



HYdrological cycle in the Mediterranean EXperiment: Overview of the Special Observation Period of autumn 2012

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Véronique Ducrocq (Météo France - CNRM) and Philippe Drobinski (IPSL-CNRS)

with contributions of (...among 300 other people):

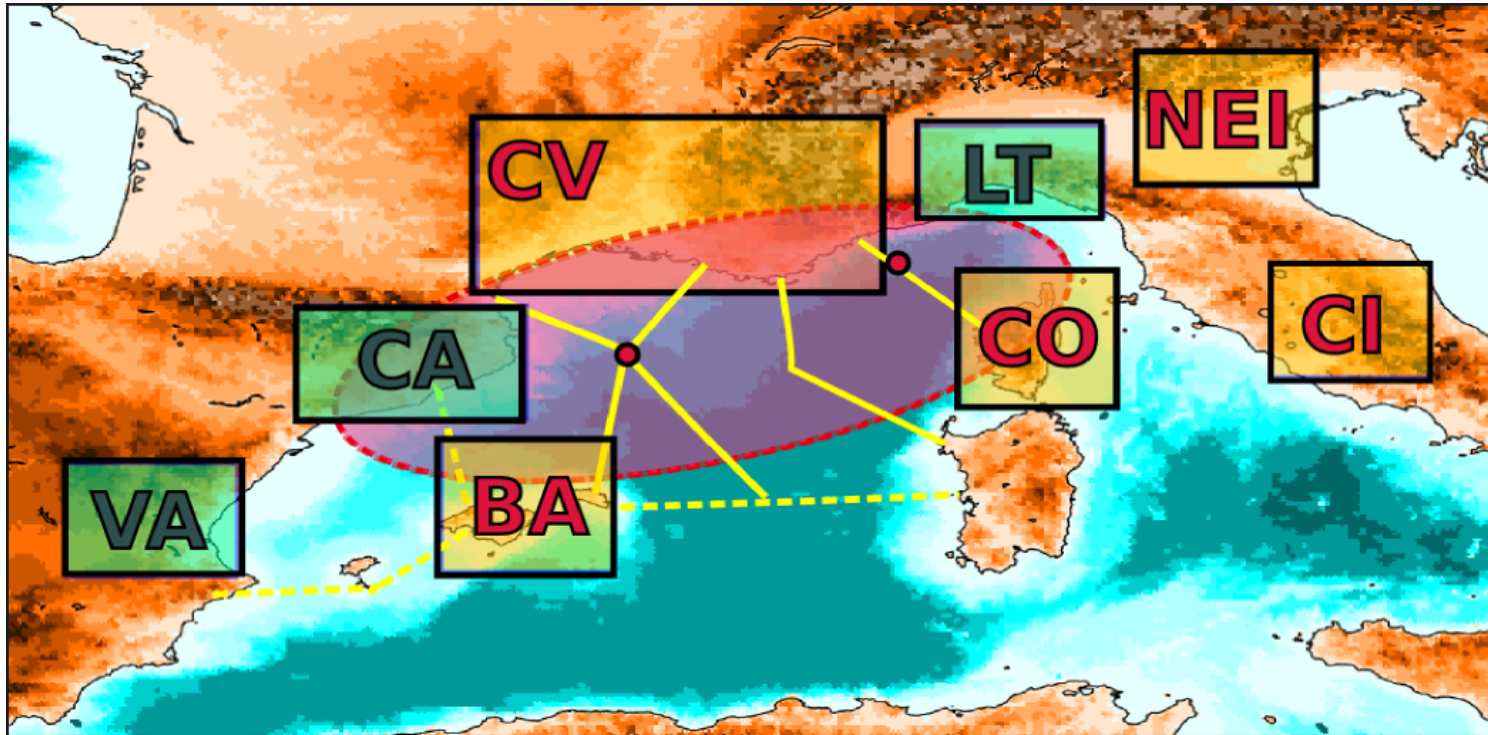
E. Adirosi, E. Anagnostou, M.N. Anagnostou, S. Anquetin, L. Baldini, S. Barbieri, A. Berne, M. Borga, B. Boudevillain, O. Bousquet, M. Calianno, M. Colantonio, L.P. D'Adderio, S. Di Fabio, P. Domaszczynski, R. Ferretti, P. Gatlin, E. Gorgucci, J.J. Gourley, J. Grazioli, M. Hagen, C. Hervier, D.P. Jorgensen, J. Kalogiros, P.E. Kirstetter, F. S. Marzano, M. Montopoli, G. Molinie, G. Panegrossi, W. Petersen, E. Picciotti, F. Porcù, Y. Pointin, T.H. Raupach, C. Reymond, N. Roberto, S. Sebastianelli, G. Simon, J. Van Baelen, G. Vulpiani, M. Wingo...

- HyMeX is a 10-y project devoted to the water cycle in Mediterranean, with emphases on the predictability and evolution of high impact weather events (HPEs, floods and flash-floods, strong winds...)
- Within the long-term observation period (started in 2010), several special observation periods (SOP) are planned for improving the process understanding, modelling and forecasting capability of high-impact weather events.
- The first SOP series in Northwestern Mediterranean:
 - Heavy precipitation event (HPE) and flash-flooding
(5 Sept.-6 Nov. 2012)
 - Strong wind events and their impact on the ocean mixed layer, dense water formation and ocean convection
(1 Feb.-15 March 2013)



