Plinius Conference Abstracts,
Vol. 11, Plinius11-169, 2009
11th Plinius Conference on Mediterranean Storms

A Mediterranean atmospheric and oceanographic observatory in Corsica within the framework of HyMEx, ChArMEx and MERMEx

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Corsica is an island located near the most cyclogenetic area of the western Mediterranean basin, south of the Gulf of Genoa. Corsica is regularly affected by intense meteorological events: windstorms, heavy precipitation, waves and coastal erosion, droughts, forest fires, and lightning. All these events are crucial for the economic activity of Corsica, which is mainly based on tourism, nautical activities, agriculture and farming.

In spite of recent improvements in operational forecasting, numerical weather predictions regularly fail to reproduce the intensity and distribution of precipitation of heavy rainstorms at the mesoscale. Local weather forecasters still have difficulties in predicting such precipitation events, particularly over the sea close to complex topography. Corsica is also relevant for the study of most of intense precipitation cases affecting continental south eastern France and northern Italy: they are generally characterized by low level warm and moist air mass transport from the south, channelled not only by the continental orography but also by the Corsica-Sardinia islands ridge. In these situations, Corsica is located in the near upstream area of the flow finally generating the cyclogenesis and subsequent high impact weather over the Gulf of Genoa. Its geographical situation would allow Corsica to play the role of a “sentry”, not yet exploited for these events.

In addition and due to the presence of various aerosol types over the Mediterranean region, such as mineral dust particles (mostly transported from the Saharan desert), anthropogenic aerosols (due to urban and industrial activities mainly from its northern continental border), but also biomass burning aerosols from forest fires and marine aerosols, atmospheric particles are likely to have a significant impact on the regional climate and on the hydrological cycle over the Mediterranean basin. In parallel and due to high deposition fluxes of desert dust and anthropogenic aerosols (which sources are close and numerous), atmospheric inputs impact marine cycles of several chemical elements in the Mediterranean environment and thus potentially the regional ecosystem.

Furthermore, in spite of high level of ozone and aerosols concentration during the summer period, permanent observations of gas and aerosols in the background troposphere are sparse in both space and time over the western Mediterranean basin. In that sense, a Mediterranean observatory in Corsica should present a great interest for investigating different scientific questions related to aerosols and gases over the Mediterranean basin. In Corsica Island, the remote semaphore of Ersa (Cape Corse), is an appropriate remote site for atmospheric background monitoring with minimum local anthropogenic emissions.

We propose to bring together initiatives concerning measurements in Corsica to create a Mediterranean observatory that would give the scientific community facilities for setting up a multiparameter observation platform in a region where observations are sparse (if even existing).

French research agencies have decided to support several projects in the frame of a large coordinated multidisciplinary programme focused on the Mediterranean region (http://www.dt.insu.cnrs.fr/c-med/c-med.php), including HyMEx (Hydrological cycle in Mediterranean Experiment; http://www.hymex.org/index.php), ChArMEx (The Chemistry-Aerosol Mediterranean Experiment; https://charmex.lsce.ipsl.fr/) and MERMEx (Marine Ecosystems Response in the Mediterranean Experiment; http://mermex.com.univ-mrs.fr/). Several initiatives based on measurements in Corsica have emerged in the frame of these projects:

• Suggestions to improve the existing data network with ground-based conventional weather stations, radiosounding station (profiles of temperature, humidity, wind speed and direction, and ozone measurement), radars, etc.;
• Aircraft measurements;
• Deployment of a wind profiler network around the western Mediterranean basin and in the island area;
• Thunderstorm and lightning activity studies;
• Observation of Transient Luminous Events associated with thunderstorms;
• Deployment of a Lightning Mapping Area;
• Forest fire studies;
• Numerical studies of heavy precipitation events;
• Study of the climatology of the low troposphere composition (ozone and precursors);
• Characterization of the aerosol microphysical and optical properties & vertical profiles;
• Studies of the aerosol mixing;
• Determination of the aerosol direct radiative impact and climate over the Mediterranean;
• Determination of solar irradiance (UV and Visible spectrum);
• Impact of the long-range transport on the air quality (gas and particles);
• Deposition fluxes of desert dust and anthropogenic aerosols and their input of soluble elements (Fe, P, N, Hg...) impacting the marine trophic chain.

This Corsican observatory would operate for all HyMEx, ChArMEx and MERMEx Long Observation Period, Enhanced Observation Period and Special Observation Periods. In addition, this observatory will be also supported by the MOOSE network (Mediterranean Ocean Observing System on Environment) to maintain a long term atmospheric observation of key parameters in this site. It is foreseen to deploy the KITcube mobile laboratory operated by the Karlsruhe Institute of Technology (KIT, Germany) on the northern tip of Corsica for an up to 12 month period within the framework of the wind profiler network at the French and Italian coast.

All atmospheric (and oceanographic) measurement initiatives in Corsica are welcome to join the project.