Detection, Analysis and Use of the Lightning Activity during the HYMEX Experiment

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We propose to perform observational-based and modeling-based studies of the electrical activity in maritime and continental Mediterranean storms in the frame of the HYMEX project. The ONERA VHF PROFEO mapper, the University of Munich LINET network, the UK Met Office long range Sferics ATDnet network and Meteorage will be used to record, document and analyze the electrical activity at the storm level, at regional or mesoscale, and at the scale of the Mediterranean basin. The lightning networks selected here are complementary not only on their geographical coverage but also on the fact that they sense different flash components. We plan to relate the lightning activity to the microphysics and aerosol contents and also to kinematics properties of the continental and maritime Mediterranean storms as measured by ground-based/airborne instruments deployed during the HYMEX experiment (radar, radiometer, lidar, in situ microphysics probes) and space borne operational sensors. An acoustic sensor array will also be deployed to characterize the infrasonic properties of lightning flashes and will provide a unique description of the lightning flashes by merging concurrent electromagnetic and infrasonic observations. In addition, simulations with the non-hydrostatic mesoscale model MesoNH will be performed to evaluate the model capability in simulating cloud and precipitation fields at the resolved convective scale over a large domain but also to test for the first time and in the context of real meteorological situations, the original electrification-lightning scheme which has been developed in MesoNH and which is dedicated to the very high spatial resolution (1 km scale and less). Our multi-scale study should offer potential applications of lightning proxy for hazardous weather detection, nowcasting of flash floods, quantitative rainfall estimation over land and sea and for data assimilation in numerical weather prediction models. We will present an overview of our research proposal.