

## Log of Actions to LMA Network, and Other Data Notes

Note: This list covers major actions and issues, and will not cover every possible detail, such as occasional system reboots, etc.

### 2018

#### 10/24

- LMA shipment arrived at National University of Cordoba (UNC), and system assembly starts
- UNC (B) station installed

#### 10/25

- Rio Primero (D) installed
- Manfredi (E) installed

#### 10/26

- Villa Del Rosario (F) installed
- Monte Cristo (G) installed

#### 10/29

- Potential Alta Gracia sites visited and determined to be unsuitable for installation

#### 10/30

- Almafuerde (H) installed

#### 10/31

- Villa Yacanto (A) installed

#### 11/01

- Pilar (C) installed

#### 11/02

- Bosque Alegre (K) installed
- Villa Del Rosario (F) hard drive failure, data recording temporarily switched to Compact Flash (CF) drive

#### 11/03

- Villa Carlos Paz (J) installed

#### 11/05

- GPS 16-h time stamp bug noted at G and K; 8 h of data per day (actual 0-8 UTC) overwritten prior to this time

- Pilar (C) watchdog problem noted

#### 11/07

- Villa Del Rosario (F) crashes and becomes non-operational
- Location scripts run at all active sites

#### 11/08

- Pilar (C) watchdog disconnected

#### 11/10

- Notable supercell storm occurred within LMA network

#### 11/12

- First set of data from case on 11/05 processed, and my\_position and noise problems noted
- Second set of data from case on 11/10 (which had corrected my\_position files) processed and low source rate noted
- Problems with incorporating G and K into source location solutions noted, even during the 8 h each day they have the correct time stamp

#### 11/13

- Villa Del Rosario (F) hard drive swapped and then station restarted, and location script was run
- Pilar (C) station moved ~10 m in attempt to reduce noise, and location script re-run

#### 11/14

- NSSTC Berm computer failure and replacement
- Villa Ascasubi (I) installed and location script run
- After this date location scripts were run whenever boxes were moved
- Almafuerte (H) visited; ant infestation and antenna collapse both fixed

#### 11/15

- Monte Cristo (G) GPS card and cables checked, with no fix to time stamp issue

#### 11/19

- Villa Yacanto (A) site dismantled due to excessive noise and periodically odd data behavior

#### 11/20

- UNC (B) box removed from site, box A installed in its place (after downloading data from both boxes)
- Villa Carlos Paz (J) data downloaded and oscillator chip reset

- Bosque Alegre (K) data downloaded, and box swapped for box B; site data start behaving poorly afterward and site communicates infrequently
- K box chips reset unsuccessfully, spare LMA board installed instead; however, serial ports accidentally crossed with cable

#### 11/21

- Pilar (C) site visited, data downloaded, and filters swapped to channel 5
- Rio Primero (D) site visited and data partially downloaded
- Monte Cristo (G) site visited, data downloaded, and box swapped for K; location script failed due to serial cable mistake

#### 11/22

- No activities beyond data analysis, due to storms; issues noted with reduced Pilar source rates due to new filters
- Notable MCS event occurred in range of network

#### 11/23

- Box G installed at UNC, box A removed (after data download)
- Site installed at Potrero de Garay, using box A; periodically odd data behavior continues to be noted

#### 11/24

- Almafuerite (H) site visited and data downloaded; ant poison spread on and around plastic container, but no infestation noted; possible electrified gate at site noted
- Bosque Alegre (B) site visited, data downloaded, Yagi antenna pointing changed, chips reset, and system operated again after multiple attempts to boot back up
- Accidentally overwrote some box A data on portable hard drive (unsure about this – the mistake was noted at the time but cursory look at hard drive indicates apparently complete A dataset); regardless, data remain on box A's old SSD.

#### 11/25

- Villa Del Rosario (F) site visited and data downloaded; hard disk screw lost and tape placed over screw hole
- Pilar (C) site visited, data downloaded, and filters changed back to channel 3; solar panel had partially disconnected from stand and rotated around mast – this was fixed and then stand joints were taped
- UNC (G) site visited, data downloaded, and chips reset unsuccessfully

#### 11/26

- Pilar (C) site revisited and solar panel bottom zip-tied to base
- Manfredi (E) site visited and data downloaded
- Villa Ascasubi (I) site visited and data downloaded

### 11/27

- Monte Cristo (K) site visited, data downloaded, chips reset, and serial cables attached to correct ports; tape placed over hard drive disk screw holes due to no screws
- Rio Primero (D) site visited, data downloaded, and chips reset due to recent odd data behavior

### 11/28

- Potrero de Garay (A) site visited, data downloaded, chips reset; hard drive was replaced but evidently failed the next day
- Bosque Alegre (B) site visited, data downloaded, and communications link improved via Yagi rotation and rescan of available providers

### 11/29

- UNC (G) chips reset unsuccessfully and data downloaded
- Potrero de Garay (A) hard drive replaced again
- Villa Carlos Paz (J) site visited, data downloaded, and chips reset; tape placed over empty hard drive screw holes
- Afternoon case over SW mountains processed, closest/quietest stations (except G) contributed to solutions.

