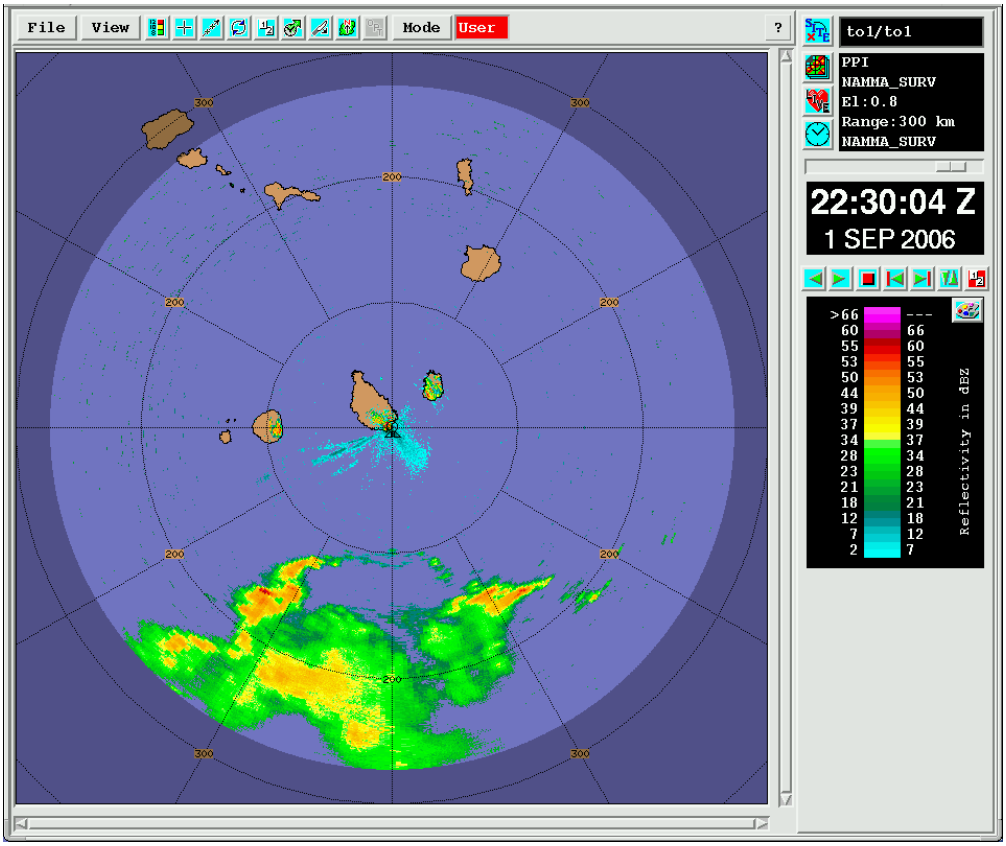


2130Z: Owing to recent arrival (jet-lag) of new CSU crew, TOGA must go scientifically unstaffed overnight. Fortunately Bowie on-duty. Scientists will return for tomorrow's day shift and possible DC-8 coordination. 2Nd-trip pattern suggests there isn't a lot of echo off to the E of our scan waiting to come in—tho evolution later in night far from certain.