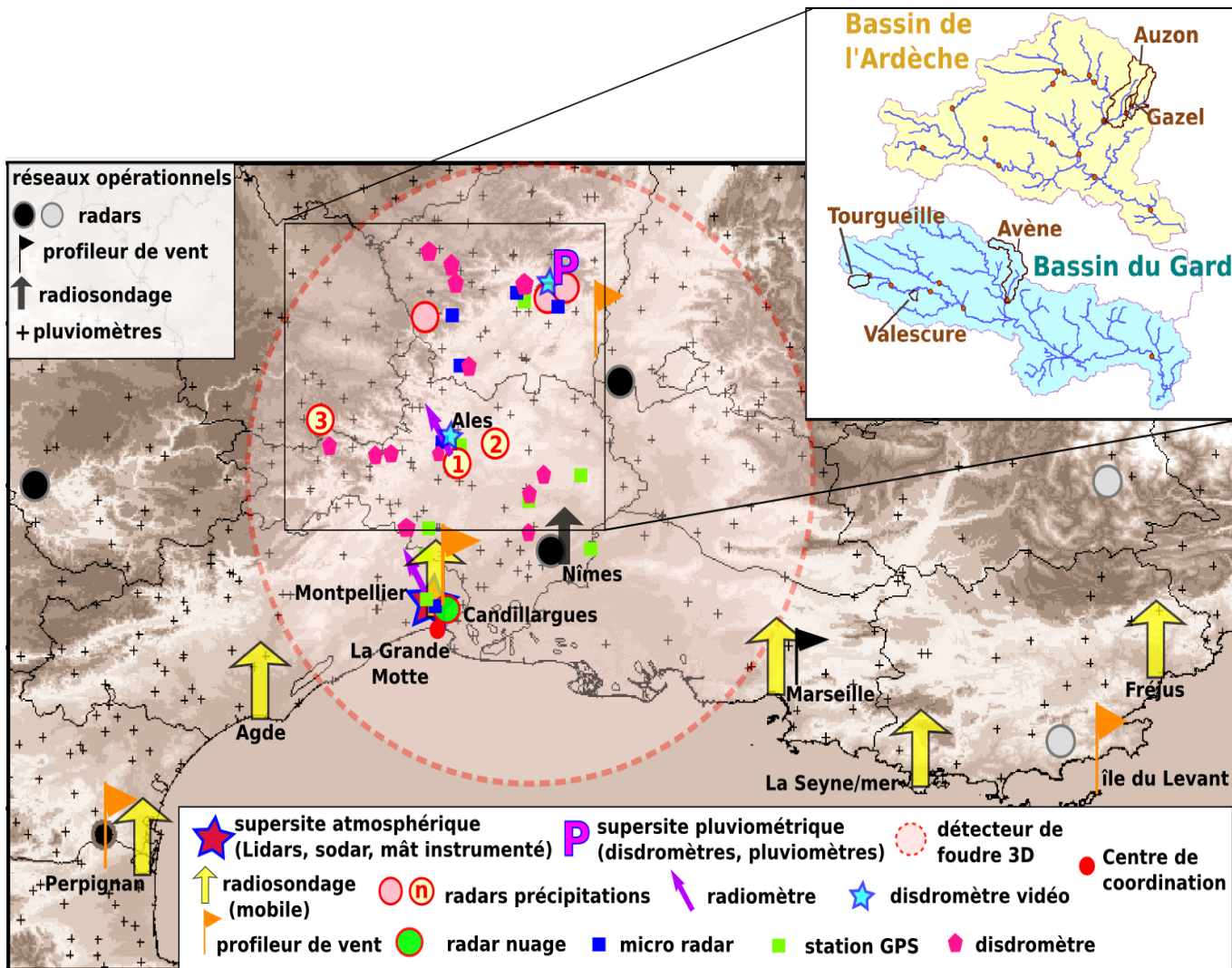
Outline:

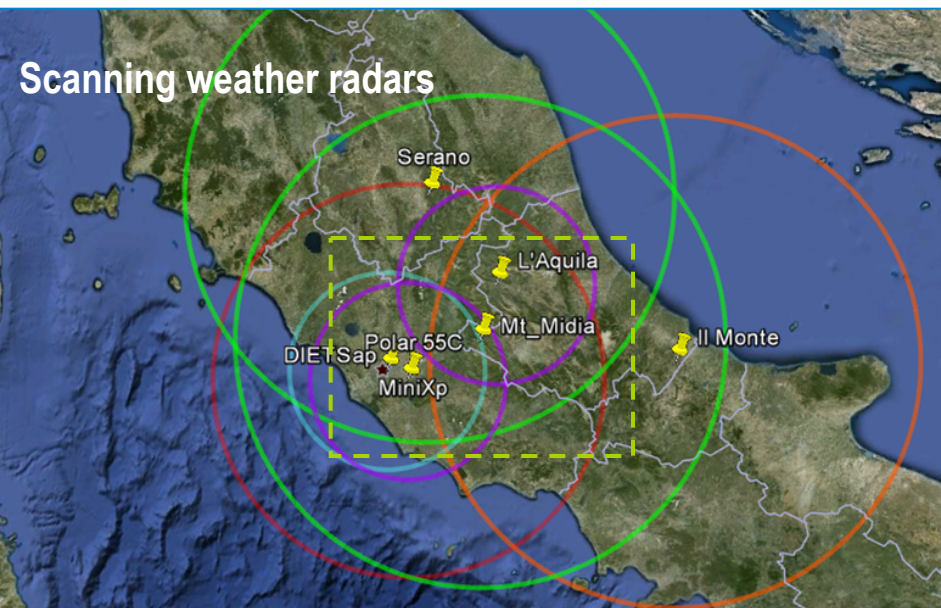
- Observation strategy
- SOP overview
- Illustrations



Monitoring the 3 components of the hydrological cycle:

- Dynamics and microphysics of the precipitating systems, distributed hydrological response
- Atmospheric upstream flow feeding the heavy precipitation events
- Mediterranean Sea (air-sea fluxes, mixing layer) prior and during HPEs





- C-band single-pol, Mt. Midia, (CETEMPS, Reg Abruzzo)
- C-band dual-pol, Il Monte, (DPC)
- C-band single-pol, Monte Serano, (DPC)
- X-band single-pol, Rome (DIET-Sapienza)
- X-band dual-pol WRX25 , at L'Aquila (HIMET, CETEMPS)
- X-band dual-pol WRX25, at CNR-ISAC, Rome (HIMET)
- C-band dual-pol radar Polar 55C, Rome (ISAC-CNR)

From December 2012 NOAA X-POL is running at CNR-ISAC Rome.