### 11/30

- Overnight decaying MCS storm in middle of network processed, all stations except G contributed to solutions
- Data downloaded from loose drives in backpack (two old A drives and one F) – most recently failed A drive unreadable by laptop
- 2.5 h of data processed from 11/10, 1 h processed from 11/22 – careful scientific analysis looks viable despite reduced networks on these days

### 12/01

- Periodic monitoring of network health using remote connection; no significant issues noted
- Visited potential permanent Villa Carlos Paz (J) site, on roof of house just across street from present site; plan to move sensor put in motion.

### 12/02

- Periodic monitoring of network health using remote connection; no significant issues noted
- Wrote draft instructions for Villa Carlos Paz (J) site move, and began arrangements to move the site

### 12/05

- Data from anomalous storm processed

#### 12/06

- Flying insect infestation noted at Pilar (C)
- Power cycled at Bosque Alegre (B)
- Hourly network status image produced automatically and posted on [geo.nsstc.nasa.gov](http://geo.nsstc.nasa.gov) starting this date

#### 12/07

- Insect infestation, including nest, removed from Pilar (C)
- Bosque Alegre (B) reported again, system rebooted
- Monte Cristo (K) system rebooted
- Spare LMA board, additional tools/supplies, and CF + other cards handed off for transport to Argentina

#### 12/11

- Bosque Alegre (B) chips reseated, CF card replaced, and SSD swapped; system rebooted normally but failed to report on network since; new letter designation for Bosque Alegre is L

#### 12/12

- Villa Carlos Paz (J) station moved to new site across street; noise floor may have increased

#### 12/13

- Villa Carlos Paz (J) my\_position file updated
- UNC (G) LMA board replaced
- Monte Cristo (K) chips reseated

#### 12/14

- Severe nocturnal MCS develops within center of network; all stations were active and contributed to solutions
- Other Villa Del Rosario lightning instruments removed, with significant reduction to noise at LMA station F

#### 12/16

- Other Almafuerte lightning instruments removed, with significant reduction to noise at LMA station H

#### 12/17

- UNC (G) stand fixed and solar panel reattached after wind damage; station's bandwidth decreased, possibly due to misaligned Yagi

- Monte Cristo (K) antenna mast fixed after wind damage; bend in upward antenna element noted but not fixed
- Data from afternoon thunderstorms over mountains processed; all stations contributed

#### 12/18

- Bosque Alegre (L) Ethernet cable reattached correctly, and is now reporting on the network; network status image-creation script updated to account for letter/port change
- Stand maintenance performed on Manfredi (E) station to make it lean less

#### 12/19

- Rio Primero (D) stand damage from wind storm repaired and station moved into middle of paddock due to other lightning instrument removal; GPS cable was cut at some point and then was spliced back together; attempted to run my\_position update script but it failed to produce a file so old file was kept
- Data from afternoon convection near and over mountains processed

#### 12/20

- UNC (G) Yagi rotated to point more directly at a cell tower; download can be intermittent but works now
- Data from anomalously electrified convection processed

#### 12/21

- Data from storms near Rio Primero (D) processed, and lack of GPS at that site confirmed
- Connectivity has declined noticeably at Pilar (C) and Monte Cristo (K) in the past 24 h

#### 12/27

- Notable case with significant lightning

#### 12/28

- Potrero de Garay (A) connectivity and GPS issues began, leading to intermittent data collection and then no response after 12/29

#### 12/29

- Bosque Alegre (L) station damaged by storm

#### 12/30

- Monte Cristo (K) intermittent GPS issues began

## 2019

### 01/02

- Bosque Alegre (L) and Rio Primero (D) stations repaired
- Notable case with significant lightning (crossing over into 01/03 as well)

### 01/05

- Bosque Alegre (L) stopped reporting

### 01/06

- Notable case with significant lightning

### 01/09

- Notable case with significant anvil lightning

### 01/21

- Rio Primero (D) stopped reliably working/reporting

### 01/23

- Notable deep storm with significant lightning

### 01/25

- Notable deep storm with significant lightning; Monte Cristo (K) contributed to solutions for much of this case

### 01/29

- Notable storms in network (thru 01/30)

### 02/10

- Notable storms in network, one of which was extremely high flash rate (thru 02/11)

### 02/11

- UNC (G) station visited and data downloaded

### 02/12

- Potrero de Garay (A) LMA board replaced, and larger CF card swapped to replace old CF and SSD; station back online and location script run; battery voltage 12.4
- Bosque Alegre (B) LMA board replaced, and larger CF card swapped to replace old CF and SSD; station back online, location script run, and station letter changed back to B; battery voltage 12.2
- Villa Carlos Paz (J) station visited and data downloaded; battery voltage 12.4; afterward, SSD failed but was repaired remotely using fsck

