

Planned F-F20 activities

SOP3a2 – Dakar ~15-30 september 2006

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Scientific objectives as proposed to CNES (2005 and 2006)

Investigation of West-African MCSs : their microphysical and dynamical properties, their interaction with the large-scale environment, their role in tropical cyclogenesis

Satellite measurements :

- to evaluate spaceborne measurements and products over land and ocean : CloudSat/CALIPSO (level1 and 2 products), METOP products, Aqua/MODIS
- to improve the rainfall estimates over continents using spaceborne microwave radiometers (SSM/I, TRMM).

Scientific objectives as proposed to CNES (continue)

Cyclogenesis :

- to improve our knowledge in processes that explained the further development of systems arriving over the west coast in Africa either to a final decay or towards a tropical storms like systems.
- Characterize microphysical and dynamical processes and their modification during the transition of convective systems from a continental to maritime regime
- Investigate the relationship between African easterly waves and MCSs / tropical cyclogenesis
- Provide an observational basis for any NWP/mesoscale modelling of African tropical cyclogenesis and MCSs during their continent/ocean transition

SAL-MCS interactions

- to study the Saharan Air Layer and its impact on West African and Tropical Atlantic Disturbances.
- Document the horizontal and vertical variability of the SAL, its physical properties, and its interaction with MCSs and developing tropical cyclones

Aircraft characteristics and Payload

Aircraft characteristics :

Max. flight level : ~11 km

Cruise flight speed : 200 ms^{-1} (11 km) 170 ms^{-1} (6 km)

Scientific mission duration : 3h30

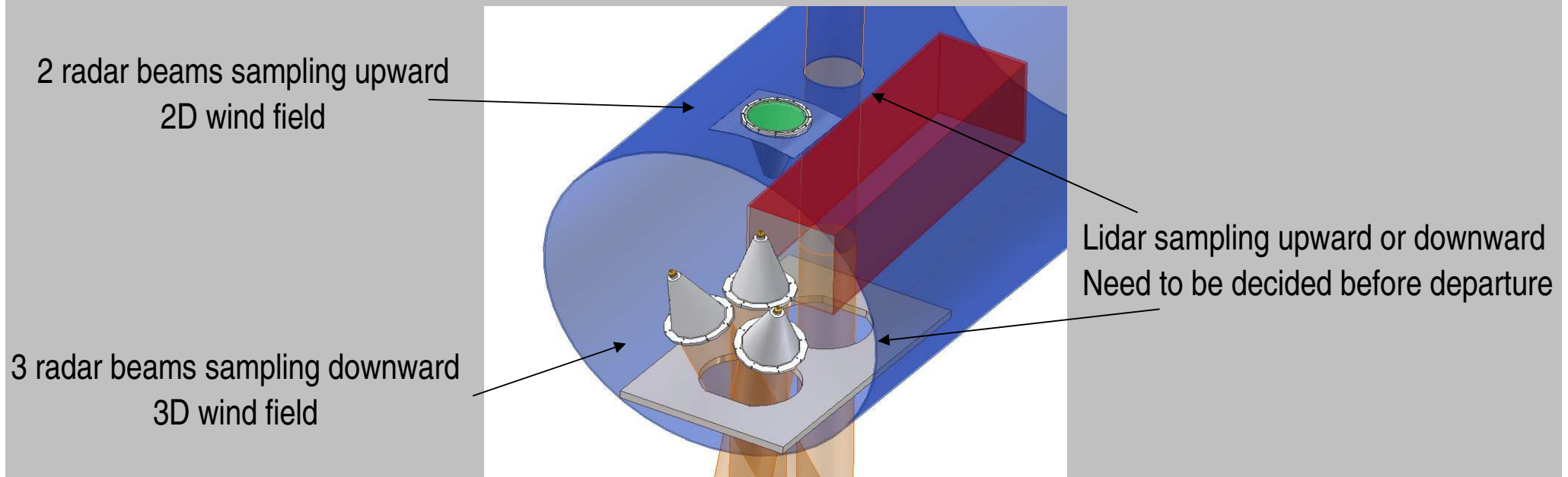
NB : convective cores must be avoided

Aircraft Payload :

Dropsonding capability : 6 sondes during « microphysics » flights – 16 sondes during « dynamics » flights

Microphysical in situ measurements : FSSP, 2D-C, 2D-P

94GHz Doppler radar / 1064, 532, 355 (HSR) nm lidar



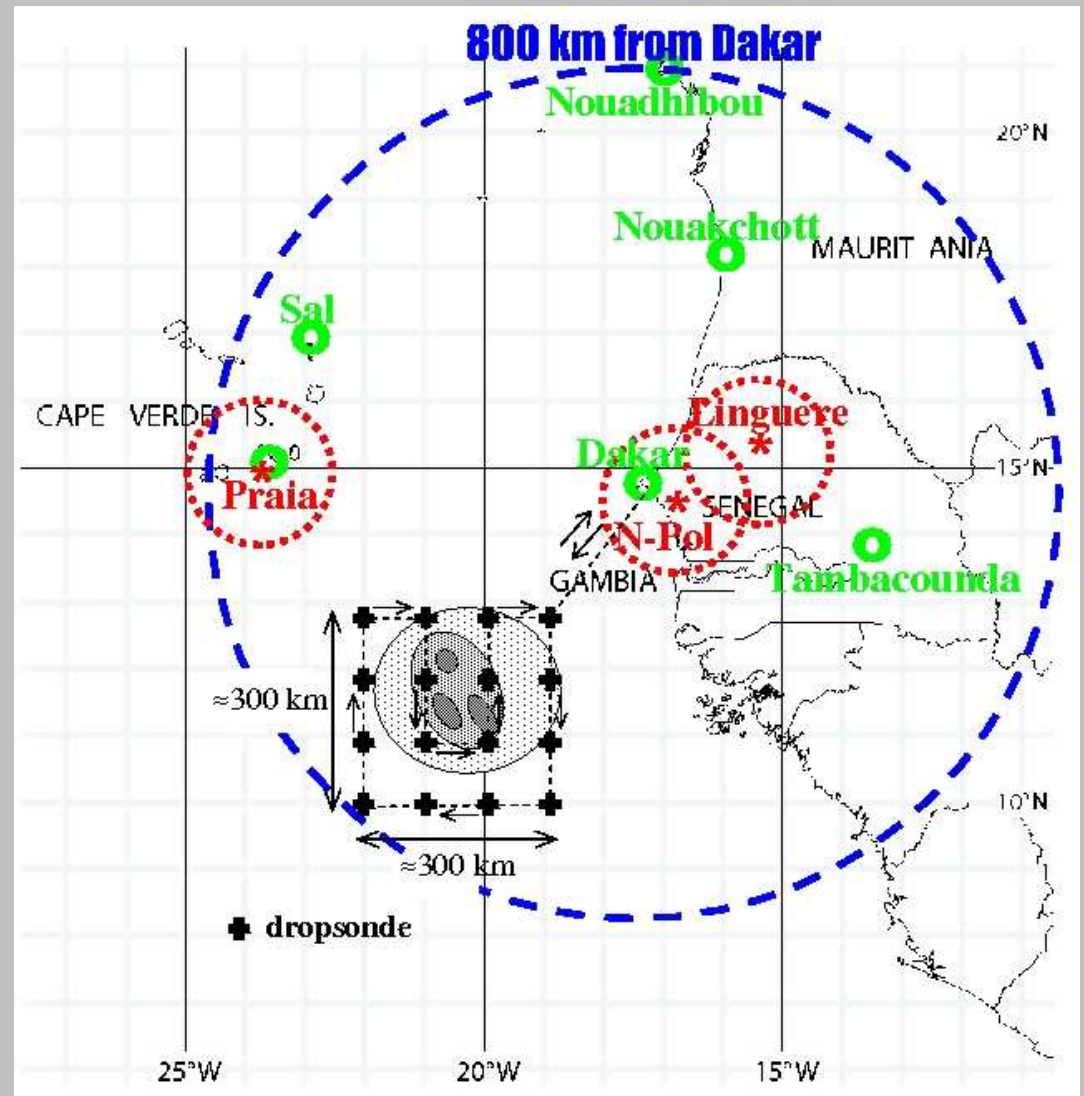
6 flight dedicated to microphysics – 6 flight dedicated to dynamics

AEW-MCS “dynamics”

**AEW-MCS evolution from
the continent to the ocean within 800 km
from Dakar:
2-3 x days D, D+1,(D+2) missions**

Documentation of domains of
about 300 km x 300 km

- *MCS-induced heat, moisture & momentum fluxes, PV signature*
- *Contribution of "vortical hot towers"*
- *Environmental field associated with the AEW + SW low level jet*
- *Role of SAL in the low to mid troposphere*