2 September

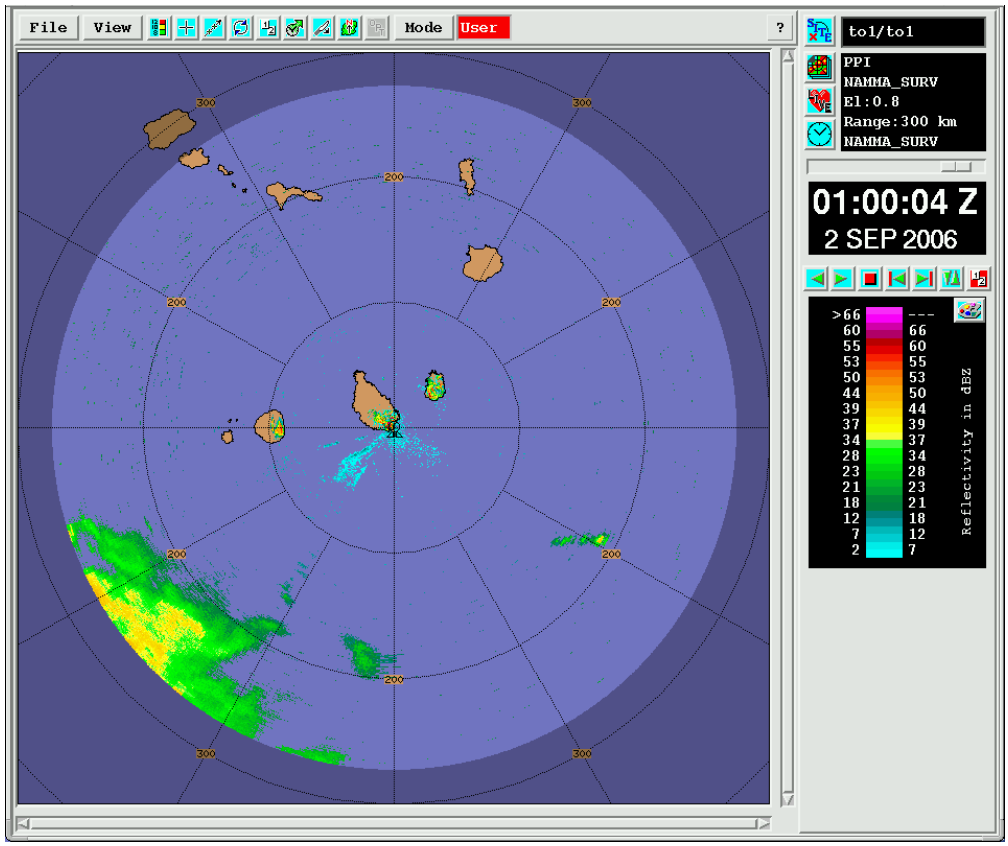
0930Z: Smull and George on-duty. Bowie reports system ran well overnight, and that Zipser called @ 0630 CVT. Returned call (per plan) at 0830 am, and reported that we see nice arc-shaped squall is approaching TOGA from ESE this morning, now just crossing 200 km range (more on this below). Ed reports this has been designated a no-fly day owing to evolving forecast that suggests area of cyclone development is NOT to SW of Cape Verdes this morning (as suggested by yesterday's forecast) but rather associated w/ convection still over African continent. Desire is to do “three-in-a-row” flights through developing way, so no-fly day today allows clock to be re-set in hopes of accomplishing this over next three days. Discussion of Praia raob winds followed. Yesterday's nearby DC-8 drop showed light N'ly vs. raob E'ly 30 kt.
Review of overnight activity: After 2100 1 September, activity began to shift W off radar scope. Previous NW'ward “bulge” of convection evolved into a short NE-SW oriented line extending N of main echo mass (along 210 radial in image

below), and was followed by another ~similar feature near the E end of echo mass.



Convective echoes exited surveillance scans shortly after 0100 UTC 2 September, with last of stratiform echo clearing scope ~0330 UTC. Only echoes of any significance during following period up until 0700 UTC was few weak cells south of Sao Tiago (near edge of our sea clutter) around 0530 UTC, possibly topographically induced—as suggested by animations showing apparent (drainage-related?) outflow boundary/fine-line propagating southward from Sao Tiago along which these weak cells developed. A few very isolated but locally moderate cells in the SE quadrant appeared to form along the N edge of zone where previous activity swept through during previous evening, i.e. perhaps along N edge of that system's wake.

