Overview of the Project ChArMEx activities on Saharan Dust in the Mediterranean region

The Chemistry-Aerosol-Mediterranean Experiment (ChArMEx: http://charmex.lsce.ipsl.fr) is a federative project coordinating international research on atmospheric chemistry and its impacts on climate, air quality, and marine biogeochemistry in the Mediterranean region, as part of the international multidisciplinary research programme MISTRALS (Mediterranean Integrated Studies at Regional And Local Scales). ChArMEx aims to characterize Saharan dust in the Mediterranean region, which is regularly impacted by Saharan dust plumes. The aim of this presentation is to provide a brief overview of these activities.

WP-1 EMISSIONS

The ChArMEx regional emission inventory combines the most recent work on emissions of primary and trace gas aerosol precursors. http://doclab.lsce.ipsl.fr/local_articles/10595/charmex.pdf

WP-4 RADIATION AND CLIMATE

Radiative forcing of desert dust

Dust episode simulations with RegCM 4.1 tested against AERONET and satellite data (Aparajeydo, going PHO). Strong SW radiative cooling in the surface and TOL, attenuated by LW positive forcing, absorption within the dust layer. Dust AOD: 0.25-3.00

Surface SW and LW radiative forcing

WP-3 AIR QUALITY AND TRANSPORT

Impact of desert dust on air quality

Saharan dust effect is visible at Corsica urban traffic stations where it explains most PM2.5 peaks in summer.

WP-5 DEPOSITION

A new dust sampler and monitoring network for weekly total insoluble dust deposition flux

The intense dust event of late June 2012 during the PreChArMEx/TRACA airborne campaign

Campaign focused on transport of continental air masses over the NW Med. with the SAFIRE ATTRA research aircraft based in Toulouse. Measurements included an aerial lidar, aerosol chemistry (AMS), bulk aerosol filter and cascade impactor samples, and aerosol physics (number/sizes distribution, spectral scattering and absorption).

The intense dust event of late June 2012: 2 flights with a sounding balloon from Marseilles carrying the new OPC LDA:

Barcelona

MOS/SERVIR-derived daily mean AOD at 550 nm

WP-6 VARIABILITY AND TRENDS

Analysis of existing satellite and model time series

Monthly average AOD at 550 nm over the Med. Sea shows a second spring peak in 2011

Example of radiation measurements of dust plumes at Cabo Cervera

See also: Simulations of aerosol radiative forcing with the fully coupled ocean-atmosphere ALADIN-Climate model by Nabet et al.

ChArMEx-ALADIN airborne campaign planned from 11 June to 05 July 2013

Focus on aerosol direct radiative forcing (column closure and regional-scale) with the SAFIRE-RegCM aircraft for model measurements and the SAFIRE Falcon2D for remote sensing, based on SBDART + surface stations incl. supersites at Cape Cervera, Lampedusa and Malèna + drifting balloons with LOAC from Marseilles.

Model simulations for the future climate

Analyses of simulations over the Mediterranean from the global EMAC (2000-2010, 2025, 2050) and ACCMIP (1850-2100) chemistry-climate simulations and comparison to MODIS AODs for the present period.

Simulations with MOCAGE at 0.2° resolution (present, 2030, 2050)

Simulations with the atmosphere-ocean coupled climate model MOCAGE (2000, 2050, 2100)

Simulations of the dust desert radiative effect with RegCM (1991-2000, 2041-2050, 2091-2100)

ChArMEx-ALADIN airborne campaign

ChArMEx-LDAR airborne campaign

...INCLUDING FUTURE

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DATA BASE

The ChArMEx data base

All observation and simulation data from a common data portal based on servers and tools from DFR/IPSLED; ICARE and IPSL/UMR/ESPR; http://chmex.lsce.ipsl.fr/CHARMEX/

ChArMEx database


Acknowledgements


ABSTRACT

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7th International Workshop on Sand/Duststorns and Associated Duststall, ESRIN, Frascati, Italy, 2-4 Dec. 2013

F. Duvel (Laboratoire des Sciences du Climat et de l’Environnement IPSL/LSCE, CEA-CNRS-UV, France) and an international ChArMEx Team: