

CHUVA and Other Field Campaigns: Status, Plans Update

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Presenter**

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Acknowledgments

Special thanks for material/inputs for this presentation:

Rachel Albrecht / CPTEC INPE (CHUVA)

Eric Defer / CNRS-LERMA (HyMex)

Paul Krehbiel, Bill Rison / NMT (HyMeX)

Steve Goodman, NOAA NESDIS (Lake Victoria)

Broader acknowledgment:

The many individuals and organizations (too many to name here without risk of missing people) leading or contributing to the multiple GOES-R science objectives being addressed in these field campaigns.



Field Campaign Participation

Target of Opportunity Approach

- Leverage field campaign observing assets with total lightning or other observations to allow GLM and Combined AWG/R3 teams to better address and assess several areas of on-going research.
 - Develop/Validate algorithms, applications, and proxy data.
 - Assess validation systems performance.
- Provide “buy-in” by providing total lightning observations.
 - CHUVA included U.S. supplied portable LMA network and European supplied LINET, as well as TRMM LIS and MSG SEVIRI (Spinning Enhanced Visible and Infrared Imager), to generate proxy data for GLM and ABI.
- Intercompare and assess data from multiple lightning networks.
 - Assessments needed to characterize and understand network data so it can be properly applied in proxy, validation and verification activities.
- Provide total lightning observations in support of campaign science objectives.
- GLM targeted field campaigns include **CHUVA** (Nov 2011- Mar 2012), DC3 (May-June 2012), **HyMeX** (Sep-Oct, 2012), **Lake Victoria** (2014 or 2015).



GLM CHUVA

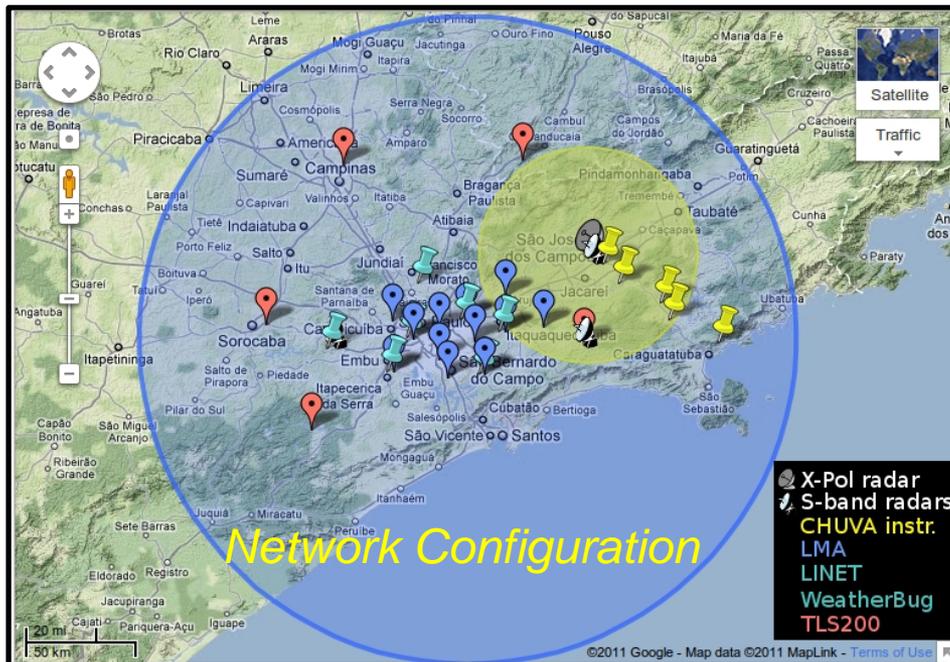
Vale do Paraíba IOP

- CHUVA is a Brazilian-led field component of the NASA-JAXA Global Precipitation Measurement (GPM) mission that will investigate distinct precipitation regimes in Brazil using a series of regional Intensive Observation Period (IOP) field campaigns.
- The name (which means rain in Portuguese) is derived from the experiment title: **C**loud processes of t**H**e main precipitation systems in Brazil: A contrib**U**tion to cloud resol**V**ing modeling and the the GPM (Glob**A**I Precipitation Measurement).
- Experiment intensive observation period (IOP) was conducted from November 2011 - March 2012.
 - Goals included improve rainfall estimation using satellites and/or radar, improve skill of cloud resolving models, contribute to Brazil precipitation climatology, and develop tools for nowcasting.
 - Strong storm electrification processes component to which we both leveraged and contributed.