After 0900 UTC, a new round of activity approached from SE in form of what was initially a small/short but classic arc-shaped squall line with trailing stratiform precipitation. Almost immediately, however, the N and S edges of this arc weakened (cf. 1000 UTC image). As has seemed typical for these squalls, a fair number of discrete cells broke out ahead of the arc and, with time, tended to morph it toward a more wedge-shaped or even ~E-W oriented feature.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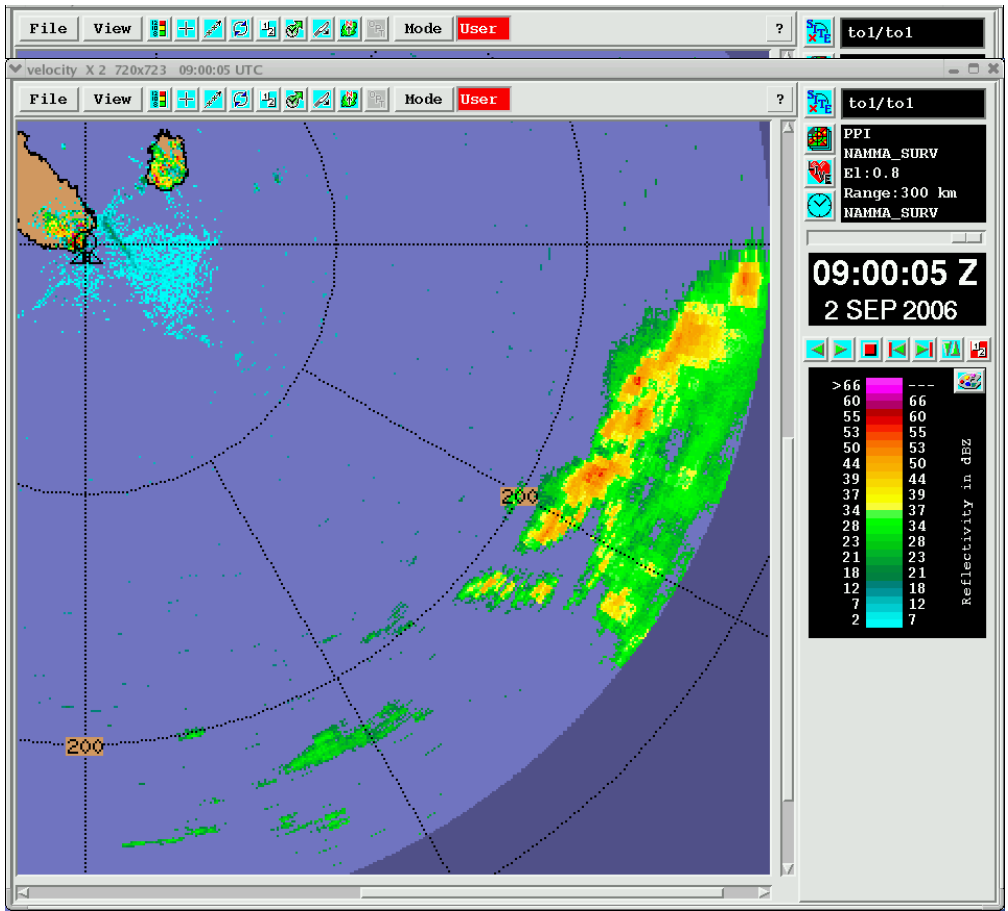
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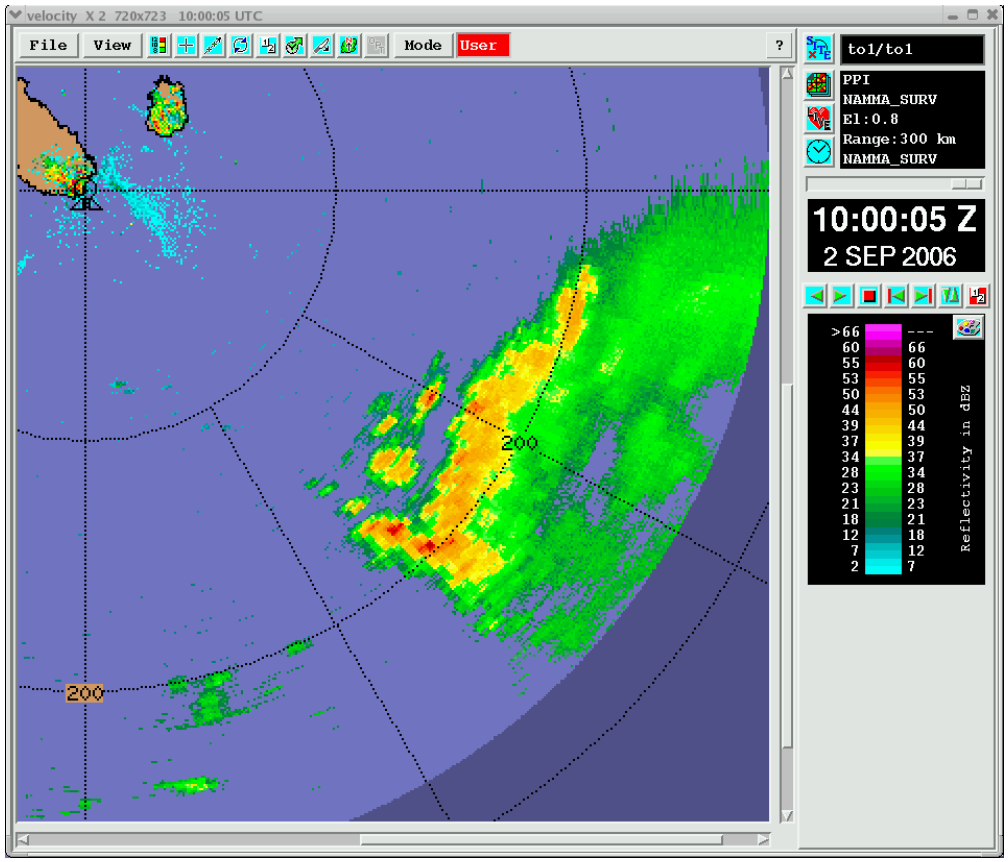
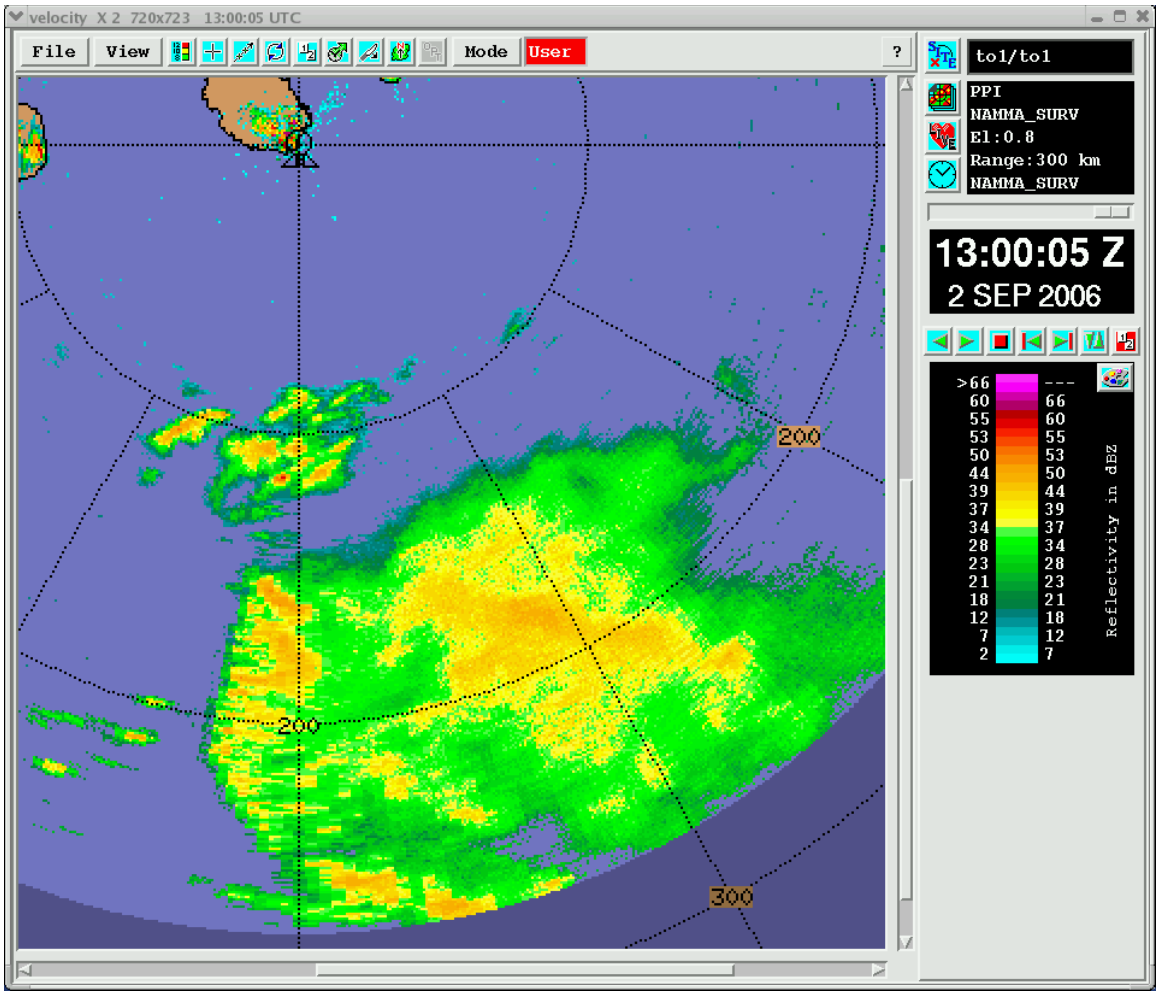


