From climate to weather: Mediterranean storms as seen from satellite-based climatology and mesoscale simulations

J.-P. Chaboureau (1), C. Claud (2), B. Funatsu (2), N. Söhne (1), S. Argence (1), D. Lambert (1), and E. Richard (1)

(1) Laboratoire d'Aerologie, University of Toulouse, France, (2) Laboratoire de Meteorologie Dynamique/IPSL, Palaiseau, France

Mediterranean storms are mesoscale cyclones that can evolve to high-impact weathers events such as heavy precipitation and flash flooding. They result from the interaction of different processes at spatial scales ranging from the large-scale to the mesoscale. Two main ingredients favour the enhancement of precipitation: a warm sea surface temperature (in late summer and autumn) and the presence of an upper-level trough. The former provides strong heat flux that feed the storm while the latter acts to destabilize the atmosphere. Climatology of Mediterranean cyclones built from satellite observations affords us information on cloud and precipitation fields of the storms and their environment. Based on a long series of NOAA/TOVS observations, a cloud system typology has revealed the frequent occurrence of an upper-level anomaly during cold season. Cloud systems are also more frequent during negative North Atlantic Oscillation phase when the north Atlantic storm track takes its southernmost position. When focusing on severe precipitation events over the Alpine region, the rain events are found preferentially in summer and autumn and are more intense downstream an upper level trough. Such upper-level forcing is also crucial on the quantitative precipitation forecast as shown from a set of mesoscale simulations verified against satellite observations. This stresses the importance of scale interactions for intense Mediterranean storms and their predictability.