Geophysical Research Abstracts,
Vol. 10, EGU2008-A-08271, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-08271
EGU General Assembly 2008

A regional climate modeling study of the effect of desert dust on the West African monsoon

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We investigate the effect of the radiative forcing of Saharan dust on the West Africa monsoon with a regional climate model interactively coupled to a dust model. Towards this purpose we intercompare sets of 38 summer monsoon season simulations (1969-2006) with and without dust effects over a domain encompassing most of the African continent and adjacent regions. We find that the main effect of the dust radiative shortwave forcing is to reduce precipitation over the Sahel region. This is in response to cooling over the Sahara, which decreases the meridional gradient of moist static energy and results in a weakening of the monsoon energy pump. The dust effects also cause a strengthening of the southern branch of the African Easterly Jet and a weakening of Tropical Easterly Jet. Over the Sahel the dust forcing causes climate response patterns that are similar to those found during dry years over the Sahel, which suggests that Saharan dust feedbacks might have a role in maintaining drought events over the region. Overall, the inclusion of dust also tends to improve the model simulation of the West Africa monsoon, as well as African and tropical Easterly jet. Limits of the model and sensitive parameters are also discussed.