GLM CHUVA

Vale do Paraíba – A High Priority Campaign

- This location in Brazil is observed by GOES (Vis/IR), MSG (SEVIRI), and TRMM (LIS).
 - Offers great environment for GOES-R and MTG activities including Risk Reduction (nowcasting algorithms), Algorithm Working Group (proxy data), and Calibration/Validation.
- As this opportunity was pursued, a community-based interest developed for comprehensive Lightning Location System inter-comparisons and assessments.



Participating Lightning Location Systems

Lightning Mapping Array (NASA/UAH)	[2011-10-24 to end]
LINET (EUMETSAT/DLR)	[2011-12-10 to end]
TLS200 (Vaisala)	[2012-01-04 to end]
ENTLN (Earth Networks)	[2011-11-01 to end]
RINDAT (INPE)	[2011-11-01 to end]
STARNET (USP)	[2011-11-01 to end]
WWLLN (University of Washington)	[2011-11-01 to end]
GLD360 (Vaisala)	[2011-11-01 to end]
ATDnet (MetOffice)	[2011-11-01 to end]
TRMM LIS (NASA)	

GLM CHUVA

LIS Correlations

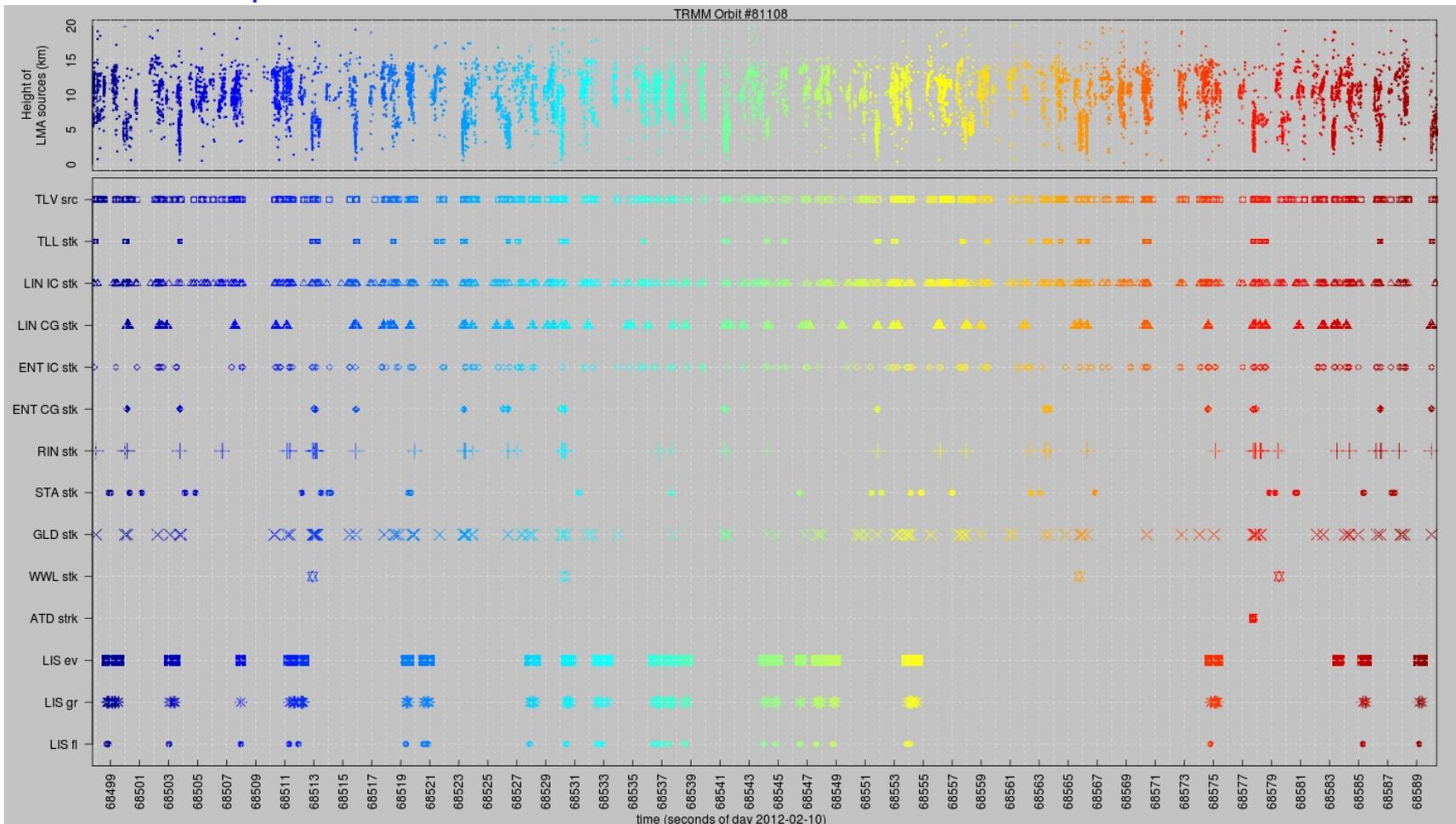
- 16 LIS overpasses with lightning flashes during CHUVA IOP:

Orbit #	Date	Time (UTC)	Time (LST)
80095	12/7/2011	20:13	17:07
80202	12/14/2011	17:00	13:54
80207	12/14/2011	23:33	20:27
80482	1/1/2012	15:02	11:56
80767	1/19/2012	23:02	19:56
80843	1/24/2012	20:02	16:56
81062*	2/7/2012	20:08	17:02
81077	2/8/2012	19:12	16:06
81108*	2/10/2012	19:00	15:54
81123	2/11/2012	18:04	14:58
81169	2/14/2012	16:55	13:49
81230~	2/18/2012	14:50	11:44
81362	2/27/2012	3:12	0:06
81576	3/11/2012	20:46	17:40
81591*	3/12/2012	19:50	16:44
81825*	3/27/2012	19:01	15:55
* - Good cases			
~ - False LIS flash			

GLM CHUVA

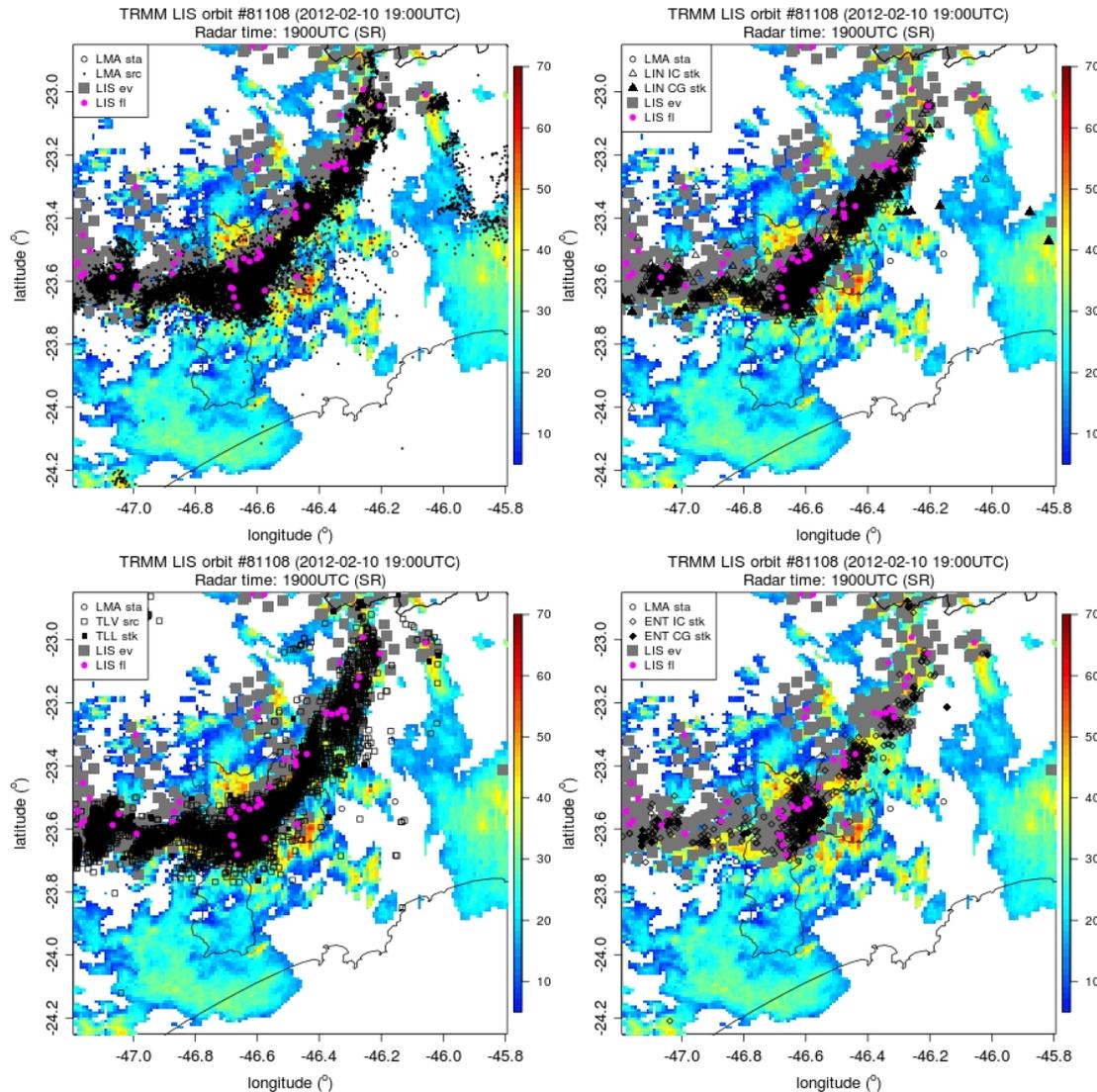
Data Archive and Quick-Look Tool

- Quick-look tool developed by Rachel Albrecht showing lightning location system data for 10 February 2012 LIS overpass.
 - Upper panel: LMA sources by time and height
 - Lower panel: Other networks and LIS detections



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Example from 10 February 2012

