LMA Case Notes

Notes: “In network” means within 100 km of network center. Maximum number of stations assumes missing data are unrecoverable, and may change if data are recovered.

10/24/2018

- Early morning mountain convection
- Station location scripts not updated, data may be compromised in unrecoverable way
- Station availability increased from 0 to 1 during the day, no mapping possible

10/25/2018

- Occasional pulse thunderstorms throughout day
- Station location scripts not updated, data may be compromised in unrecoverable way
- Station availability increased from 1 to 3 during the day, no mapping possible

10/26/2018

- Scattered early morning storms in region, many likely within 100 km
- Station location scripts not updated, data may be compromised in unrecoverable way
- Station availability increased from 3 to 4 during the day, no mapping possible

10/28/2018

- Scattered weak storms in area relatively early in day, likely beyond 100 km
- Station location scripts not updated, data may be compromised in unrecoverable way
- Four stations available, no mapping possible

10/29/2018

- Afternoon thunderstorm to south, likely beyond 100 km from network
- Station location scripts not updated, data may be compromised in unrecoverable way
- Four stations available, no mapping possible

10/30/2018

- Early afternoon thunderstorms near Cordoba
- Station location scripts not updated, data may be compromised in unrecoverable way
- Station availability increased from 4 to 5 during the day, only very limited mapping possible

10/31/2018

- Morning storm near Cordoba, may have occurred before network reached 6 usable stations
- Station location scripts not updated, data may be compromised in unrecoverable way
- Station availability increased from 5 to 6 during the day

11/02/2018

- Small cell blew up near Cordoba late in the day

- Station location scripts not updated, data may be compromised in unrecoverable way
- Seven stations available

11/03/2018

- Overnight storm near Cordoba, then multiple storms rolled off mountains starting late morning
- Station location scripts not updated, data may be compromised in unrecoverable way
- Station availability increased from 7 to 8 during the day

11/04/2018

- Scattered overnight cells near Villa Yacanto and also in center of network
- Afternoon convection near Yacanto
- Station location scripts not updated, data may be compromised in unrecoverable way
- Eight stations available

11/05/2018

- Line of convection moved thru eastern half of domain in morning, then followed by scattered afternoon convection
- Station location scripts not updated, data may be compromised in unrecoverable way
- Eight stations available

11/06/2018

- Small MCS moved west to east thru center of network overnight
- Later there was scattered small afternoon cells in and near network
- Station location scripts not updated, data may be compromised in unrecoverable way
- Eight stations available

11/07/2018

- Distant small cells early, then afternoon small cells near Villa Yacanto
- Station locations scripts updated throughout day, data beforehand may be compromised
- Station availability decreased from 8 to 7 as F crashed

11/10/2018

- Weak cells to SE early, then supercell developed near center of network, followed by storms moving off mountains
- Duration of event ~1700-2400 UTC
- Station availability varied between 6 and 7 during event; occasional loss of network coverage due to GPS issues

11/11/2018

- Continuation of previous day's event

- Event lasted essentially entire day; multiple rounds of storms passed thru network, first west to east then NW to SE
- Cells were mostly discrete and typically multiple cells were in network at any one time
- Station availability varied between 6-7; occasional loss of network coverage due to GPS issues

11/12/2018

- Continuation of previous day's event, multiple cells moving NW to SE
- Cells were mostly discrete and typically multiple cells were in network at any one time
- Cells continued ~0000-2000 UTC, then after a couple hours a similar pattern developed and reestablished itself during ~2200-2400 UTC
- Station availability varied between 6-7; occasional loss of network coverage due to GPS issues

11/13/2018

- Continuation of previous day's event
- Cells continued to roll thru NW to SE until convection eventually diminished
- Duration of main event ~0000-0500 UTC (Total event duration ~60 hours)
- Scattered flashes near mountains during ~2000-2300 UTC
- Station availability varied between 7-8 (only 7 during main event)

11/17/2018

- A few storms to NE, mostly beyond 100 km
- Duration of event ~1500-1900 UTC
- Station availability during event varied between 8-9