### 02/13

- Pilar (C) station visited and data downloaded; extended one of the antenna elements out ~6" to match the others; damage to solar panel noted and deemed relatively minor with respect to charging capability (panel voltages were good); battery voltage 12.6
- Villa Del Rosario (F) visited and data downloaded; battery voltage 12.5
- Rio Primero (D) chips reseated, new larger CF installed, and batteries replaced (voltage at 10); corrosion noted on solar controller, which may have caused the poor charging; almost immediately afterward, sensor stopped recording data but remained reporting on network
- Monte Cristo (K) LMA board replaced, new larger CF installed, and tall vegetation around sensor cut down; batteries were low due to the vegetation shading and weak cell signal

### 02/14

- Temporary overnight Bosque Alegre (B) and Monte Cristo (K) outages noted, likely due to low batteries
- Manfredi (E) site visited and data downloaded; battery voltage 12.5
- Villa Ascasubi (I) site visited and data downloaded; battery voltage was low at 11.9; removed blockages from solar panel, battery voltage rebounded to 12.2
- Almafuerite (H) site visited, ant infestation cleaned out, and data downloaded; battery voltages at 12.8
- Bosque Alegre (B) batteries replaced (12.5)

### 02/15

- Pilar (C) outage began
- Rio Primero (D) cables reset and station began operating nominally again; battery voltages improved from 12.2 to 12.6
- Monte Cristo (K) batteries replaced (12.5)

### 02/16

- Pilar (C) station restarted via power cycling computer
- Bosque Alegre (B) extremely low noise threshold and lack of triggers noted, likely due to a poor VHF connection

### 02/22

- Notable storms in network

### 02/26

- Bosque Alegre (B) visited by Eldo and Rolo; found LMA board VHF input disconnected; battery voltage very low at 10.5



03/12

- Bosque Alegre (B) batteries swapped for newly charged versions by Eldo

03/14

- Monte Cristo (K) batteries swapped and vegetation cleared by Rolo

03/26

- Noise at Rio Primero (D) dropped significantly, to < -80 dBm; station stopped contributing to solutions due to apparent GPS issue (later determined to be likely animal-damaged cable)

04/29

- UNC (G) station dismantled

04/30

- Monte Cristo (K), Rio Primero (D), Villa Del Rosario (F), and Manfredi (E) stations dismantled

05/02

- Villa Ascasubi (I) and Pilar (C) stations dismantled

05/03

- Almafuerite (H) and Potrero de Garay (A) stations dismantled

05/04

- Bosque Alegre (B) and Villa Carlos Paz (J) stations dismantled

05/07

- Crate packing complete

## Notes

- Villa Del Rosario (F) data pre-11/13 (10/28-11/7) may be on box's CF card. SSD failed on 11/2, then hard down on 11/7.
- All network data prior to 11/7 do not have correct my\_position files; F does not have this before 11/13
- Network had six stations installed by 10/30; however, it didn't have six stations without a chronic GPS problem until 10/31
- The 11<sup>th</sup> station was not installed until 11/14; however, the network was intentionally down to 10 installed stations during 11/19-11/23
- Network before 11/29 had fewer than 10 stations with no drive failures, or chronic/episodic GPS problems
- Potrero de Garay (A) and Manfredi (E) are the consistently noisiest sites; Monte Cristo (K) is one of the consistently quietest sites
- Network did not have 11 stations contributing to solutions until 12/14
- Significant noise reductions occurred at Villa Del Rosario (F) and Almafuerde (H) after the other lightning instruments were disassembled
- Rio Primero (D) had a cut and re-spliced GPS cord from 12/19 until 01/02
- Potrero de Garay (A) stopped being reliable during 12/28 until 02/12; limited reporting during 01/14-16
- Monte Cristo (K) stopped being reliable during 12/30 until 02/13
- Bosque Alegre (L) stopped reporting during 01/05 until 02/12
- Rio Primero (D) stopped being reliable during 01/21 until 02/15
- Most of January 2019 featured only 7-8 stations reporting/active
- Ailing stations were brought back online during 2/11-2/16
- After being rejuvenated on 02/12, Bosque Alegre (B) did not record triggers due to a poor VHF connection until 02/26
- Potrero de Garay (A), Bosque Alegre (B), and Monte Cristo (K) commonly experienced overnight outages starting on 02/20, caused by poor battery charging (esp. when cloudy)
- Villa Carlos Paz (J) and Almafuerde (H) commonly experienced overnight outages starting around 3/31
- Pilar (C) experienced an overnight outage on 04/01
- Villa Del Rosario (F) and Villa Ascasubi (I) began experiencing overnight outages by ~04/19
- Manfredi (E) began experiencing overnight outages on 04/26
- Overnight outages at multiple stations (A, B, E, F, H, I, J, K) grew in frequency and duration during the month of April 2019
- Network effectively down (i.e., fewer than 6 stations active on a regular basis) as of ~04/19
- Network teardown started 04/29