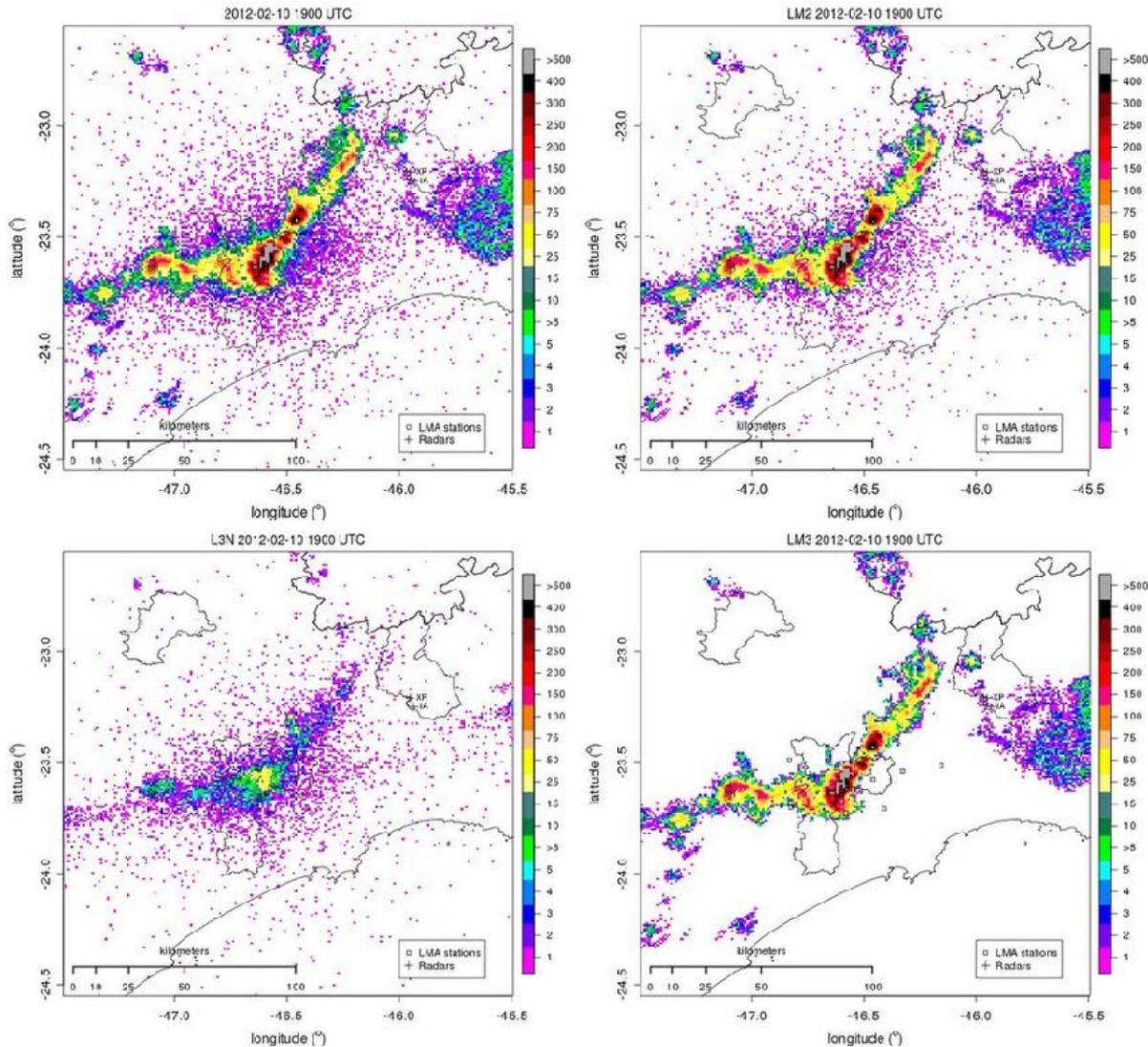


- Same 10 February 2012 case with data overlaid on radar.
 - Upper left: Radar + LIS + LMA
 - Upper right: Radar + LIS + LINET
 - Lower left: Radar + LIS + TLS200 VHF
 - Lower right: Radar + LIS + EarthNetworks

Example courtesy Rachel Albrecht

GLM CHUVA

Analysis Challenges – Example LMA Noise



- LMA noise source (due to a São Paulo TV station)
- First attempts to filter noise:
 - Group sources into flashes (McCaul's flash algorithm) and use only flashes with more than 10 sources.
 - If flash mean+1s lat/lon falls within 300 m of the TV tower, do not use it.
 - It works for non-thunderstorm days, but apparently it also filters real sources
 - Next steps (before starting network intercomparisons):
 - a) Recover real sources from 1-min accumulations of “noise” and real sources;
 - b) Play with LMA-flash algorithm variables.

upper left: all sources
upper right: flashes with 10+ sources
lower left: “noise” sources
lower right: filtered sources

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Level 1b Data Status

- **Expected release: by 5 October 2012**
- Ready to be released, just awaiting for ftp users to be assigned by INPE's IT office.
- According to CHUVA's MOU agreement:
 5. Each investigator's data is proprietary until the data appear in publication or, if the data are included in the archive, until this archive is published/released to the scientific community. Organizations that collect CHUVA lightning data are responsible for the reduction, analysis, interpretation and publication of their data and research results.
 6. An investigator whose unpublished data are posted to the CHUVA Data Archive **has the right to be included among the authors** of any resulting publication. **The investigator may decline co-authorship but not the use of this data.** The investigator must provide information concerning the quality of the data and may require that suitable caveats regarding the data be included in the publication. It is the responsibility of the sponsoring investigator to solicit the participation of the investigator whose data are to be used as early as possible during the formative stages of the investigation.
- Video Camera data will not be archive in CHUVA database due to their excessive disk space requirement. Any investigator interested in this dataset should contact directly the investigator responsible for the camera.
- The viability of a WMO report and/or a technical journal paper on the network intercomparisons is being studied.
- CHUVA data available to the research community. Collaborations welcomed.
- **CHUVA International Science Workshop: 8-10 May 2013 in São Paulo**

GLM CHUVA

Data Access

- Go to **CHUVA WEB** – <http://chuvaproject.cptec.inpe.br/>
- **First step** – Sign up (create user account).
- **Second step** – Sign in
- **Third step** – You must accept the Terms of use
- **Forth step** – There are three options:
 - **FTP access** – for a FTP client
 - **Winscp Software** – if you do not have a client FTP, you can make a download of it
 - **Data access** – Direct access by browser

HyMeX

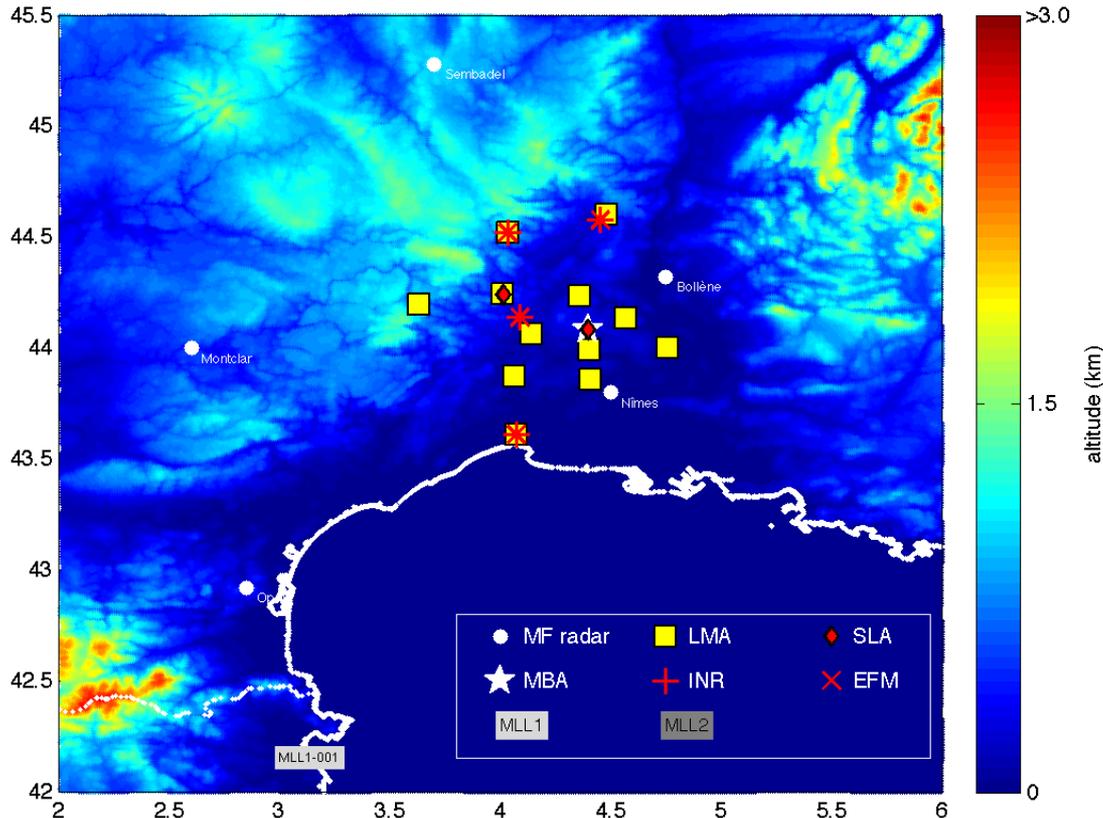
Hydrological cycle in Mediterranean eXperiment

- A 10-year project with a goal to develop better understanding and quantification of the hydrological cycle with an emphasis on high-impact weather events.
- We are only involved with SOP1 (now underway Sep-Oct 2012, in Southeast of France).
- Like CHUVA, there is a strong electrification component led by Eric Defer.
 - Primary objective: multi-scale and multi-year lightning detection for observational- and modeling-based studies of the electrical activity in maritime and continental Mediterranean storms.
 - Second objective: characterization of the electrical nature of storms and lightning flashes.
- NASA providing support through loan (NMT) of 12 LMA stations and also with distrometers/rain gauges in support of GPM.
- NOAA providing support through visiting scientist funding (for Bill Rison / NMT).

HyMeX

GLM Objectives and Instrumentation

- HyMeX affords an additional opportunity to conduct Lightning Location System inter-comparisons and assessments.
- Allows GLM and Combined AWG/R3 teams to further develop/validate algorithms, applications, and proxy data using comprehensive HyMeX data sets.



