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Contribution of the ChArMEx/ADRIMED field campaign to the regional climate simulation of aerosol-radiation interactions

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The Mediterranean region is submitted to numerous and various aerosols, that show a high spatio-temporal variability and play an essential role in the regional climate system. Indeed aerosols interact with shortwave (SW) and longwave (LW) radiation with ensuing consequences on radiative budget and regional climate. Intensive airborne measurements have been performed in summer 2013 during the ChArMEx/ADRIMED campaign, in order to focus on these aerosol-radiation interactions and their modeling.
Regional climate models such as CNRM-RCSM are now able to include a prognostic aerosol scheme in order to represent the main natural and anthropogenic aerosol species and their impact on SW/LW radiation and climate. However, up to now, the evaluation of these aerosol schemes is often limited to the integrated atmospheric aerosol content given by the aerosol optical depth. The objective of the present work is to take advantage of the airborne and ground-based measurements available in the ChArMEx/ADRIMED field campaign in order to evaluate in detail the ability of the CNRM-RCSM regional climate model to simulate the aerosol microphysical and optical properties as well as the interactions with SW and LW radiation.
A simulation has been carried out with CNRM-RCSM over the period of the campaign (June-July 2013), driven by the ERA-Interim reanalysis as lateral boundary forcing. This simulation has been compared to different observations performed during the campaign, in terms of aerosol concentration, size and vertical distribution, as well as deposition. An original aspect concerns the comparison with SW and LW heating rate profiles obtained from aircraft measurements. The results show the relatively good performance of the model in the representation of aerosols, but also some discrepancies in terms of aerosol vertical and size distribution. Therefore this evaluation represents a step forward to improve the representation of aerosol radiative effect in regional climate models.