Proposed flight plan – mesoscale documentation

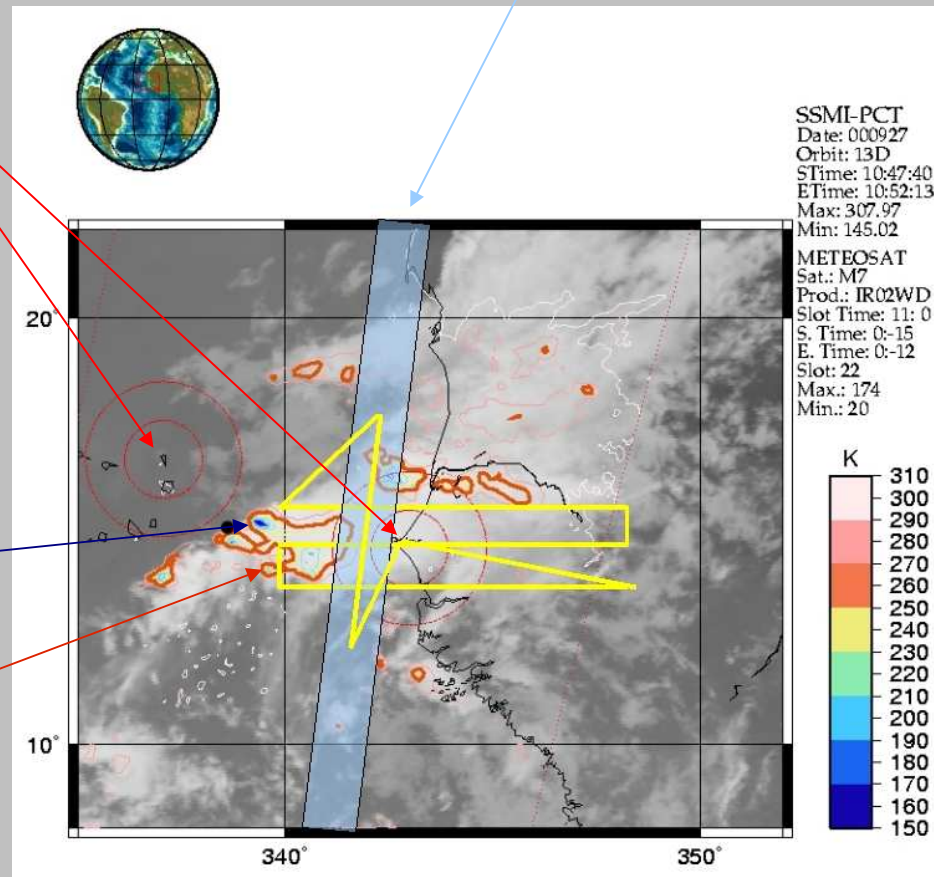
1 flight level

A-Train overpass

Ground based radars

Convective rain

Stratiform rain



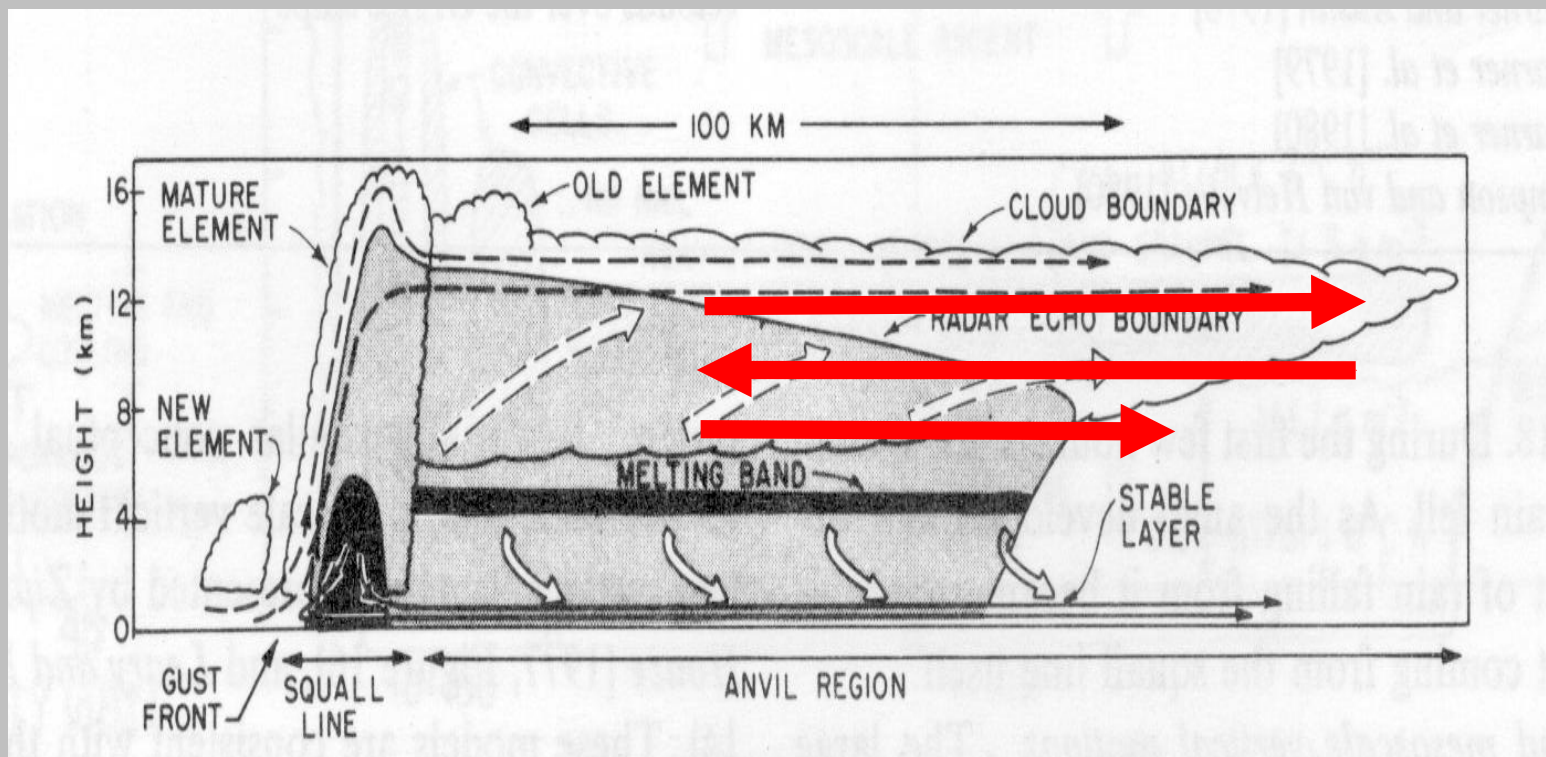
Horizontal variability
Mesoscale documentation
Water budget

Several adaptations are proposed depending of the cloud system location or satellite overpass

Proposed flight plan – vertical variability documentation

Vertical documentation of microphysical properties

Temporal evolution (documents 3 times the same vertical plan)



3 flight levels

To be performed preferably colocalised with polarimetric ground-based measurements
=> evaluate the hydrometeors classification from ground-based radars

Proposed flight plan – SAL and MCS interactions

SAL documentation and validation of CALIPSO aerosol products

Flight above a SAL event 2 transects perpendicular

Vertical and horizontal variability of the SAL

Full use of the HSR in order to retrieve the lidar phase function

Date	Actual Schedule		Potential Schedule		Potential Schedule		Potential Schedule	
	FF20	DC8	FF20	DC8	FF20	DC8	FF20	DC8
21/08/2006	SOP2a2		SOP2a2		SOP2a2		SOP2a2	
22/08/2006	Niamey/Paris		Niamey/Paris		Niamey/Paris		Niamey/Paris	
