Preliminary Results on the Study of the Lightning Activity and Cloud Properties Recorded During the SOP1-IOP6 (24 September 2012)

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1 – Objectives

Investigate the properties of lightning flashes and activity relatively to the dynamics and the microphysics of the parent thunderclouds

Document and understand the full lifecycle of the SOP1 IOP6 event

Investigate the relevance of total lightning activity as a convective precipitation proxy using high resolution HyMex SOP1 measurements

2 – Instrumentation and Methodology

Instruments:
- HyLMA (NMT; IC + CG), EUCLID (CG)
- Clouds/precipitation:
  - RASTA (LATMOS, 95 Ghz; airborne)
  - MXPOL (EPFL, 9.4 Ghz Dpol; Monbrun)
  - X1 (LaMP, 9.3 Ghz; La Bombine)

Methodology:
- i) Merging of radar and lightning observations
- ii) Temporal and spatial investigation at flash and storm scale

3 – Preliminary Results

Lightning and Precipitation

- HyLMA provides more information on the spatial distribution of lightning flashes than usual OLLIs to investigate the relationships between total lightning activity and precipitation at high resolution
- Lightning activity without precipitation can be explained by radar beam attenuation and/or lightning flashes in non precipitating clouds
- Total lightning activity seems located few km behind the intense precipitation for the studied case at the studied period
- Lightning flashes recorded over a large range of low level reflectivity according to the convection stage, the inner cloud structure and cloud charge regions
- Next step:
  - Study at the scale of the convective cell with exclusion of attenuated radar beams

Lightning, Kinematics and Microphysics

- Vertical extension of the lightning flashes consistent with the vertical structure of the parent clouds
- Upper lightning channels in deep convective areas often propagating just below the upper edge of the clouds
- Lightning intra-cloud discharges often located in convective regions with high reflectivity and high updraft whatever the altitude

Next steps:
- Exploit radar-based microphysics retrievals to study flash structures relative to the cloud environment
- Further investigate lightning properties in convective and stratiform cloud regions separately

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