Extreme rainfall variability over the Cévennes-Vivarais region

(1) (2) (3)

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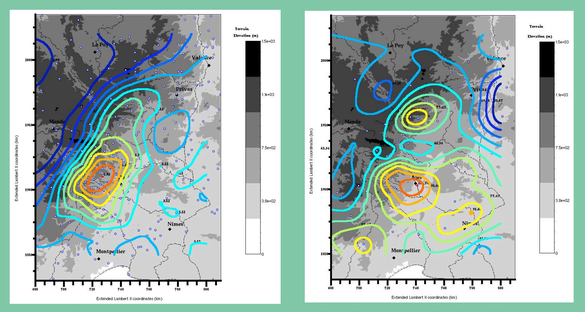
Rainfall regime - State of Art

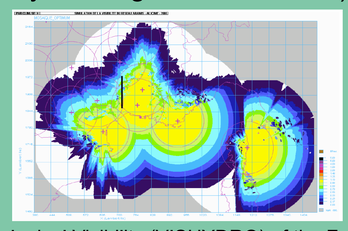
100 year return period rainfalls differ in relation with relief organisation depending on the accumulation time (i.e. hourly, daily).

Daily accumulations (left) look more influenced by the relief than **hourly accumulations** (right).



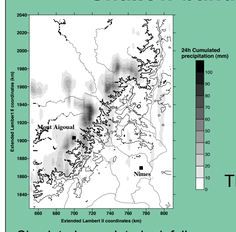
100 year return period rainfalls for 2 accumulation time :
(left) daily; **(right)** hourly.

Observation is tricky in mountainous areas (beam blocking, ground clutter, low density of the ground networks).



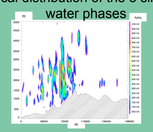
Hydrological Visibility (VISHYDRO) of the French radar network in the Mediterranean region.

Shallow banded convection



Simulated cumulated rainfall

Vertical distribution of the 3 simulated water phases



The atmosphere forcing is based on a generic sounding characterised of the shallow convection weather type.

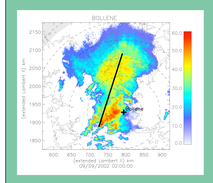
Main properties :
- **Both low** rain intensity (~10mm.h^{-1}) and intermittency
- depends on the income flux and the **relief structure** (triggering)

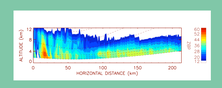
The convection properties explain the space and time rain variability.

Convection processes ?

Rainfall/weather regimes ?

Deep Convection





The September 2002 event as observed by the radar at Bollène

Main properties :
- **Both strong** rain intensity (~100 mm.h^{-1}) and intermittency
- depends on the large scale forcing (SST, PV, etc ...) and the **presence of the relief** (enhancement, location)

Identification of the convection processes (Microphysics, surface feedbacks)

There is a need to a special attention of the lower layers of the atmosphere.
The upper atmosphere observation need to be complemented with ground networks (DSD, lightning, flux stations).

Enhance observation networks to:
- **Improve the quantitative precipitation estimation**
- **Build long time series**

Identification of the weather type that explains the scales of variability

Need to built a link between the weather typing and the understanding of the convection processes.
Explain the contribution of the extreme events within the rainfall regime and its evolution in a context of climate change.

OBSERVATION STRATEGY OVER THE CV REGION

HyMeX — HYdrological cycle in Mediterranean EXperiment

Long Observation Period (2010 - 2020)

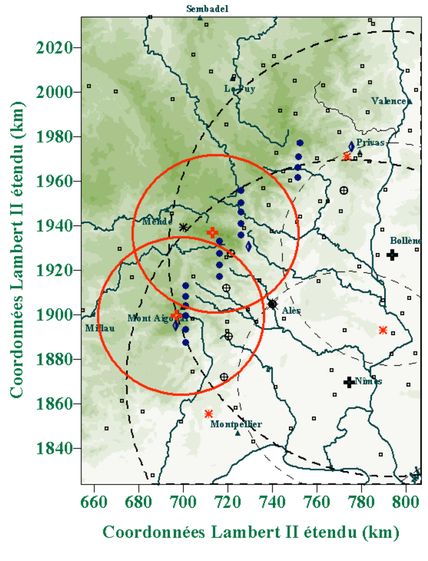
Enhance the ground observation networks (DSD - lightning)
Take advantage of the new S Band radar protocol (Polarimetric - Doppler) for the QPE estimation
Provide pluviometric reanalysis.

Enhanced Observation Period (2011 - 2013)

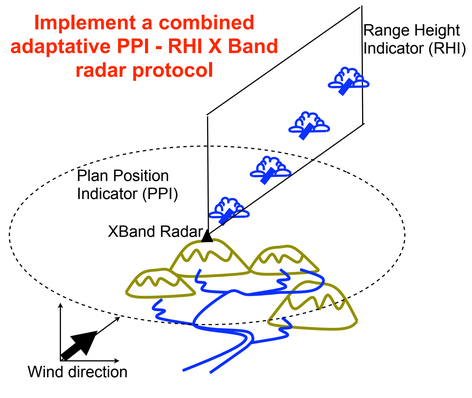
Promote high frequency soundings within the mountainous area.
Display a specific raingauge and DSD networks below the rain bands

Special Observation Period (falls 2011 - 2012)

Settle X Band radar (positions obtained with the VISHYDRO evaluation) to scan the lower layers of the atmosphere.
Densify the lightning network in order to built a 3D tomography of electrical activity.



Implement a combined adaptative PPI - RHI X Band radar protocol



Symbols legend :

Raingauges ❍, DSD ⊕,
Lightning ✳, Soundings
SBand ---, XBand — radar