23/08/2006	Paris		Paris		Paris		Paris	
24/08/2006	Shift		Shift		Shift		Shift	
25/08/2006	Chemistry		Chemistry		Chemistry		Chemistry	
26/08/2006	to		to		to		to	
27/08/2006	microphysic		microphysic		microphysic		microphysic	
28/08/2006	configuration		configuration		configuration		configuration	
29/08/2006	Test flight		Test flight		Test flight		Test flight	
30/08/2006	Paris/Niamey		Paris/Niamey		Paris/Niamey		Paris/Niamey	
31/08/2006								
1/09/2006								
2/09/2006		Sal		Sal		Sal		Sal
3/09/2006		SOP3a1		SOP3a1		SOP3a1		SOP3a1
4/09/2006	Niamey	SOP3a2	Niamey	SOP3a2	Niamey	SOP3a2	Niamey	SOP3a2
5/09/2006	SOP2a3		SOP2a3		SOP2a3		SOP2a3	
6/09/2006								
7/09/2006								
8/09/2006								
9/09/2006								
10/09/2006					Niamey/Daka		Niamey/Daka	
11/09/2006								
12/09/2006	Niamey/Daka		Niamey/Daka					
13/09/2006								
14/09/2006								
15/09/2006								
16/09/2006								
17/09/2006								
18/09/2006	Dakar		Dakar		Dakar		Dakar	
19/09/2006	SOP3a2		SOP3a2		SOP3a2		SOP3a2	
20/09/2006								
21/09/2006								
22/09/2006								
23/09/2006								
24/09/2006								
25/09/2006								
26/09/2006								
27/09/2006								
28/09/2006								
29/09/2006								
Overlap period	3 days		8 days		5 days		10 days	