1030Z: Convection now confined to an at-most 100 km long delta-shaped segment, still with a large trailing stratiform echo reflecting convection's prior large latitudinal extent. Few echoes are now forming along a distinct ~NE-SW line just inside 100-km range mark in 120-180deg sector.

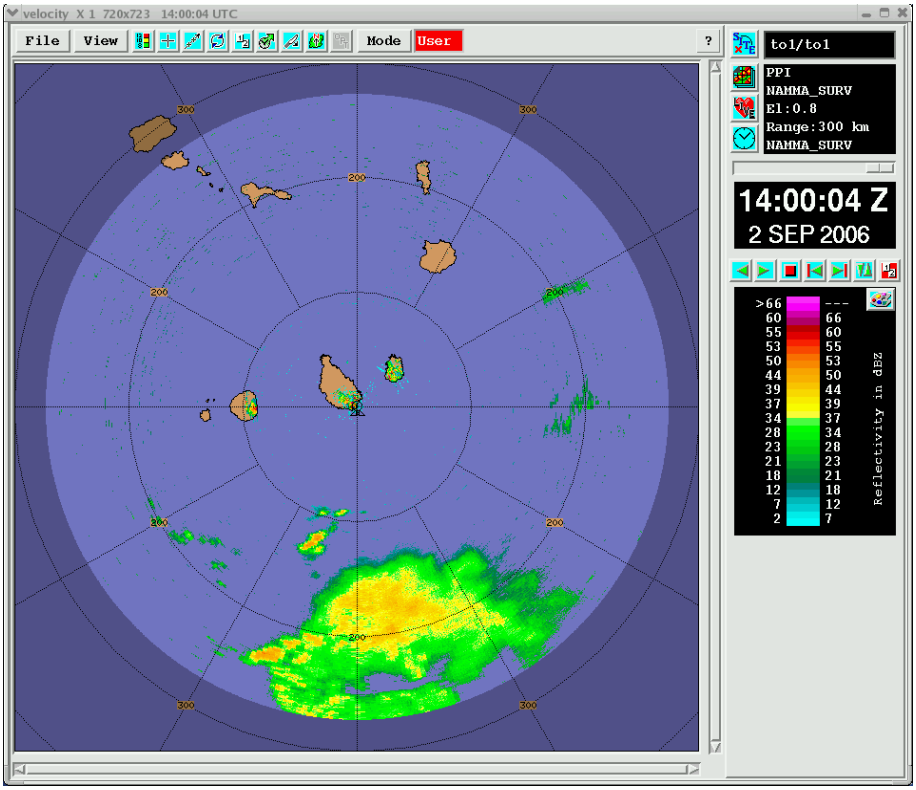
1300Z: Convection has advanced to region south of TOGA, with cells along leading edge of squall being somewhat weaker, but now with a better defined arc-shape. There is a large region of trailing stratiform echo. Also, an isolated region of convective cells located slightly to the north of the main squall line. The main system and any isolated cells seem to be moving SSW.

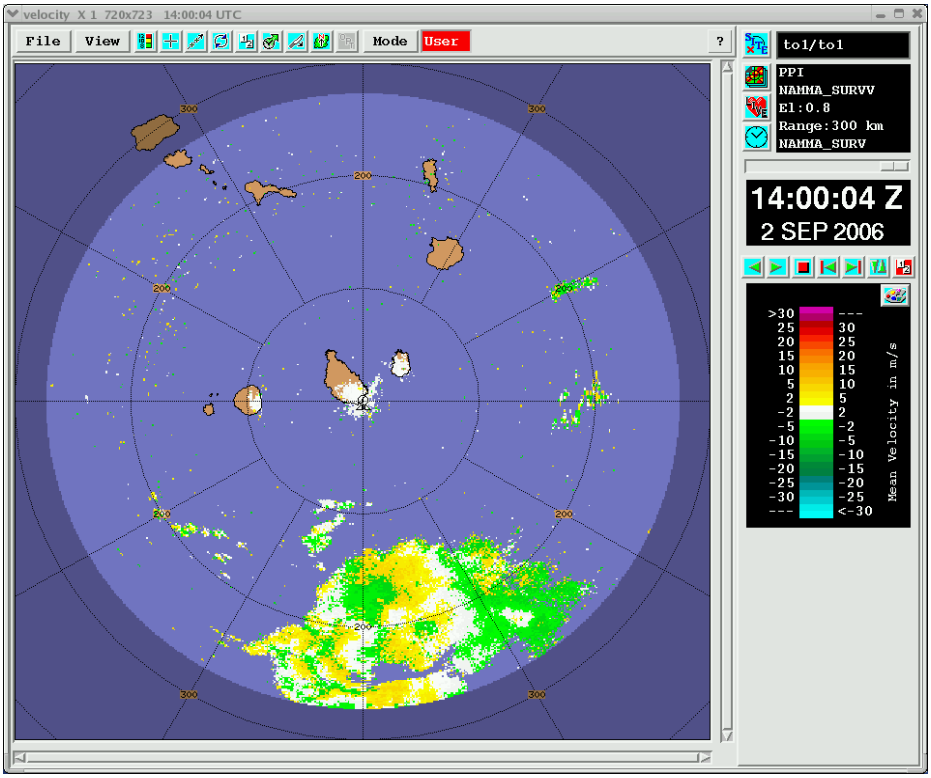
Further note on forecast: Yesterday's model forecasts (including consensus among multiple models) predicting rapid cyclogenesis whose center would have already passed W of TOGA by this morning were clearly wrong. Latest (00 UTC 2 Sept) runs are now delaying this development to a later time (viz. Late Sunday/Monday), and hence tying it to activity presently still over African continent. This major model change in large part led to Ops Center's decision to delay multi-day flights. For what it's worth, GFS puts center of lowest SLP (<1004 mb) almost over Sao Tiago by 18 UTC tomorrow, apparently related to NAMMA forecasters statement that the “wave” should be near 21W on Sunday and ~28W on Monday.