11/22/2018

- Upscale growth from cell initiation thru to a long, slow-moving convective line
- Line oriented NW-SE in northeast portion of network, and moved toward the NE
- Distant storms to SW prior to main event
- Duration of event ~1000-1800 UTC, with scattered distant lightning before and after
- Eight stations available, but Pilar only contributed to a small number of solutions due to channel 5 filter

11/26/2018

- Widely scattered, low-flash-rate thunderstorms throughout much of the day
- VHF density maxima generally below 10 km, flashes tended to be horizontally stratified
- Lightning occurred off and on during ~0200-1900 UTC
- Station availability varied between 7-9

11/27/2018

- Widely scattered, low-flash-rate thunderstorms moved eastward from mountains throughout day

- Storm were clustered near southern portion of network early, switching to northern region later
- Several of the storms were beyond 100 km
- Occasional horizontally stratified lightning flashes
- Duration of event ~0000-1800 UTC
- Number of stations varied between 7-10

11/28/2018

- Relatively brief mountain thunderstorm during afternoon
- Timing of event ~1800-2000 UTC
- Number of stations varied between 8-9 (B may be fully recoverable later)

11/29/2018

- Occasional very distant SW storms early, then scattered afternoon to early evening thunderstorms over the W & SW mountains
- Storms appeared shallow - bulk of VHF sources below 10 km
- Duration of in-network event ~1700-2400 UTC
- Number of stations varied between 8-10 (B may be fully recoverable later)

11/30/2018

- Continuation of previous day's event
- Mountain convection formed into NW-SE line that passed SW-NE thru network
- Later that afternoon, scattered diurnally forced thunderstorms, especially over the mountains
- Sources were very low in altitude, with maxima located as low as 5 km during first event
- Relatively low flash rates during this day
- Duration of first event ~0000-0800 UTC; duration of second event ~1500-2300 UTC
- Number of stations varied between 9-10 (B may be fully recoverable later)

12/01/2018

- Scattered distant storms, then a multicell thunderstorm blew up in the middle of the network and moved to the NE
- Source altitudes were low, ~5-10 km VHF maxima
- Duration of in-network event ~0300-0600 UTC
- Station available varied between 8-9 (B may be recoverable later)

12/04/2018

- Afternoon multicellular convection developed over mountains and then the convective envelope moved eastward onto the plains
- Some storms produced horizontally stratified flashes
- Bulk of VHF sources below 10 km during event, especially late
- Duration of event ~1600-2330 UTC
- Station variability varied between 8-9 (B may be recoverable later)

12/05/2018

- Continuation of previous day's event
- Two distinct convective events; the first involved scattered weak thunderstorms over the western mountains, as well as far to the north
- Second event involved the development and propagation of intense, evidently anomalously electrified convection within the network, followed by scattered weak thunderstorms over the mountains
- Weak mountain thunderstorms had higher altitude VHF source maximum than the intense anomalous cell
- Duration of first event ~0000-0700 UTC
- Duration of second event ~1700-2400 UTC
- Station availability varied between 8-9 (B may be recoverable later)

12/06/2018

- Continuation of previous day's event
- Scattered weak thunderstorms over the mountains
- Duration of event ~0000-0400 UTC
- Station availability varied between 8-9 (B may be recoverable later)

12/10/2018

- Two brief thunderstorms, one to SW, then another to the NE
- Duration of event ~0700-1100 UTC
- Eight stations available during event (A & B may be recoverable later)

12/11/2018

- Storm developed near 100 km range to NE and quickly split into two separate multicells, one headed NE and one moving E
- Possible overshooting-top lightning in storms
- Later, a brief cell occurred over the NW mountains
- Timing of event ~1700-2330 UTC
- Station availability during event varied between 8-9 (A may be recoverable later)

12/12/2018

- A few scattered cells throughout the domain, both in network and beyond 100 km
- Duration of event ~0400-1000 UTC
- Station availability varied between 8-9 during event (A may be recoverable later)

12/13/2018

- A few short-lived mountain cells between 0500-0900 UTC, then multiple stronger cells developed in the southern portion of the network during 2300-2400 UTC
- Station availability varied between 8-10 (A may be recoverable later)

