Geophysical Research Abstracts
Vol. 16, EGU2014-2998-1, 2014
EGU General Assembly 2014

Towards an offline parameterization of convective dust storms

Florian Pantillon (1), Peter Knippertz (1), John Marsham (2), and Cathryn Birch (2)

(1) Karlsruhe Institute of Technology (KIT), Institute for Meteorology and Climate Research (IMK), 76128 Karlsruhe, Germany (florian.pantillon@kit.edu), (2) University of Leeds, Institute for Climate and Atmospheric Science (ICAS), School of Earth and Environment (SEE), Leeds, LS2 9JT, UK

Around half of dust emissions worldwide originate from the Sahel and Sahara regions, of which a major but uncertain fraction are caused by convectively-generated dust storms (haboobs). In these storms, evaporation-driven downdrafts form cold pools that quickly propagate and create near-surface wind gusts. Current global models do not capture such storms, because their convection schemes do not allow effective formation of such cold pools. We suggest a parameterization of near-surface wind gusts and dust emissions generated by cold pools, based on the downdraft mass flux from the convection scheme. It assumes the horizontal dispersion of all downdrafts into cold pools and the unknown geometry of the cold pools results in one free parameter. The parameterization is applied to Unified Model (Cascade) runs for the 2006 Summer in West Africa. The free parameter is tuned for 40-km and 12-km runs with convection scheme, using 4-km convection-permitting runs as a reference (4-km runs have been evaluated using 1.5-km runs in previous studies). The parameterization successfully increases the near-surface wind beyond the threshold for dust emission and compensates for the lack of convectively-generated dust storms when the convection scheme is activated. The long-standing problem of too early activation of the convection scheme in the Sahel and Sahara regions remains an issue in the parameterization of the diurnal cycle of dust emissions.

This parameterization is developed in the framework of the ERC Desert Storms project.