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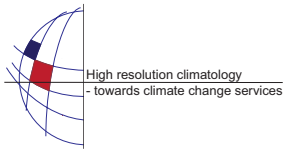

Sensitivity of the dust cycle in a Chemistry-GCM

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Mineral dust is an important part of the atmospheric aerosol. The export of Saharan dust across the Atlantic Ocean to the South American continent is known to be an important source of nutrition to the rain forest and the sea. Dust mobilisation in deserts and long-range transport occurs in episodic events and is strongly influenced by synoptic-scale flow patterns. The scientific understanding of these processes, the resulting global dust distribution and the climate impact is still low.

In this study, the atmospheric chemistry general circulation model ECHAM5/MESSy (EMAC) is used to simulate the mineral dust cycle. We performed free-running 5-year time slice simulations and nudged experiments for selected dust emission episodes. Two different dust emission schemes and four different horizontal resolutions have been used for investigating their influence on the entire dust cycle. The horizontal resolutions T42 (∼312 km), T63 (∼208 km), T85 (∼155 km) and T106 (∼125 km) are explored.

Independent of the horizontal resolution the “Balkanski” dust emission scheme simulates global maxima of the dust emissions and the dust column mass in the north-western part of India. Various observations indicate that in reality the maximum lies over the Sahara Desert. The “Tegen” dust emission scheme shows a much more realistic distribution. For all horizontal resolutions both schemes simulate dust emissions, total dust load and a dust life time within the range of the 15 GCMs participating in the AEROCOM-project (Aerosol Comparisons between Observations and Models). However, in T42 and T63 the northward transport of dust is too strong leading to unrealistic high column masses in high northern latitudes. The transport and subsequently the global dust distribution in T85 and T106 is much more sensible. The dust emission (total load) is 28 % (16 %) higher in T106 as in T85 which is traced back to higher wind velocities in T106. In addition to these climatological investigations, the event-specific experiments will be evaluated in detail using various observational data sets.