

# ChArMEx 2013

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ChArMEx 2013 Field campaign

ChArMEx program, which is part of the meta-program MISTRALS (integrated Mediterranean studies at regional and local scales), aims to better characterize the pollution of the Mediterranean basin and to identify sources, aggravating factors and the impact on the environment at near and long term.



Balloon launch base during the pre-campaign in 2012. The base has been installed by CNES close to the sea-shore so that balloons drift above the sea and avoid inhabited zones.

## Context and challenges

Historic cradle of many civilizations, the Mediterranean region is a major geostrategic interest including environmental issues, politics and society are considerable. However, this is a very vulnerable area whose future habitability could be compromised. One major source of concern is the degradation of air quality and possible positive feedback of this pollution on the regional climate and vice versa.

Little known facts, the air is often more polluted in the middle of the Mediterranean than in the suburbs of major cities in Europe, especially in summer, during which gaseous and particulate pollution peaks. If this pollution is partly due to the activity of the 470 million residents, it is mostly a product of import. The reason is simple. Located at the confluence of several natural weirs draining the air neighboring continents (Europe and North Africa to the south), the Mediterranean is the receptacle of all the pollution. These converging pollution, trapped in the basin, especially in the western part which is surrounded on all sides by tall peaks, can be:

- Pollution due to anthropogenic emissions from the north and flowing into the basin via the major river valleys (Rhône, Po);
- Natural pollution from the Sahara as huge plumes of desert dust;
- Pollution from the periphery of the basin due to forest fires or ecosystems plants that emit organic compounds under the influence of heat and water stress.

In addition, under the influence of the Mediterranean climate, warm, sunny and dry, this pollution will acquire a greater harm due to the formation of ozone and ultrafine dust (especially organic aerosols AOS called secondary organic aerosols) could cause respiratory and cardiovascular disease, but also climate change causing more droughts: the beginning of a vicious circle.

ChArMEx program, which is part of the meta-program MISTRALS (integrated Mediterranean studies at regional and local scales), aims to better characterize the pollution of the Mediterranean basin and to identify sources, aggravating factors and the impact on the environment at near and long term. These objectives have required the strengthening of the observation means of existing Mediterranean observatories together with the creation of new observatories in the western basin where they were none. In addition to these long-term monitoring stations, intensive measurement campaigns are organized during the summer

(pollution season). This 2013 field campaign comes after a pre-campaign which took place in 2012 and will be followed in 2014 by several small campaigns.

## Dates and venues

The 2013 field campaign will take place between June 10 to August 10 2013. Activities will be mainly in the western Mediterranean. As in the 2012 pre-campaign, the teams will be deployed on a dozen sites including ground measurement stations, balloon launch pad and aircraft bases. Ground operations will be continuous from June 10 to August 10 while airborne operations are organized into two periods of special observations (SOP): SOP-1a from June 12 to July 5 and SOP-1b from July 23 to August 9.

## Resources deployed

Observatories for continuous measurement of gaseous and particulate air pollution will be in permanent alert throughout the basin. This network includes ten stations ran by the research institute of 7 foreign countries that collaborate to ChArMEx. Some are part of international networks such as EMEP or ACTRIS and others have been created by the program ChArMEx. This is the case of the station of Cap Corsica, which was deployed in a remote location away from any direct sources of pollution in order to capture the pollution imported in the western Mediterranean. This new facility is a model for research observatory for monitoring the atmospheric environment and air quality. Its characterization means for automatically tracking air pollution and the number of measured physico-chemical parameters are truly exceptional. Seven laboratories are involved in the monitoring, with the support of Qualitair Corsica.



ChArMEx/CORSiCA observatory, in Corsica. It is located in an area with very few inhabitants. Central image : The containers are full of scientific instrumentation. Image on the right : Automatic collector for atmospheric fallouts. This high autonomy CARAGA collector at the ChArMEx/CORSiCA Observatory is part of a network of such instruments set up for monitoring dust particles from Sahara.



ATR-42 flying close to a drifting balloon (arrow).

This pollution hunt will also be done in the air thanks to the participation of both SAFIRE aircraft, the ATR-42 of Météo-France and the Falcon-20 of the CNRS. Both planes will be based in Cagliari (Sardinia) during the SOP -1a in order to capture dust plumes that may originate from Africa. During SOP-1b, the ATR will be based on an Air Force Base in Genoa (Italy) for probing the pollution plumes originating from the Po valley or the Rhone Valley and possibly plumes from forest fires.



Launch of two balloons for measuring the vertical profiles of ozone, atmospheric aerosols and meteorological parameters during the summer 2012 pre-campaign.

Some flights will be coordinated with the release of balloons, which will be made from the base of Minorca (Balearic Islands) during the first SOP and from Hyères in the second. Released in pollution plumes, these drifting balloons will follow the plume and give its real time location thanks to a GPS system. They will also perform continuous measurement of ozone or particles concentrations. The planes will be able to fly and sample the tracked pollution plumes several times within several hours apart. This will enable aircraft teams to follow very accurately the evolution of a multitude of parameters and thus the overall pollution in the air. This strategy has already been successfully tested in June 2012 as part of the pre-campaign.



Launch of a drifting balloon from Martigues-La Couronne during the summer 2012 pre-campaign.  
On the left, the ChArMEx balloon team.

It is also planned to measure air quality at sea aboard the yacht Zero CO<sub>2</sub>, and navigate between Nice, Corsica and Genoa.

## Support

For its French part, ChArMEx program is primarily funded by CNRS-INSU, ADEME, ANR (ANR-Blanc ADRIMED and SAF-MED), CNES, the Territorial Community of Corsica and the European FEDER program, the CEA, Météo-France and several universities, the Ecole des Mines de Douai, the PACA region, EDF, the National School of Bridges and Roads ...

## Partners

French partners are those listed above, as well as Qualitair (Corsican air quality agency) and AirPACA (air quality agency of Provence). At the international level, ChArMEx brings together a set of bilateral cooperation and / or multilateral. The 2013 field campaign includes cooperation with IDAEA, Polytechnic University of Catalonia, the University of Granada and the University of the Balearic Islands in Spain, ENEA and the University of Florence in Italy, University of Malta, KIT, Germany, and the University of Cork in Ireland. Other international contributions are discussed.

## French laboratories involved

LSCE / IPSL (Saclay), LA / OMP (Toulouse), GAME / CNRM (Toulouse), LISA / IPSL (Créteil and Paris), AMPA-Dunkerque (ULCO) LOA (Lille), SPE (Corsica), LAMP / OPGC (Clermont-Ferrand), LATMOS / IPSL (Paris), Geosystems (Lille), LMD / IPSL (Palaiseau, Paris), CEREAS (Marne-la-Vallée) LIVE (Strasbourg), MIO / Pytheas (Marseille), CEREGE / Pytheas (Marseille), LCP (Marseille), PC2A (Lille), LGGE / OSUG (Grenoble), and LPC2E/OSUC ICARE (Orléans), Ecole des Mines de Douai ... The project receives substantial technical support ICARE Data Centres (Lille) and SEDOO (OMP-Toulouse).

# More information:

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