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Current issues in modelling modern dust

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In the past years the modelling of dust aerosol transport and its climate impact at global and regional scales received considerable attention. However, many aspects of the variability of atmospheric dust loads remain poorly understood. While the physical processes that are responsible for dust emission and deposition are reasonably well known, and parameterizations of soil surface properties controlling dust emissions progressed since the first dust models were published, models of modern atmospheric dust still often show considerable deviations from observations. In fact, in some cases models that contain a simple description of dust emission processes perform better in comparison with observation than others which treat the physical processes and surface conditions that are responsible for dust emission with considerable detail. One cause can be inadequacies in simulated meteorological fields that are used to compute dust emission fluxes. In contrast to global-scale dust models, regional dust models are expected to better reproduce individual dust events due to their higher grid resolution. Still, recent intercomparisons of regional dust model results showed large deviations in dust emission and transport. The representation of dust emission events that are related to precipitation events (haboobs, density currents) is problematic at grid resolutions that require parameterization of wet convection processes. Large-scale models need to be able to reproduce the specific regimes that are responsible for modern dust emissions in order to be useful for application under different climate conditions. New remote sensing products like the infrared dust indices from geostationary satellites, the DeepBlue product of the MODIS instruments and the retrieval of backscatter profiles from CALIPSO promise an improved understanding of modern dust regimes and are expected to lead to considerably improved dust models.