1340Z: Noted this morning as the group was heading to the radar and still currently very hazy/dusty outside. Some noted that this was the worst visibility they had seen yet. Today seems rather unique in that it's both extremely hazy (and apparently dusty) but also very moist, as witnessed by low/dark cloudbases hanging over near mountains most of the day.

1400Z: Some “popcorn” areas of reflectivity directly to the East and ESE of TOGA appeared around 1300Z and have continued through this time with velocity signatures (small showers?). The cells to the North of the main stratiform region seem to have collected into one small convective system. Although it appears that the previously well-defined arc had broken down and is possibly reforming into a wedge shape. The system continues to move to the WSW.





1510Z: Most of the echoes in the scanning region are either beginning to dissipate or move out of the scan area. The large region of what used to be

the trailing stratiform region is still S of TOGA and continues to persist, but it is difficult to tell if it is connected to any real organized convective regions.

1630Z: Last remnants of squall-system's trailing stratiform region are exiting surveillance scans in 180-210deg sector. Second-trip pattern and hint of 1st trip echo entering far E edge hints at approaching new activity—we'll see.

1730Z: Sea clutter pattern has expanded/intensified appreciably during past hour and (no surprise) winds here at radar site are picking up—probably close to 15 kt sustained, definitely w/ a N component. Second-trip pattern in surv scans clearly indicates cellular echoes approaching from the E, which should be entering our scope within the hour.

1830Z: Leading edge of new echoes just coming onto scope in 090-120 sector.

1930Z: Isolated cell cluster near 120deg/250 km, with perhaps more to come in this evening. To our SW, small E-W line of cells centered near 245deg/65 km that developed rapidly after 1830Z displays evidence of E'ly shear (stronger dBZ gradients on their E side, W'ward tilt w/height) with tops confined below 6km. Peak intensities 35-38 dBZ.

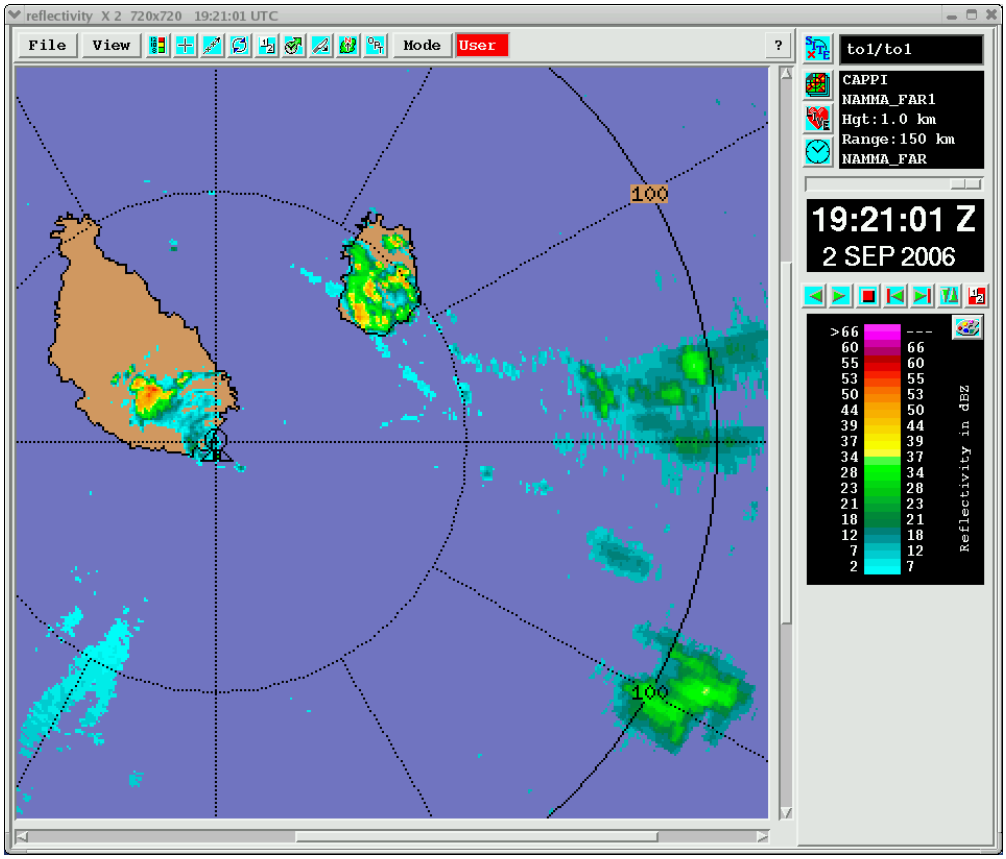
2030Z: Yet another new development popped up very rapidly shortly after 1930—a vigorous cell centered near 095deg/75 km. Peak indicated approaching 50 dBZ. A bit tricky because this echo developed in an area of 2nd trip. Seems to be part of an emerging E-W line of broken cells rapidly developing.

