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Direct, semi direct and indirect radiative forcing of aerosols and its impact on precipitations over the Pyrenean Massif

Carlos Diaz, Veronique Pont, Fabien Solmon, and Catherine Liousse

Laboratoire d'Aérologie- UMR 5560, CNRS- Université Toulouse III- Paul Sabatier, Toulouse, France (carlos.diaz@aero.obs-mip.fr)

The Pyrenean range atmosphere is largely influenced by both anthropogenic and natural sources of aerosols. Under various possible meteorological influences, the Saharan dust, marine aerosols, biomass burning aerosols, fresh and aged carbonaceous aerosols as well as inorganic aerosol, mix together in the Pyrenean atmosphere. Through a regional modeling approach compared to numerous available observation datasets over this area, our goal is to estimate the possible impact of such aerosol content on the regional radiative balance and climate, including precipitation over the range. The approach is as following:

- A Regional modeling exercise is carried out using the ICTP Regional Climate Model REGCM4, forced by ERA-Interim reanalysis and using an interactive aerosol scheme. The MACCity and GFAS emission inventories for gases and aerosols are considered for anthropogenic and wildfires sources from January 2010 to December 2020
- Optical aerosols properties are evaluated thanks to the Pic du Midi aerosol properties observation database belonging the ACTRIS network. Simulated wind fields and thermodynamic parameters are evaluated using ECMWF reanalysis. Simulated aerosol optical thickness (AOT) is also compared to MODIS AOT observations.
- The next step consists in estimating the aerosol direct and indirect radiative forcing and effects over the Pyrenees by comparing simulations including or not these different feedbacks. The sensitivity of regional precipitation to aerosol will be assessed, including the inter-comparisons with precipitation observation such as TRMM, CRU, and possibly higher resolution regional products.

Preliminary results of simulation performed over a short period will presented and discussed as a first step toward longer climatic integrations and full assessment of the role of the aerosol in the Pyrenean regional climate, and its possible future evolution following climate change and emission scenarios.