12/14/2018

- Multiple existing storms moved out of range, but then within the core of the network a large and intense MCS blew up, starting around 0130 UTC
- MCS was very tall, with overshooting-top lightning above 20 km and very high flash rates peaking around 0300 UTC
- Duration of storms ~0000-0900 UTC
- Station availability varied between 10-11 (still awaiting word on whether A data are recoverable for entire event)

12/16/2018

- Very distant short-lived cell to SE around ~1600 UTC
- Ten stations available during event (A may be recoverable later)

12/17/2018

- A couple of brief cells far to NW, then multicellular convection over the NW mountains, followed by another brief storm far to NW
- Source altitude maximum descended with time as close storms decayed
- Dispersion in noise along NE radial
- Events occurred during ~1500-2200 UTC
- Ten stations available (A may be recoverable later)

12/18/2018

- Scattered multicell thunderstorms moved west to east across domain
- VHF source maxima generally below 10 km altitude
- Some horizontally stratified flashes, particularly late in storms' lifetimes
- Duration of event ~0300-1200 UTC
- Ten stations available (A may be recoverable later)

12/19/2018

- Multiple rounds of storms, mainly over the mountains, during ~1100 UTC-2300 UTC with occasional 1-2 h gaps
- Event peaked during ~1600-1800 UTC with multiple storms over the western mountains that featured horizontally stratified lightning
- Some occasional cells over plains, but event was mostly mountain-focused
- Station availability varied between 9-11 (A may be fully recoverable later)

12/20/2018

- Multiple rounds of multicell storms streamed off the mountains throughout the day, concentrated during ~0000-1000 UTC and again during ~1600-2400 UTC
- The latter round featured a very intense storm that appeared to be anomalously charged, peaking within the network around 2100 UTC
- Station availability varied between 9-10 (A may be fully recoverable later)

12/21/2018

- Continuation of previous day's event
- Multiple storms continued rolling thru network from west to east, and then dissipated
- Source maxima below 10 km and some horizontally extensive flashes noted
- Duration of event ~0000-0400 UTC
- Station availability varied between 9-10 (A may be fully recoverable later)

12/26/2018

- Couple short-lived thunderstorms over mountains
- Duration of event ~1600-2000 UTC
- Station availability varied between 8-9 (A may be recoverable later)

12/27/2018

- Multicell thunderstorms developed to distant SE, and then intense multicell thunderstorms developed over the mountains and moved onto the plains
- Frequent horizontally stratified flashes
- Duration of event ~0700-2400 UTC
- Nine stations available (A may be recoverable later)

12/28/2018

- Four rounds of thunderstorms
- First round was continuation of previous day's event; multicells to distant north gradually dissipated
- Second round involved convection moving into range from west, but storms dissipated after they reached the Sierras de Cordoba
- Third and fourth rounds involved pulse convection in SW portion of network
- First & second rounds duration ~0000-0600 UTC; third round ~1500-1800 UTC; fourth round ~2000-2200 UTC
- Station availability varied between 8-9 (A may be recoverable later)

12/29/2018

- Very distant (200+ km) thunderstorms to SW during 2300 UTC hour
- Nine stations available during event

12/30/2018

- Long-lived event with multiple rounds of thunderstorms
- Portions of a distant MCS to south moved northward into network, followed by a series of multicellular storms moving off mountains
- Interesting and very rapid northward propagation of the MCS's convective envelope once it was in network
- Duration of event in network ~0500-1830 UTC
- Station availability varied between 8-9

01/01/2019

- Short-lived cell occurred just outside network during 0500 UTC hour
- Lightning detected more than 300 km away to northeast around 1600 UTC
- Nine stations available

01/02/2019

- Multiple cells developed over mountains, quickly followed by explosive development in the SE portion of network
- Upscale development occurred in the storms east of the mountains
- Very high flash rates after 1800-2000 UTC, but much of strongest storm was beyond 100 km
- After strongest plains storms weakened, additional upscale development occurred to NE of network, beyond 100 km
- Long anvil lightning in mountain storms, especially late
- A lot of noise, day may benefit from more restrictive chisqr
- Duration of event in network ~1700-2400 UTC
- Ten stations available

01/03/2019

- Continuation of previous day's event
- Multiple cells moving west to east both inside out outside of network
- Overall pattern of decay during event
- Frequent anvil and stratiform lightning, especially late in event
- Duration of event ~0000-0800 UTC
- Nine stations available

01/06/2019

- Multiple cells early in the SE portion of the network, followed by development and upscale organization over the mountains
- Convection eventually organized into a N-S oriented line that produced frequent stratiform lightning late
- Duration of event ~0900-2400 UTC
- Station availability varied between 8-9

01/07/2019

- Continuation of previous day's event
- A few scattered stratiform flashes in NE portion of network
- Duration of event ~0000-0200 UTC
- Eight stations available

01/08/2019

- A few cells in the southern portion of the network early, then development of an intense storm in the northern portion of the network, which moved NE unlike most convection that moved toward SE
- After northern storm dissipated, there were additional pulse thunderstorms near mountains
- Large amounts of noise sources, stricter chisqr threshold would yield benefits
- Duration of event ~0700-2100 UTC, with some breaks between storms
- Eight stations available

01/09/2019

- Multiple storms in and near network throughout day, some developing upscale
- Frequent anvil and stratiform lightning observed after 1600 UTC
- Possible radial dispersion artifacts along NE azimuth during event
- Large amounts of noise sources, stricter chisqr threshold would yield benefits
- Duration of event ~1000-2300 UTC
- Eight stations available

01/10/2019

- Numerous weak cells moved west to east through network
- Some stratiform lightning, especially late in event
- Timing of event in network ~0100-0700 UTC
- Some scattered long-range cells as well
- Eight stations available

01/13/2019

- Multiple rounds of storms moved through network, roughly NW to SE
- Long-lived event, duration ~0300-2100 UTC
- Eight stations available

01/14/2019

- Mountain cells developed and started moving toward network
- Duration of event ~2100-2400 UTC
- Station availability varied between 8-9

01/15/2019

- Continuation of previous day's event
- Multiple cells passed NW to SE thru network
- Duration of event ~0000-0800 UTC
- Station availability varied between 8-9

01/17/2019

- Scattered low-flash-rate cells passed thru network from NW to SE
- Event timing ~0700-1400 UTC

- Some long-range cells to S prior to main event
- Eight stations available

01/22/2019

- Diurnally forced mountain thunderstorms
- Duration of event ~1900-2340 UTC
- Station availability varied between 7-9

01/23/2019

- Multicellular storm formed in southern portion of network then moved toward SE
- Lots of long-range cells to SE
- Short-lived mountain thunderstorm around 0030 UTC
- Duration of first main event in and near network ~0200-0600 UTC
- Then pulse-like, multicellular convection over SW mountains and also near Cordoba
- Duration of second main event ~1430-2300 UTC
- Station availability varied between 7-8

01/24/2019

- Short-lived cell in center of network
- Occasional weak storms beyond 100 km
- Timing of in-network event ~0300-0400 UTC
- Seven stations available during in-network storm

01/25/2019

- MCS developed off SW mountains and moved thru network toward northeast
- Storms were extremely tall on radar and LMA, up to 20+ km
- Some stratiform lightning late in day
- Timing of event ~1700-2400 UTC
- Station availability varied between 7-9, notable impacts on flash/source time series around 2000 and 2130 UTC

01/26/2019

- Continuation of previous day's MCS event
- MCS decayed as it moved out of network, but new development occurred near the mountains and also developed upscale into another MCS
- Multiple hours of stratiform lightning during second MCS, some of which persisted even after convective cells collapsed
- Timing of event ~0000-1000 UTC
- Station availability varied between 7-8

01/29/2019

- Pulse-like, multicellular convection over SW mountains and also near Cordoba

- SW convection propagated north toward Cordoba and VCP and merged with convection there
- Qualitatively similar to second event on 01/23/2019
- Duration of event ~1700-2400 UTC
- Seven stations available

01/30/2019

- Distant multicell convection to south grew upscale while moving north into core of network
- Stratiform lightning occurred late in the event
- Duration of event ~0200-0900 UTC
- Seven stations available

01/31/2019

- Diurnally forced multicellular convection over western mountains
- Some distant convection to NE
- Most lightning beyond 100 km
- Duration of event ~1430-2330 UTC
- Seven stations available