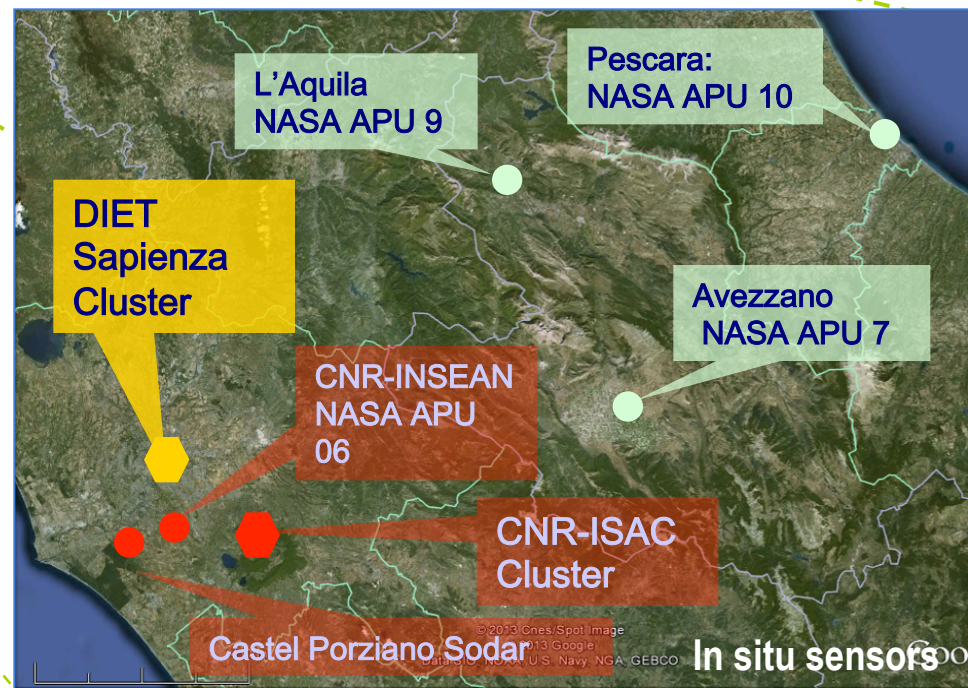
DIET Sapienza cluster (Rome historic center)

2-Dimensional Video Disdrometer, 2dvd (NASA);
 Vertically-pointing FM-CW 24 GHz MRR (NASA);
 Tipping Bucket Rain Gauges (NASA).
 Parsivel (DIET-Sapienza)
 Doppler X-band disdrometer PLUDIX (Un. Ferrara)

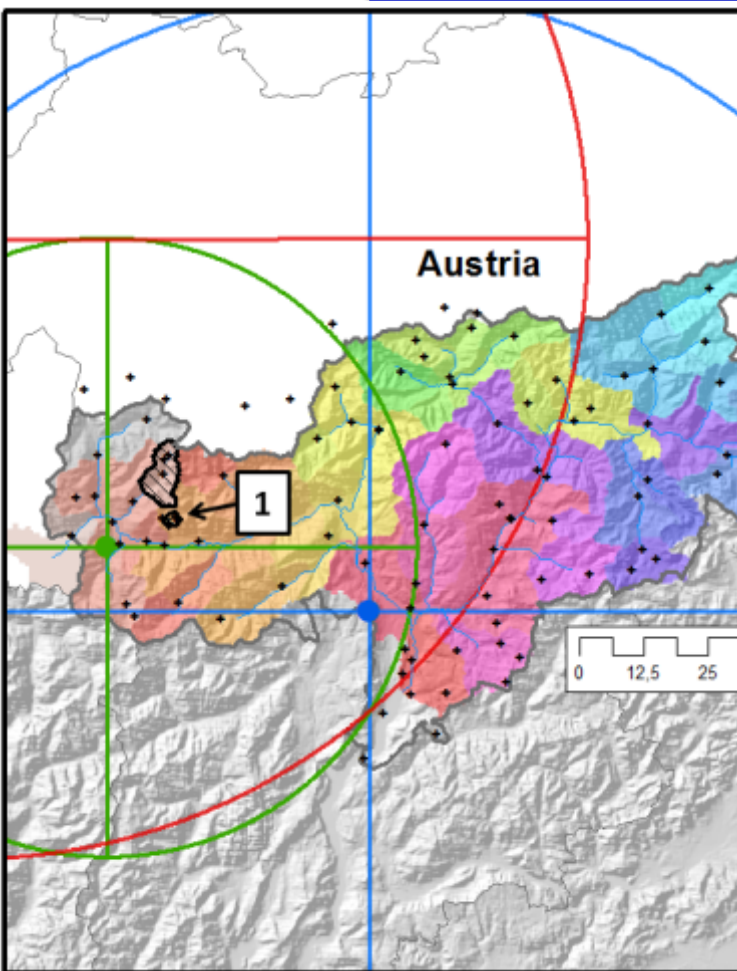


CNR ISAC Observatory cluster (Rome countryside)

Parsivel (CNR-ISAC)
 Parsivel2 (CNR-ISAC)
 Thies Clima disdrometer,
 NASA APUs (variable number)
 Doppler X-band disdrometer PLUDIX (Un. Ferrara)

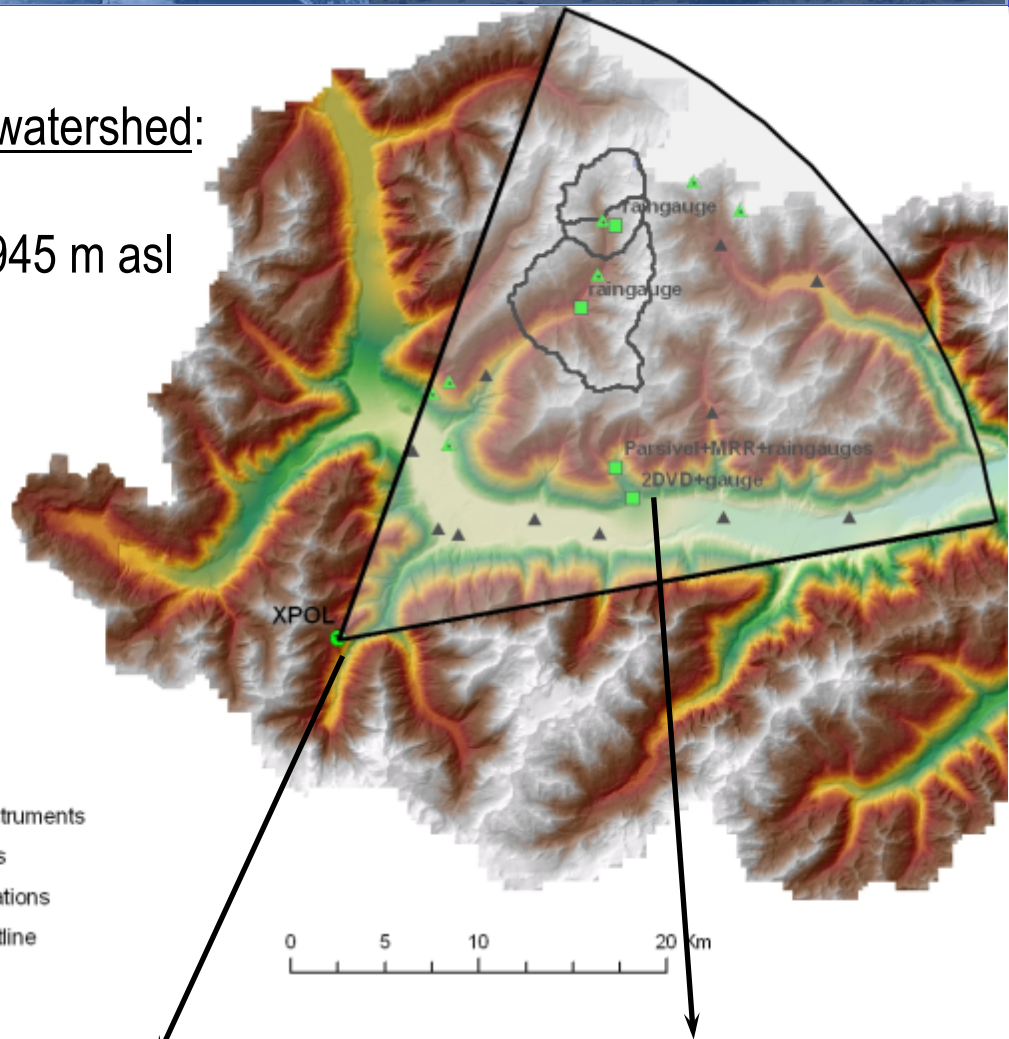


In situ sensors



Gadria watershed:
7.8 km²
1394-2945 m asl

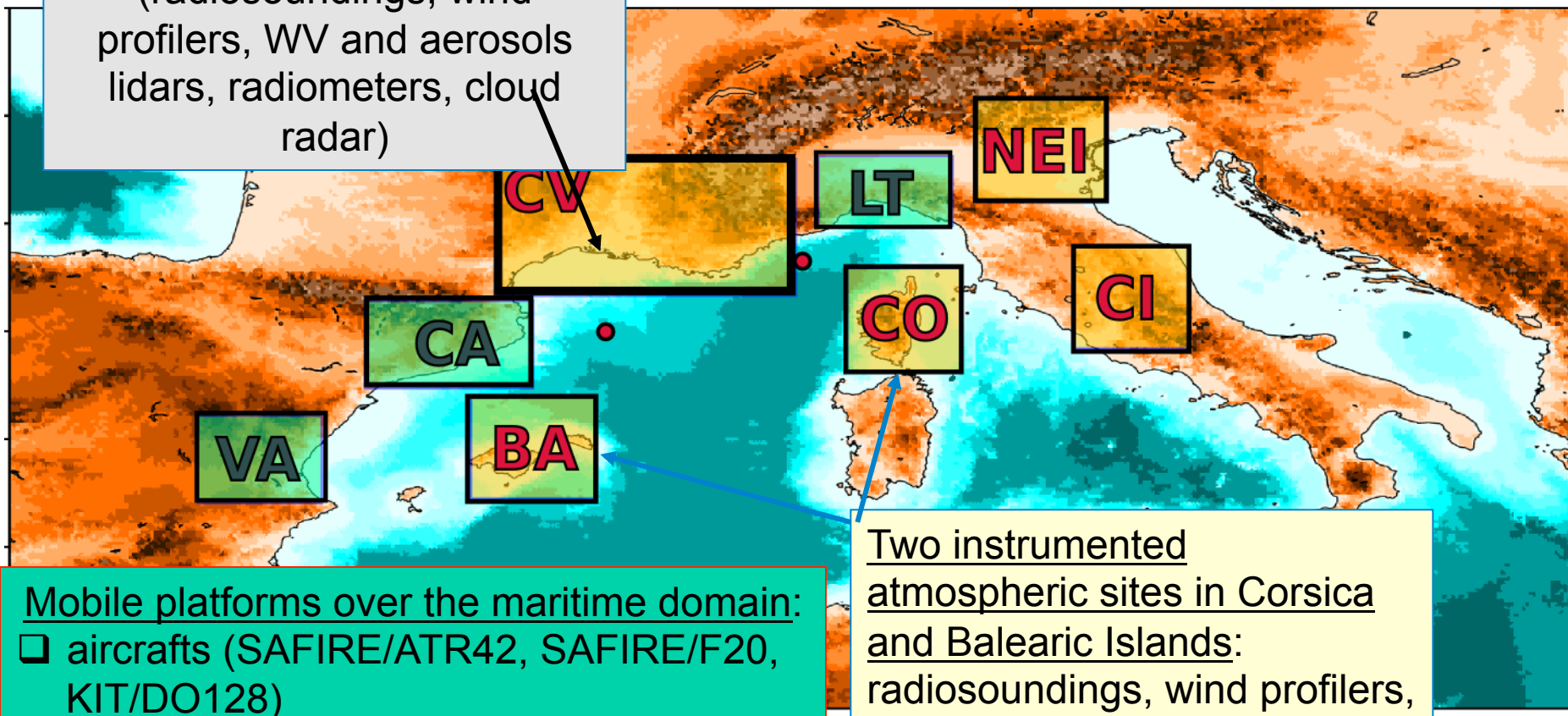
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- XPOL_instruments
 - ▲ AAstations
 - ▲ Meteo_stations
 - Mazia_outline



**NOA Mobile Polarimetric
X-band radar**

**NOA 2D-Video Disdrometer
NOA Parsivel Disdrometer
Tipping Buckets
NASA MRR**

Coastal observations
(radiosoundings, wind
profilers, WV and aerosols
lidars, radiometers, cloud
radar)



Two instrumented
atmospheric sites in Corsica
and Balearic Islands:
radiosoundings, wind profilers,
WV, aerosols and wind lidars

Mobile platforms over the maritime domain:

- aircrafts (SAFIRE/ATR42, SAFIRE/F20, KIT/DO128)
- Boundary-layer balloons
- Research vessel and ships of opportunity
- Gliders, fixed and drifting buoys



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The HyMeX Operation Center was located in La Grande Motte near Montpellier, close to the French research aircraft base and the Candillargues supersite.

- ❑ Morning daily briefing 7/7, in visioconference with L'Aquila, Palma, San Giuliano, Mahon and Toulouse
- ❑ Weather forecast performed by a Météo-France forecaster at HOC + complementary information supplied by AEMET and l'Aquila secondary centers for Spain and Italy.
- ❑ Several dedicated NWP systems for the SOP (AROME_WMED, WRF)

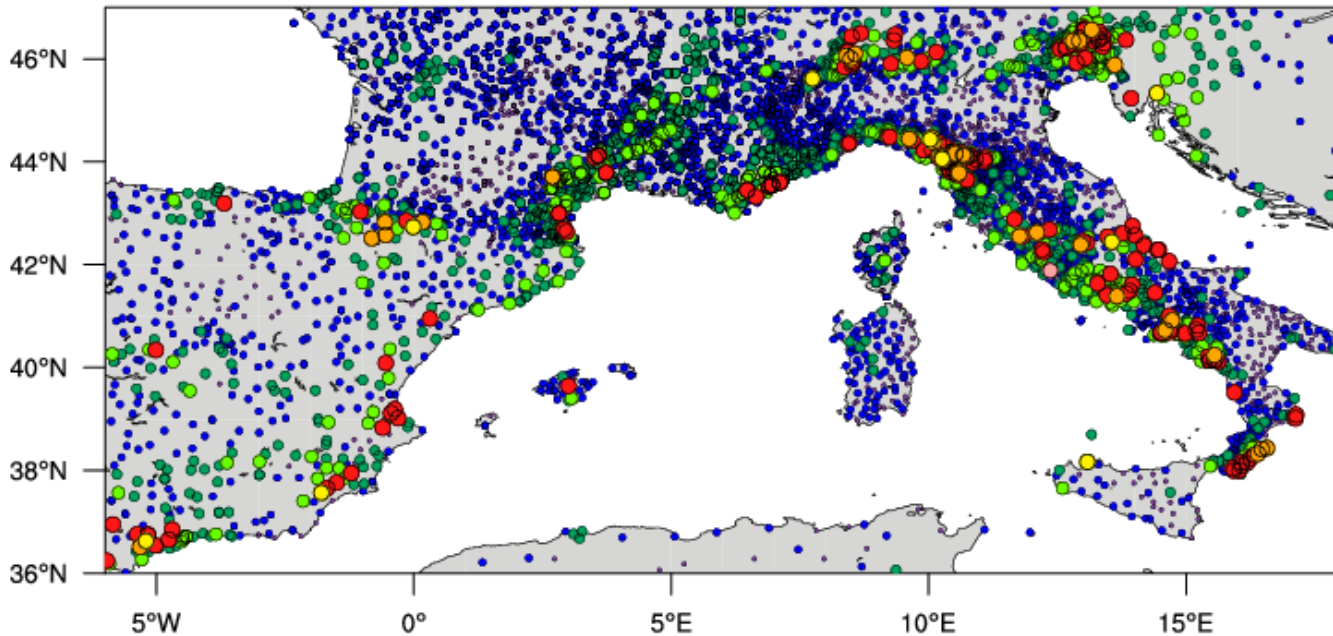


34 days with on-alert observations during the two months:

- 13 IOPs dedicated to heavy precipitation events (HPE),
 - 5 IOPs with orographic precipitation (ORP),
 - 2 IOPs with strong winds (SWE)
 - 5 IOPs for instrument validation (LV),
-
- For France: 11 events over CV, 6 over CO
 - For Italy: 6 events over LT, 5 over CI, 5 over NEI
 - For Spain: 4 events over BA, 3 over CA and 2 over VA (11 casualties on 28/9)



24H RAINFALL TOTALS (mm) - Maximum at each station over 5 Sep.-6 Nov. 2012



Ducrocq et al (2013)

- 20 days with at least one station recording more than 100 mm
- A lot of rain in Italy
- Less than normal rain in the CV; no hydrological response
the EOP continues during the next 3 autumns (FloodScale project)

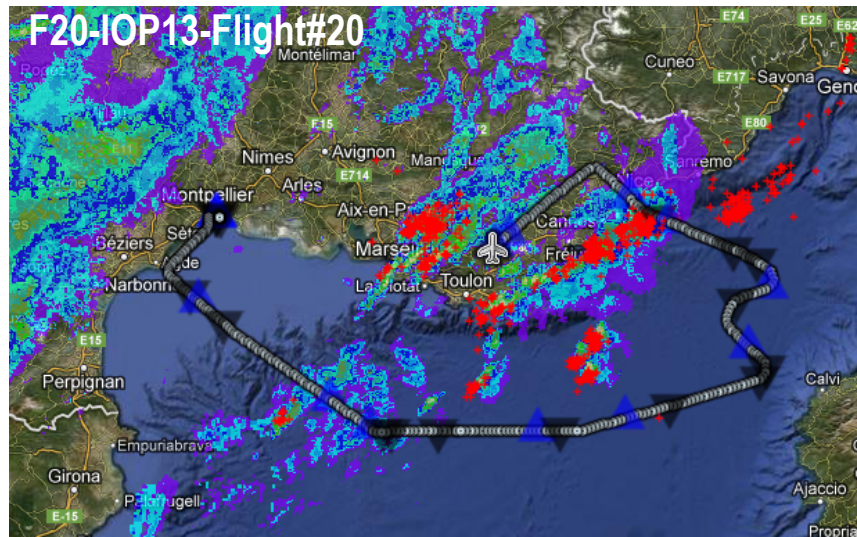
251 Flight hours:

- ✓ 87 hrs SAFIRE/ATR42 for monitoring the upstream flow WV Leandre II Lidar, aerosols, turbulent air-sea fluxes
- ✓ 69 hrs SAFIRE/F20 within the precipitating systems Rasta cloud radar, cold microphysics probes, 45 dropsondes launched over the sea
- ✓ 95 hrs KIT/DO128 over and offshore Corsica orographic, diurnal convection, air-sea fluxes

F20-IOP16a-Flight#26



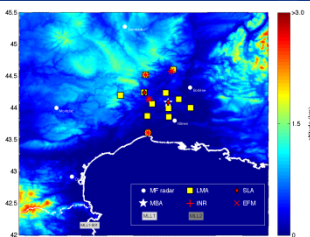
A lot of flights during night, with rain and lightning....



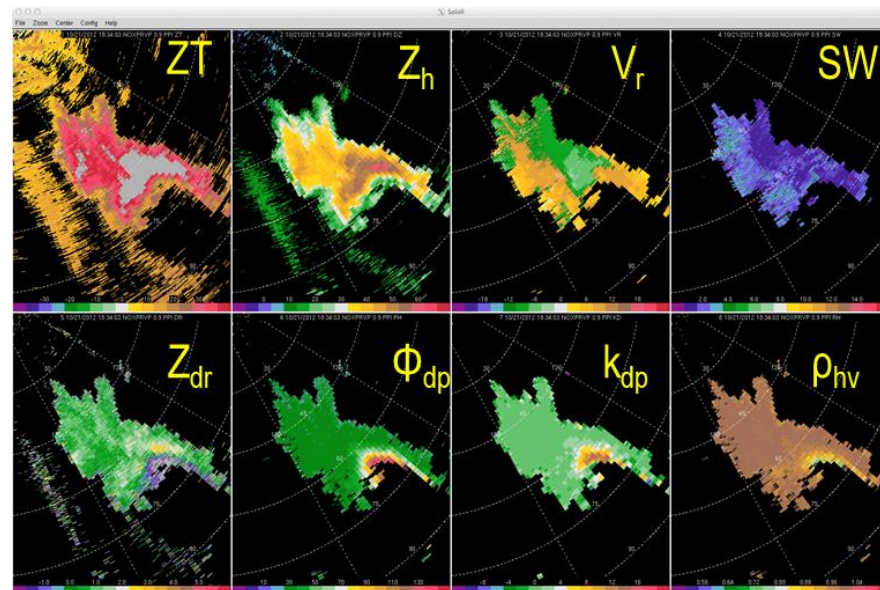
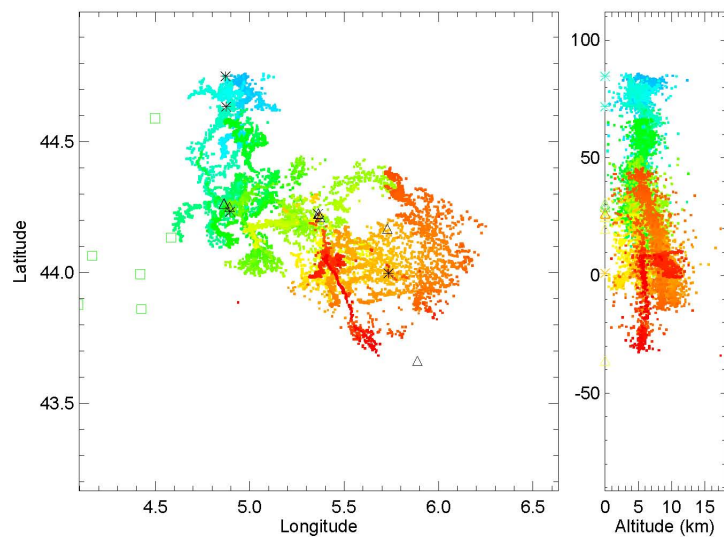
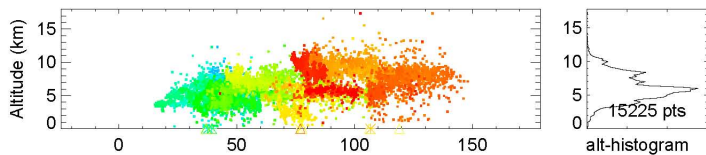
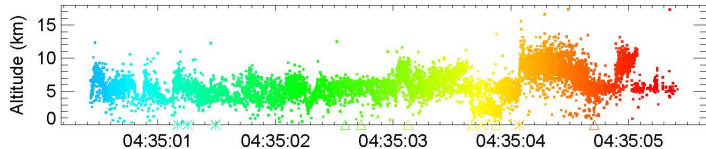


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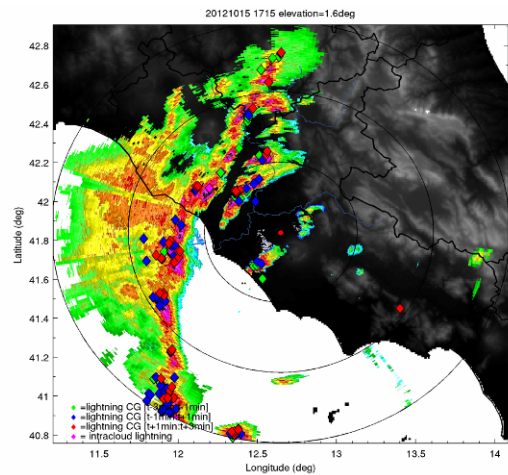


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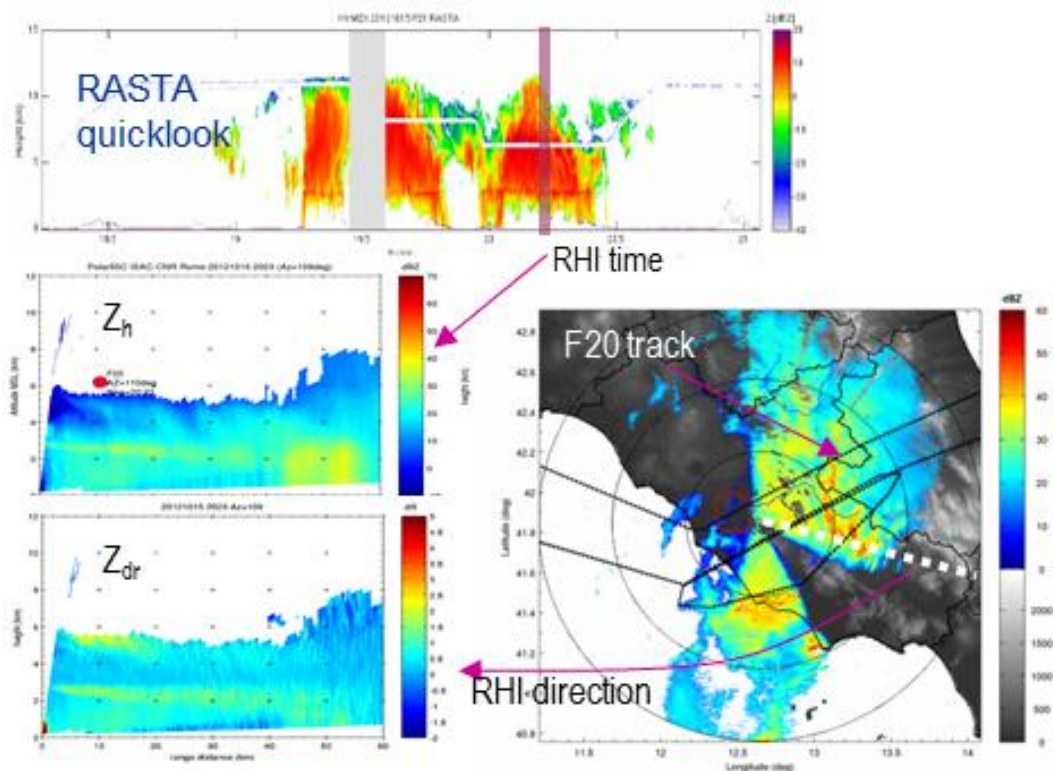
PIs: O. Bousquet , J. Gourley, D. Jorgensen, P. Kirstetter