In addition to rapid convective development due E of TOGA, light orographic precipitation (in general area where we have been observing heavy cloud for many hours over the Island) appears to be on the increase surrounding higher terrain to our NW, as illustrated by changes in 1km MSL CAPPI over last hour (examples attached next page). This echo possibly due to modulation of moisture/cloud water being advected westward from convection near our 090deg radial. Farther out, stratiform anvil is beginning to edge onto far-E edge of scope. Looking more and more like a rainy night for Praia. Can we break our dry streak? Or will the rain once again move to south for a near miss? Stay tuned...

No need to change from NAMMA_FAR to NAMMA_NEAR scan program *yet*, but this could very well be required later.

2130Z: Echo continues to congeal into ~E-W band approximately along our 090 radial, perhaps with a slight S'ward drift over time. Other echoes are forming along ~WSW-ENE broken line extending from NW of Sao Tiago across N end of channel separating Sao Tiago & Maio; these cells are moving S'ward, suggesting they are trending toward falling-in to developing E-W band near Praia's latitude. Other thin line of echo recently formed along 50 km range ring in SW sector.

Smull & George going off-shift.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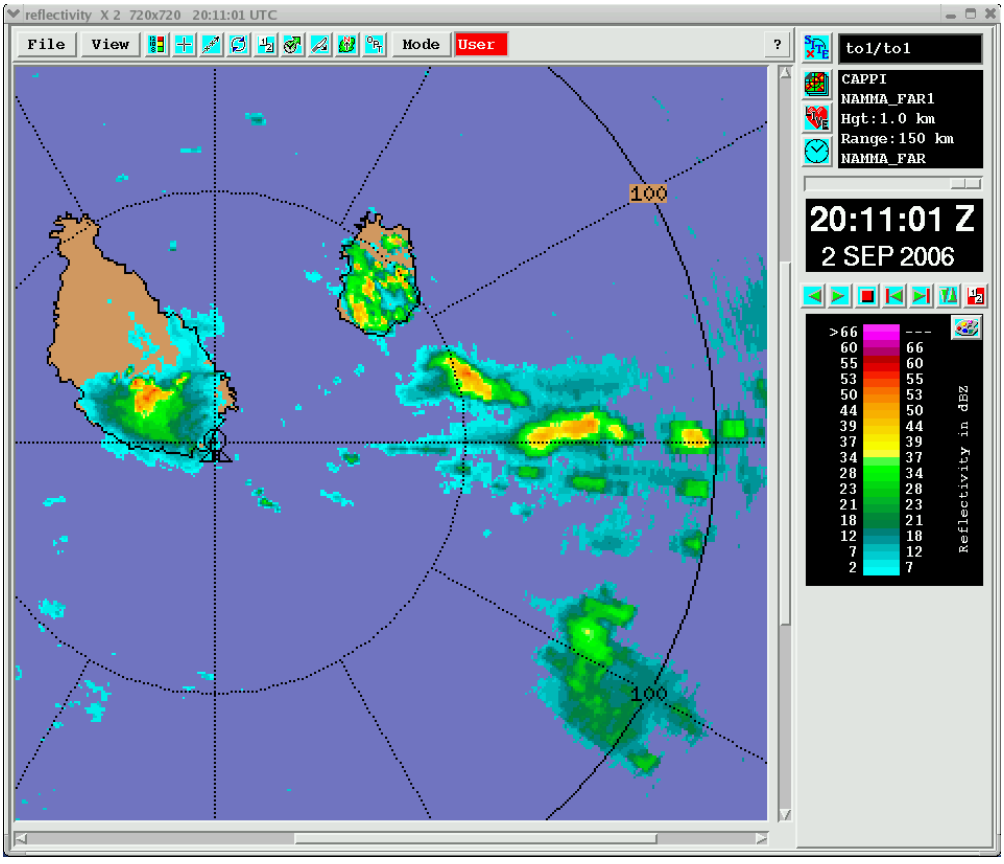
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Reflectivity in dBZ
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2130Z – Lang on shift. Switched to NAMMA-Near scan to top close echo.

2200Z – Antenna started spinning about a minute late due to time reset on toga1.

