European Conference on Severe Storms 2015
14–18 September 2015, Wiener Neustadt, Austria
ECSS2015-147
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Study of Lightning Flashes Based on Distinct Observation Data Sets Recorded During the HyMeX SOP1

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A lightning discharge is a complex, powerful and impressive phenomenon. A lightning flash consists in a suite of sub-processes with different physical properties in terms of propagation properties, radio frequency radiation type, current, space and time scales. At present time many details of those physical sub-processes remain to be understood. In order to investigate and understand natural lightning discharges and their sub-processes in a comprehensive manner it is necessary to observe them simultaneously with instruments that cover a large frequency range and are sensitive to different lightning properties.

The PEACH project (Projet en Electricité Atmosphérique pour la Campagne HyMeX) during HyMeX (Hydrology cycle in the Mediterranean Experiment) SOP1 (Special Observation Period 1) aimed to observe and investigate the lightning activity as well as the electrical state of continental and maritime thunderstorms in the area of the Mediterranean Sea. Several distinct systems and instruments, sensitive to electromagnetic signals radiated by lightning flashes, were operated in the Cevennes-Vivarais (South-eastern France). A Lightning Mapping Array (HyLMA), a fast electric field antenna combined with a high speed camera (VFRS), a slow electric field antenna (SLA) and operational lightning locating systems (OLLS) collected unique lightning data throughout the 2-month period of the SOP1.

Observations collected during the 24th September 2012 IOP6 case are presented in the present contribution. The IOP6 lightning activity was remarkably well sampled by the different PEACH sensors. Examples of cloud-to-ground (CG) flashes as well as intra-cloud (IC) flashes are discussed. The properties of the different successive flash components are documented in terms of temporal and spatial evolution, duration and spatial extension, radiation type and amplitude, and electrical charge transfer. For a better understanding, those flashes are placed back in their electrical context and in their cloud environment as measured from research and operational weather radars. Finally we discuss on the actual IC and CG flash components reported by the EUCLID operational lightning location system.