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Density currents and their role on dust mobilization

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Density current formation and propagation are well studied mechanisms in fluid dynamics with many applications to several science fields. In the atmosphere, density currents are formed due to a combination of specific conditions, at ranges varying from local to regional. Such systems can be produced either because of deep tropical convective activity over the sub-Sahel region or because of orographic storm activity over the Atlas Mountains. Especially over hot desert areas, the formation of density currents is an important triggering parameter for dust mobilization and thus is often followed by the generation of short living but intense dust fronts. These dust fronts have lifetimes of several hours and horizontal extension that can reach several hundreds of kilometers. The present modeling study aims at examining the formation and evolution of convectively generated density currents and the associated dust production at the slopes of Atlas Mountains. Simulation results with RAMS/ICLAMS model showed that the evaporation of precipitation resulted in the formation of a cool pool near the Atlas Mountains region. The phenomena were enhanced by the topographic slope and a dust front was produced at the edge of the propagating density current. The model results are compared with available observational data and the ability of the model to provide a reliable representation of the spatiotemporal features of the event is discussed. As it was shown in these simulations, the contribution of this kind of meso-beta scale features to dust production is considerable.