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A simulation study of dust-borne iron transport during the Australian ‚red dawn‘ event in 2009

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Iron is an essential micro-nutrient for the growth of phytoplankton in the ocean. Phytoplankton, in turn, is of importance in the carbon cycle as it converts carbon dioxide into organic carbon. Atmospheric dust deposition is a source of iron in the upper ocean.

This study aims at simulating atmospheric emission, transport, and deposition of dust, with a focus on its iron content. The dust module of Shao (2004) implemented in WRF has been extended for this study to model dust and its explicit mineralogical composition. Based (a) on global maps of the dominant soil types as defined by Post and Zobler (2000), (b) on the association of specific soil types with a typical mineralogical composition (Scanza et al., 2015), and (c) on the average iron content in specific minerals (Journet et al., 2008), we can quantify the iron content of emitted dust. This configuration of the WRF model simulates dust transport distinguishing different dust particle sizes, enabling a detailed analysis of the dust iron content. As a first application, we analyse the red dawn event in Australia in 2009 as a case study. Our preliminary results for dust are compared against satellite based dust indices, as well as ground station data. We also quantify the associated iron content in terms of atmospheric surface concentration and deposition.

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