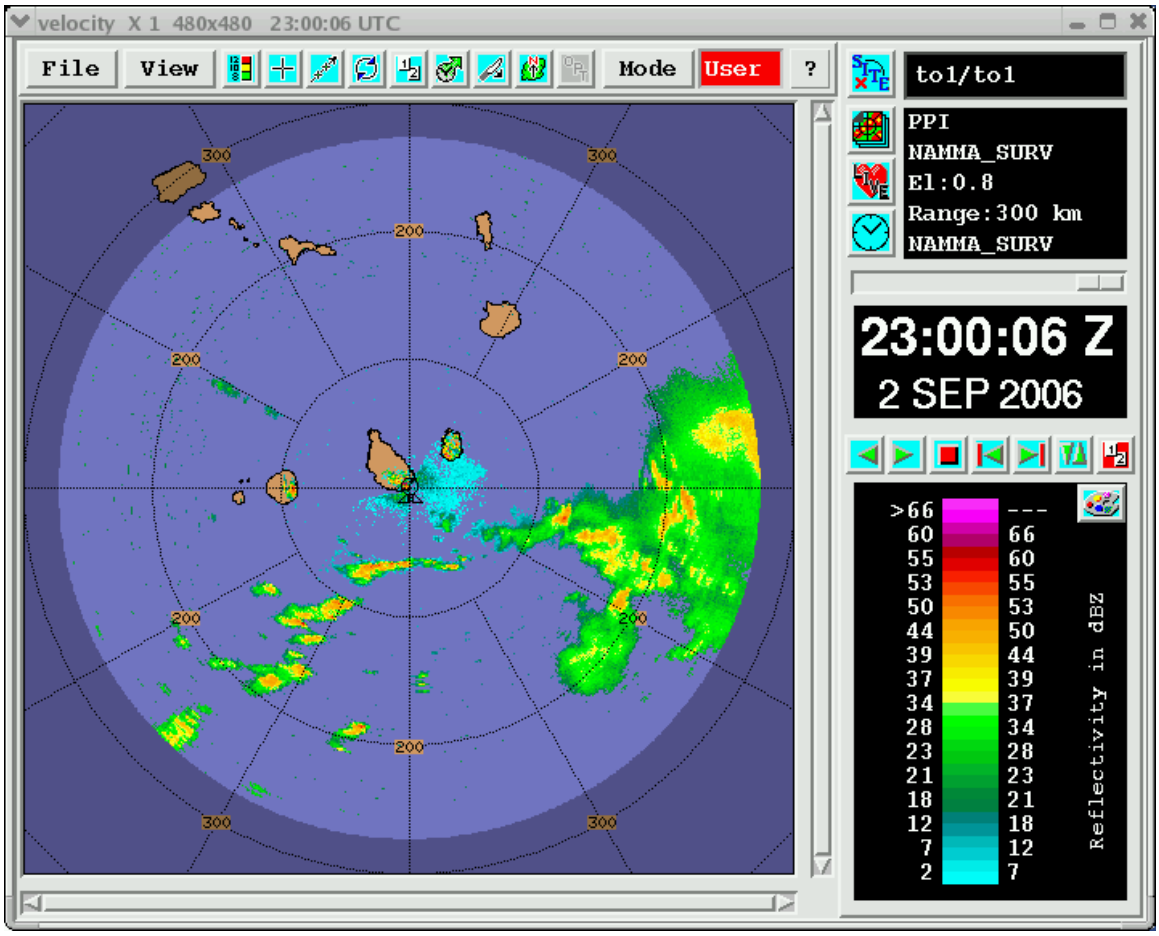
2210Z – Missed low-level surveillance due to time reset. Tech informs me the scheduled scans will work now.

2220Z – Low-level surveillance partially cropped due to leftover time from late start, but should be back on schedule now.

2230Z – Scan review appears to be messed up a bit from the time change and the NAMMA near switch. Difficult to loop and review properly.

2240Z – Eastern line not hanging together, but southern convection maintaining strength.

2300Z – Eastern convection has developed a significant region of stratiform echo. Review times now appear to be back in order, though much of the last hour's worth of review data is messed up timing-wise. There is a 210113 9 Sep 06 stamped NAMMA Near file which is really 2201 2 Sep.



2310Z – Switched back to NAMMA Far due to collapse of nearby convection, and continued strength of further convection.

2320Z – Significant second-trip on lowest 150-km scan, especially to the east with the stratiform echo.

2330Z – SW echo continues to organize into a long linear feature that fills the SW quadrant of the scope. Line is quasi-stationary.

2359Z – Starting new log file.

NO MORE ENTRIES IN THIS FILE! See file NAMMA-TOGA_Radar_Scientist_Log_S3ep-end.odt (.doc, .pdf)