DC8 / FF20 Coordination

Possible schedules

Actually : 3 days in common

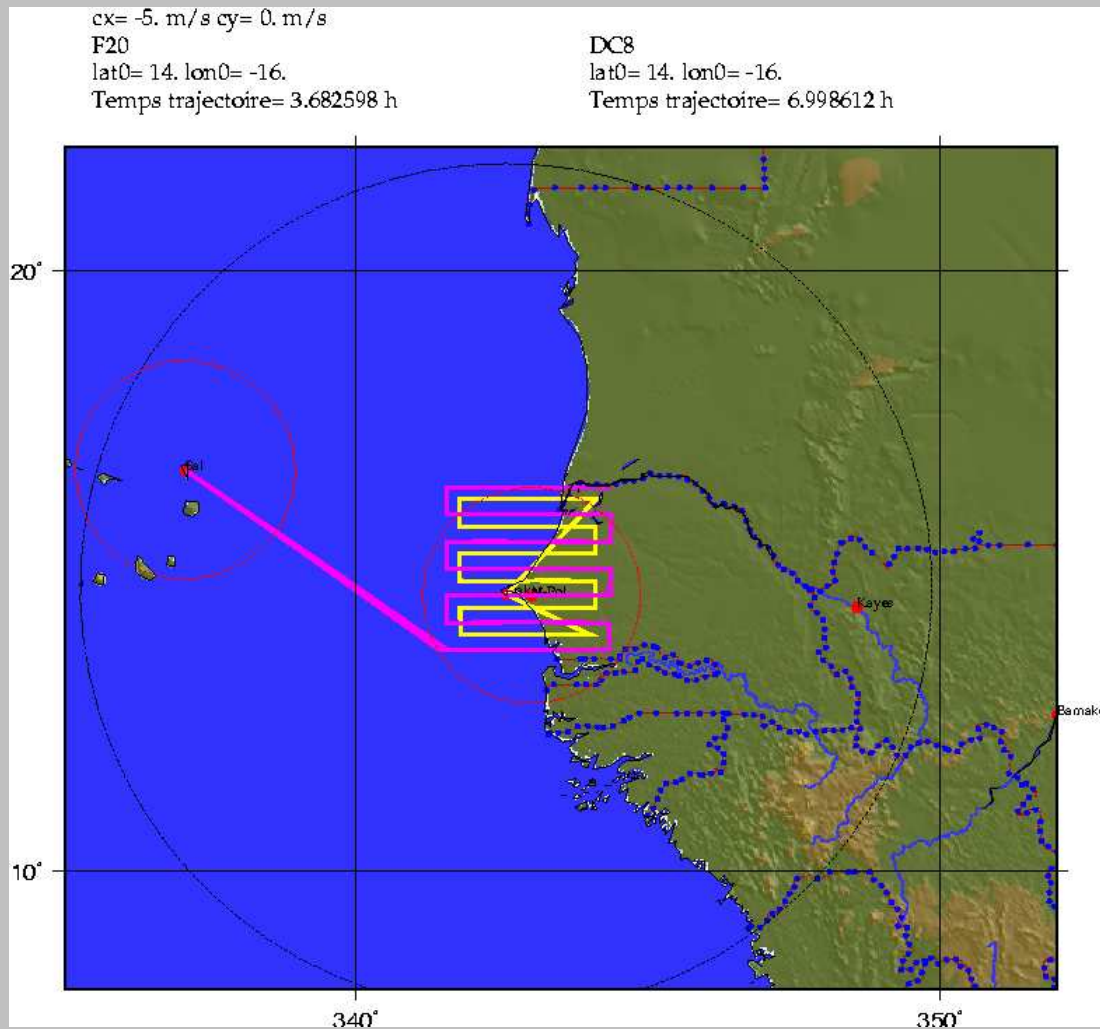
Can be increased to 5 or 10

Proposed coordination (to be discussed) - FP1

Mesoscale description (3D dynamical and microphysical documentation)

Temporal evolution of microphysical properties

Budget analysis



Both aircraft at the same altitude
(11 – 12 km)

