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How can a dusty cold pool change the diurnal evolution of the Saharan Atmospheric Boundary Layer ?

Cécile Kocha (1), Cyrille Flamant (1), Julie Berckmans (2), Andreas Fink (2), Luis Garcia-Carreras (3), Peter Knippertz (3), Jean-Philippe Lafore (4), Fabien Marnas (5), John Marsham (3), Doug Parker (3), Philip Rosenberg (3), Claire Ryder (6), Pierre Tulet (7), and Richard Washington (8)

(1) LATMOS, CNRS-UPMC-UVSQ, Paris, France (cecile.kocha@latmos.ipsl.fr), (2) IGM, University of Cologne, Germany, (3) School of Earth and Environment, University of Leeds, UK, (4) CNRM-GAME, Météo-France and CNRS, Toulouse, France, (5) LSCE, CEA-CNRS-UVSQ, Gif-sur-Yvette, France, (6) Department of Meteorology, Reading, UK, (7) LACy, CNRS-Université de La Réunion-Météo-France, Saint-Denis de la Réunion, France, (8) Oxford University Centre for the Environment, Oxford, UK

In the framework of the Fennec 2011 Special Observing period, a large and dusty density current (known as a haboob) was observed on the 21 June to cover half of the western part of the Sahara. Thanks to the AROME high resolution model used to forecast this event in real time, two research aircraft (the SAFIRE Falcon and the FAAM BAe 146) operated over Mauritania and Mali on that day, and we are able to document its characteristics in detail.

Particularly large dust particles were observed in this haboob. These particles are known to absorb and scatter solar and thermal radiation. The comparison of AROME simulations with and without coupling with dust shows that the radiative impact of the dust induced a decrease of sensible heat fluxes by 200W/m^2/AOD and an increase of the temperature in the atmospheric boundary layer by 1°C. Surface fluxes are one of the principal parameters controlling the growth of the boundary layer. However, during the day, the simulation coupled with dust shows a deeper boundary layer (reaching ∼5km high) than the simulation without dust. Here, we explore the competition between surface heating and elevated heating in the boundary-layer development.