- Operational LLSs include ATDnet, EUCLID, LINET, ZEUS.
- Other atmospheric electricity sensors deployed.
 - 12 LMA stations (NMT,NASA)
 - 2 slow antennas (NMT)
 - 4 induction rings (S. Coquillat)
 - 4 field mills (S. Soula)
 - 1 acoustics array (T. Farge)
 - 2 mobil lightning labs (each has fast camera, electric field sensors)

HyMeX

SOP Operations

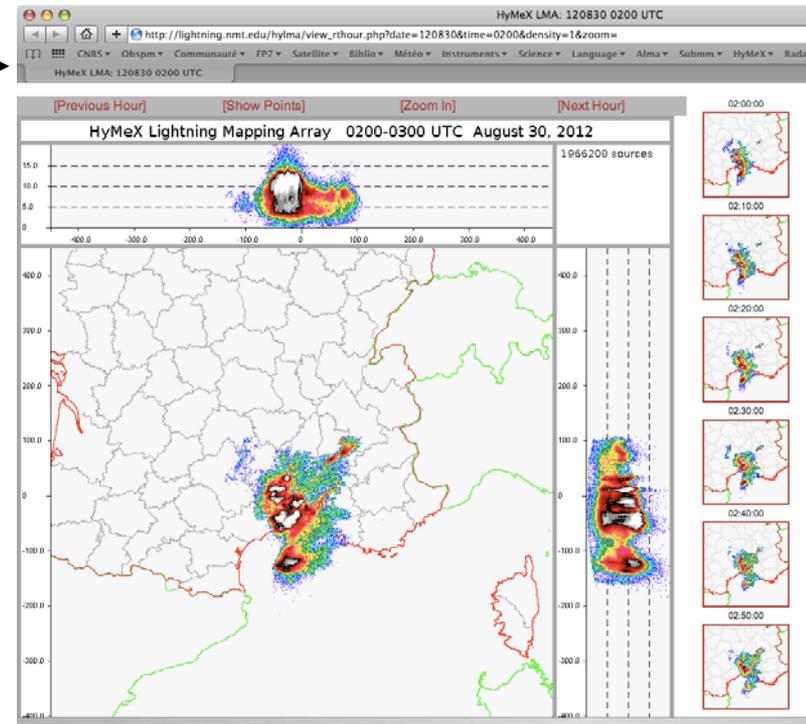
- Stand-alone LMA in real time through wireless connection (http://lightning.nmt.edu/hymex_lma/status.html) (<http://lightning.nmt.edu/hylma/current/>)
- MLL on “storm chasing mode” with guidance from HOC
- Other instruments recording continuously with post-event evaluation

HyMeX Operation Center (HOC) SOP web site
(multiple sources of info (models, radar, satellite ...))

LMA real time

The screenshot shows the HyMeX Operating Center (HOC) SOP web site. The page is titled "HyMeX Operating Center" and "Current Day: 18-Sep-2012". It features a navigation menu on the left with categories like Reports, Models, Observations, and Facility status. The main content area displays a grid of links for various data sources and reports for the day of 18-Sep-2012.