02/01/2019

- Short-lived, scattered cells in NW portion of network
- Many cells beyond 100 km
- Some isolated weak convection around 0500 UTC
- Duration of main event in network ~1600-1900 UTC
- Seven stations available

02/02/2019

- Afternoon convection over mountains, mostly beyond 100 km
- Brief excursions of lightning into network during ~1300-1400 and ~1800-1900 UTC
- Seven stations available

02/08/2019

- Diurnally forced mountain convection later moves into center of network
- Duration of event ~1700-2400 UTC
- Seven stations available

02/09/1019

- Continuation of previous day's event
- Strong, multicellular convection in center of network later merges with convection moving in from west, and subsequently decays
- Stratiform lightning late in event, first in center of network then beyond 100 km from a different storm

- Duration of in-network event ~0000-0800 UTC
- Seven stations available

02/10/2019

- Extremely high flash rate storm in center of network
- Possible lightning hole between 2030-2100 UTC
- Significant vertical variability in altitude of source density maximum
- Seven stations available

02/11/2019

- Possible MCS moved through the network, then storms redeveloped over the mountains and moved into northern part of the network.
- Duration of in-network event 0230-1200 UTC
- Multiple high flash rate storms between 0300-0530 UTC
- Station availability varied between 6-7

02/19/2019

- Weak storms beyond 100 km during 1700-1900 UTC
- Ten stations available

02/22/2019

- Multiple high flash rate storms in network (possible supercells)
- Strong multicellular convection blew up over center of network
- In-network event started around 1740 UTC and continued into next day
- Ten stations available

02/23/2019

- Thunderstorm from previous day quickly died out
- High flash rate storm formed over the mountains and then moved into southern part of the network
- Another high flash rate storm formed outside of 100-km radius ~1300 UTC
- Constant stratiform lightning for first half of the day
- Duration of main in-network event 0300-0700 UTC
- Ten stations available

02/24/2019

- Many high flash rate storms blew up along a line (east to west) that propagated north during the day
- Very active day with high flash rate storms and stratiform lightning
- Almost 500 flashes per minute around 0600 UTC
- Duration of in-network event 0020-1600 UTC
- Station availability varied between 9-10

02/25/2019

- Air mass thunderstorm popped up and quickly died (0710 UTC), 2nd air mass thunderstorm formed outside of network (0850 UTC).
- Station availability varied between 8-10

02/27/2019

- Single cell formed and moved into SW part of network ~1830-1930 UTC
- Air mass thunderstorm formed and quickly dissipated outside of radius (~2100 UTC)
- Station availability varied between 9-11

03/03/2019

- Diurnally forced multicellular thunderstorm from 1830-2000 UTC
- Later in the day two short-lived air mass thunderstorms formed at 2010 UTC & 2200 UTC
- Radial dispersion in LMA sources beginning around 2100 UTC
- Eleven stations available

03/04/2019

- Squall line moved into the network from the south and propagated north with new storms developing over the mountains after the line passed
- Intense mountain thunderstorm (~0940 UTC)
- Active lightning day with a max of 600 flashes per minute around 0700 UTC
- Radial dispersion ahead of squall line and continuing for first half of the day
- VHF source altitude maxima gradually decreased and hovered around 6-7 km with multicellular thunderstorm that moved across the network from 1300-1600 UTC
- Eleven stations available

03/05/2019

- Two high flash rate storms outside of 100 km radius (0700-1000 UTC)
- Couple of low flash rate storms in network (1130-1430 UTC)
- Multiple storms outside of 100 km radius throughout the day
- Some radial dispersion during 0730-1000 UTC
- Station availability varied between 10-11

03/07/2019

- Brief lightning moved into network at ~1750 UTC, then a few air mass thunderstorms fired up at ~1900 then died out quickly
- Around 2230 UTC a line of storms began to blow up through the center of the network with a couple of high flash rate storms behind the line
- High flash rates with most storms that formed after 2200 UTC
- Low VHF source altitude maxima with air mass thunderstorms at ~1900 and also with the squall line that formed later in the day
- Eleven stations available

03/08/2019

- Continuation of previous day's event
- Squall line propagated northeast with very high flash rates and eventually died out followed by brief excursions of lightning during 0710-0800 UTC
- Some stratiform lightning with the squall line inside the network, but as the line died out there was plenty of stratiform lightning outside of 100km
- Low VHF source maxima with squall line to start, but the VHF source maxima continued to rise as the line propagated northeast
- Station availability varied between 10-11

03/10/2019

- Multiple low flash rate storms with little stratiform lightning past 100km
- When thunderstorm at ~1240 UTC first fired up it had low VHF source altitude maxima
- Station availability varied between 9-11

03/11/2019

- Multiple cells, mostly beyond 100-km range, some stratiform lightning with these
- Overnight outages at 2 stations due to low batteries
- Station availability varied between 9-11

03/12/2019

- Air mass thunderstorm blew up and quickly died around 1800 UTC
- Thunderstorm had a low VHF source altitude maxima
- Station availability varied between 9-11

03/14/2019

- Long-lived intense thunderstorm (1800-2200 UTC)
- A lot of radial dispersion with this storm
- Some anvil lightning from time to time
- VHF source altitude maxima at 6-8 km
- Station availability varied between 10-11

03/15/2019

- Line of storms propagated into network from the west
- Intense thunderstorm formed over Sierras de Cordoba at ~1440 UTC
- Intense thunderstorm formed just north of 100 km range at ~1720 UTC and moved eastward
- Constant stratiform and anvil lightning with this line of storms
- Station availability varied between 10-11

03/16/2019

- Low flash rate storm at beginning of the day that was ongoing from previous period, had some stratiform lightning with it
- Line of storms moved through the network during 0300-0800 UTC with a lot of stratiform lightning behind it; the line developed outside of the network and further development occurred as the line moved over the mountains.
- Main in-network event lasted from 0300 to 0800 UTC with other brief periods of lightning throughout the day
- Low flash rate storms the entire day except for a thunderstorm in the northern part of the network at ~0510 UTC
- VHF source altitude maxima below 10 km for most of the day
- Station availability varied between 10-11

03/17/2019

- Multicellular thunderstorms intensified outside 100 km and then moved into network from the west
- High flash rate storm outside 100 km around 0040 UTC, and another in the network around 0420 UTC
- Stratiform lightning during 0100-0540 UTC, and another short burst at 0750 UTC; this was also the time frame for the in-network event
- Low VHF source altitude maxima in storms during 0300-0700 UTC
- Station availability varied between 10-11

03/19/2019

- Multiple air mass thunderstorms in network throughout the day
- Air mass thunderstorm outside of network ~1800 UTC
- Eleven stations available

03/20/2019

- Two weak air mass thunderstorms formed in the network (0100-0200 UTC)
- Station availability varied between 10-11

03/25/2019

- Continuous pop up thunderstorms after ~1500 UTC in and outside of 100 km range
- Eleven stations available

03/26/2019

- Low flash rate storm moved across northern part of network (0000-0120 UTC)
- Multiple weak storms beyond 100 km (0000-0400 UTC)
- Station availability varied between 10-11

03/30/2019

- Two thunderstorms formed outside of 100 km radius and were moving south (~2330 UTC)

- Station availability varied between 8-10

03/31/2019

- Lightning occurred most of the day with the main convection occurring in the southern half of the network and beyond 100 km
- Some high flash rate storms with a very intense thunderstorm forming around 1730 UTC and tracked across the southern part of the network; interesting flash altitude throughout the intense thunderstorm ‘s life cycle during 1730-2200 UTC
- Lots of stratiform and anvil lightning throughout the day
- Station availability varied between 7-10

04/01/2019

- Storms beyond 100 km continuing from previous day, with constant thunderstorms developing in the network throughout the day
- A lot of stratiform and anvil lightning throughout the day, especially at ~1430 UTC
- Station availability varied between 6-9

04/15/2019

- Around 0730 UTC weak storms fired up beyond 100km
- Around 1100 UTC multiple high flash rate storms began to fire through the eastern half of the network
- After ~1100 UTC there was some stratiform and anvil lightning
- Station availability varied between 7-10