F20 documents a 250 x 250 km²
domain

3D wind field downward
(MANDOPAS) + 3D microphysics
(RALI/RadOn + MANDOPAS)

DC8 documents twice a 300 x 300
km² domain

=> full complementary of the radar
(downward)

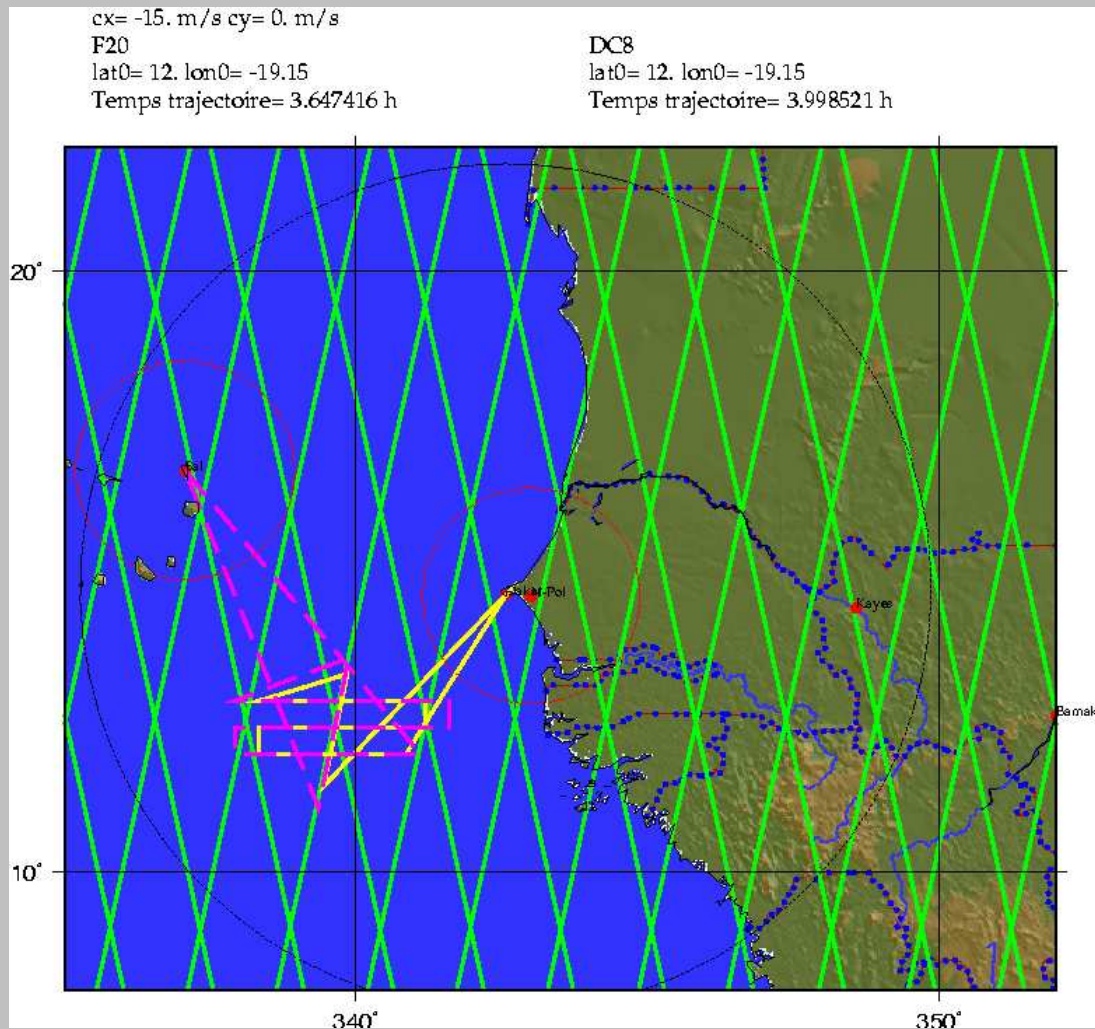
=> temporal evolution of
microphysical properties

Proposed coordination – FP2

CloudSat / CALIPSO product (L1 and L2) evaluation

Coincident measurements

Cross-track documentation



F20 flying at 11-12 km altitude
documents 3 cross-track legs of
300 km

DC8 flying at 9-10 km altitude
documents 3 cross-track legs of
400 km

Colocalised A-Train / active and
microphysical measurements
=> direct comparison with
CloudSat/CALIPSO products
Cross-track variability documentation
=> evaluation of A-Train products