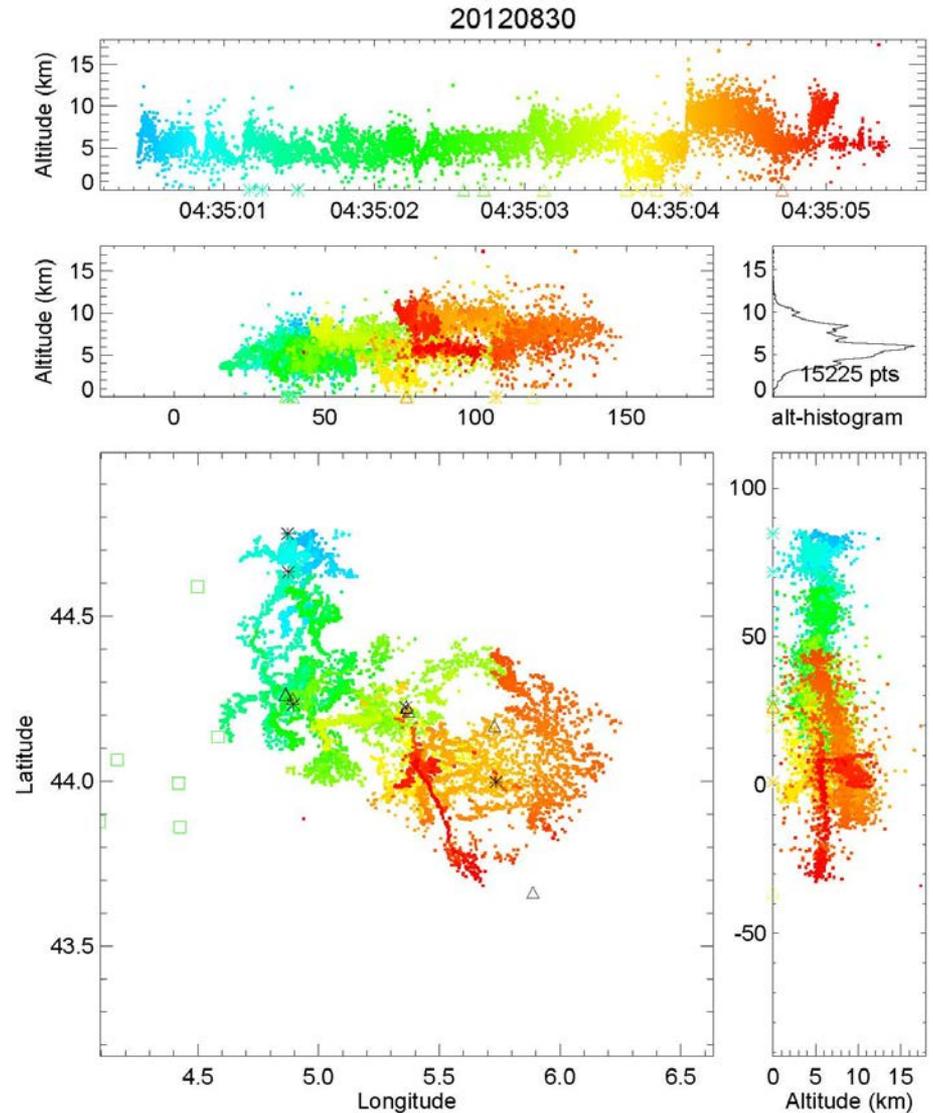
Category	Item	Item	Item	Item
Reports	Daily reports	Daily Meeting Report	Facility status	MF regional forecast
	Marine reports	IOP Overview Summary	Data Targeting System	
	Other reports	Bulletins Large Mkt. Occ.	Weather bulletin METAREA3	Bulletins Cote
	Forecast Charts	Forecaster's corner	Post-events surveys	
Models	Atmospheric models	Model Schedule	Convection-permitting models	Convection-parameterized models
	Hydrological models	ISBA-TOPMODEL	CHYM Alarm map	MARINE
	Ocean models	Mercator		
	Observations			
Observations	MCS tracking			
	Satellite products	Visible	Dust composite	Flux Cms
	GPS	Brightness Temp.	Clouds Composite	SST
	Radars	European composites	Operational radars composite	Single operational radars
Lightning	Discharges	French catchments	Spanish catchments	X-Band San Gualtero
	Lightning Mapping Array	European Cooperation for Lightning Detection	Lightning Location Network (LINET)	ZEUS
	Surface stations	Hu2m	V10m	RainGauges HP/Iconet
	Radio soundings	Operational RB	SOP RB(Corte, San Gualtero)	SOP RB(CNRM)
Ship	GLiders	Nice-Caivi Tiritin / MooseT00-19	XXX-YYY - Eudoxus / PerseusT02-00	XXX-YYY - Noa / nomr12groom
	Argo floats	ARGO floats	XXX-YYY - Menorca - Sg508 / MooseT02-09	XXX-YYY - Hannan / MistralT01-00
	Surface buoys	Atmosphere	Ocean	
	Hydrometeorological sites			



HyMeX

LMA Large Flash Example

- Incredibly long (6 s) and widespread flash toward the end of storm on 30 August 2012 storm
- Plot also shows Euclid CG data (x's and Δ 's)



Lake Victoria SWFDP

Severe Weather Forecast Demonstration Project

A proposed WMO severe weather forecast demonstration project for developing countries (2014-2015).

- Objective: Capacity Building Project for a Nowcasting Service for East African countries surrounding Lake Victoria (Kenya, Uganda, Tanzania)
- Nowcasting Service using NWP, Satellites (MSG), Lightning
- WMO estimates 5000 deaths/yr on the lake due to thunderstorms
- Field project in 2014-2015 to understand storm formation and intensity
- Total lightning network encircling the lake
- GOES-R Benefits- SEVERI and total lightning proxy data for algorithm development and validation

