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Development and technical paper | 03 May 2012

Importance of the surface size distribution of erodible material: an improvement on the Dust Entrainment And Deposition (DEAD) Model

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Received: 20 Sep 2011 – Discussion started: 10 Nov 2011 – Revised: 06 Apr 2012 – Accepted: 10 Apr 2012 – Published: 03 May 2012

Abstract. This paper is based on dust aerosol cycle modelling in the atmospheric model ALADIN (Aire Limitée Adaptation dynamique Développement InterNational) coupled with the EXternalised SURFace scheme SURFEX. Its main goal is to create an appropriate mineral dust emission parameterization compatible with the global database of land surface parameters ECOCLIMAP, and the Food and Agriculture Organization (FAO) soil type database in SURFEX. An improvement on the Dust Entrainment And Deposition scheme (DEAD) is proposed in this paper by introducing the geographical variation of surface soil size distribution, the Marticorena and Bergametti (1995) formulation of horizontal saltation flux and the Shao et al. (1996) formulation of sandblasting efficiency α. To show the importance of the modifications introduced in the DEAD, both sensitivity and comparative studies are conducted in 0 dimensions (0-D) and then in 3 dimensions (3-D) between the old DEAD and the new DEAD. The results of the 0-D simulations indicate that the revised DEAD scheme represents the dust source emission better, particularly in the Bodélé depression, and provides a reasonable friction threshold velocity. In 3-D simulations, small differences are found between the DEAD and the revised DEAD for the simulated Aerosol Optical Depth (AOD) compared with the AErosol RObotic NETwork (AERONET) photometer measurements available in the African Monsoon Multidisciplinary Analyses (AMMA) databases. For the surface concentration, a remarkable improvement is noted for the revised DEAD scheme.

How to cite: Mokhtari, M., Gomes, L., Tulet, P., and Rezoug, T.: Importance of the surface size distribution of erodible material: an improvement on the Dust Entrainment And Deposition (DEAD) Model, Geosci. Model Dev., 5, 581-598, https://doi.org/10.5194/gmd-5-581-2012, 2012.