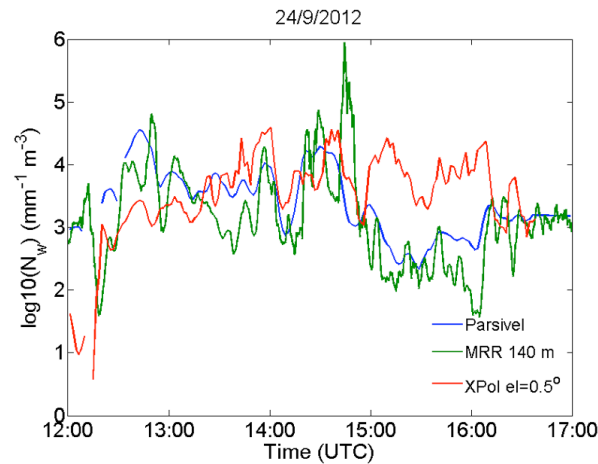
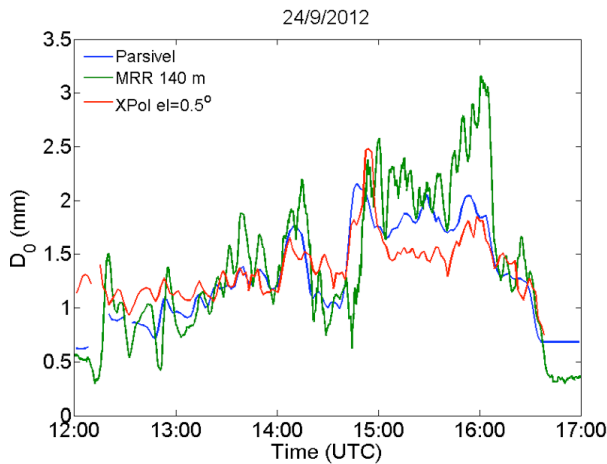
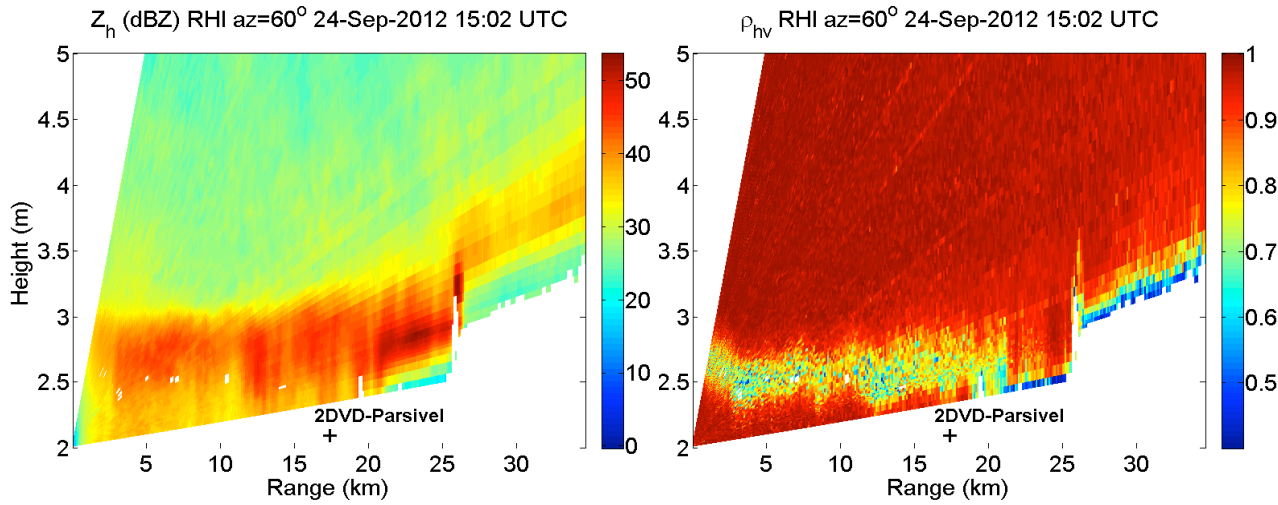
PIs: S. Coquillat, E. Defer, P. Krehbiel, B. Rison



LINET
lightning location
network
and
C-band dual-pol
radar

C-band dual-pol and 94 GHz RASTA radar





DSD parameters (D_0 and N_w)
estimated from:

- Parsivel
- MRR (140 m above ground)
- XPol (0.5° elevation)

- ❑ A successful SOP with synergetic implication of several scientific communities from several countries (~200 instruments deployed, ~300 scientists involved)
- ❑ US contribution (NASA, NOAA...) is particularly acknowledged
- ❑ Next meetings to coordinate and foster the data analyses:
 - SOPs debriefing: 15-17 April 2013, Toulouse, France
 - 7th Int. HyMeX Workshop: 7-10 October 2013, Cassis, France
- ❑ HyMeX: a long-term GV site for GPM for HPEs in rugged topography
GPM: a critical input for some of the HyMeX scientific objectives
 - Long-term water budget of the Mediterranean Sea
 - Evolution of water resources around the Mediterranean Sea

Talks:

Anagnostou and Gourley: Use of GV data to evaluate and improve uses of satellite-rainfall in hydrologic modelling of complex terrain basins.

Berne et al.: Small-scale variability of Mediterranean rainfall: data and preliminary analyses from HyMeX SOP1 in Ardèche.

Posters:

108 - Anquetin et al.: Orographic precipitation in Mediterranean area: structured observation strategy implemented during HyMeX enhanced observation period

112 – Berne et al.: Mediterranean orographic rainfall – observation during HyMeX SOP1

247 – Baldini et al.: Multisensor precipitation observations during HyMeX SOP 2012 in Italy

