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HyMex - Mediterranean High Impact Weather on the Convective and Synoptic Scale - Real-world Measurements and COSMO Model Simulations

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During the HyMeX campaign the Karlsruhe observing system KITcube (http://www.imk-tro.kit.edu/4635.php) will be installed in Corsica. KITcube is a newly developed measuring system for convection studies. It is designed to monitor the evolution of convection in its different stages. The whole system is mobile and allows flexible scan strategies with its different remote sensing systems. KITcube consists of a surface-based network with stations measuring the standard meteorological parameters and the energy balance at the Earth's surface. These stations are designed for the distribution over an area of about 10 x 10 km2 to account for surface inhomogeneities and terrain height. KITcube includes two scanning Doppler wind lidars. A sodar is available for mean wind profile observations. A micro-wave radiometer measures temperature and humidity profiles as well as integrated water vapour content. An infrared-radiometer estimates the cloud base and cloud cameras deliver information about the distribution and evolution of clouds. A scanning cloud radar monitors the development of clouds and estimates the horizontal wind profile within the clouds. A vertical pointing K-band rain radar, disdrometers and a ceilometer deliver additional information about precipitation and cloud base. Two radiosonde systems can be operated at different sites. Newly developed dropsondes are available to measure temperature, humidity and wind speed profiles in key regions concerning the evolution of convection. These sondes are dropped from a DO 128 research aircraft, which also measures the fluxes of radiation, sensible and latent heat. Beside the overall goals of HyMeX the IMK-contribution scientifically aims (i) at monitoring the conditions for high impact weather in the pre-convective environment in the upstream region (Ligurian Sea), (ii) to quantify the contribution of different processes to the evolution of the pre-convective conditions and deep convection, and (iii) to investigate the impact of the Corsican island, i.e. its orographic, thermal and aerodynamic influence, on initiation and evolution of single cumulonimbus (Cbs) and MCSs and of deep convection embedded in cyclones. The respective model simulations using the COSMO model of the German Weather Service will be done within the project PANDOWAE-MED (Predictability and Dynamics of Weather Systems in the Atlantic-European Sector - Mediterranean) which focuses on the dynamics of Mediterranean cyclones and the factors that determine their predictability. The main point of the project is on the numerical simulation of the initiation, development, and decay of western Mediterranean cyclones, the elaboration of the relevant processes determining the cyclogenesis, and the numerical representation of these processes. For this purpose sensitivity studies with respect to the influence of surface fluxes of sensible and latent heat as well as on the role of orography have been performed for typical cases of Mediterranean cyclones. Mediterranean cyclones will be shown and supplemented by energy budget estimations. The low-level penetration of cold air to the Mediterranean Sea on the front-side of a trough approaching from the northwest is strongly influenced by the orography of southern France and Spain and leads to the formation of lines with strong wind shear and/or convergent air flow. Along these lines small scale deep pressure areas develop, which are visible in the pressure and wind field only below 700 hPa. Independently the flow pattern around the Western Alps and the channelling effect of the mountains bordering the Po valley are followed by the formation of a synoptic scale cyclone at Upper Italy. The small scale structures in the pressure and wind fields vanish after a core of deep pressure has been formed on the synoptic scale. The results shown will help to prepare the HyMeX research strategy for airborne observations of Mediterranean cyclogenesis with and without embedded convection.