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Asian Monsoon and Elevated Heat Pump Mechanism in coupled aerosol-climate model simulations

M. D'Errico (1,2), C. Cagnazzo (3), P. Fogli (1), W.K. M. Lau (4), and J. von Hardenberg (5)

(1) CMCC Euro-Mediterranean Centre for Climate Change, Bologna, Italy, (2) University of Venice, Venice,Italy, (3) ISAC-CNR, Rome, Italy, (4) Laboratory for Atmospheres, NASA Goddard Space Flight Center, Greenbelt, Maryland, USA., (5) ISAC-CNR, C.so Fiume 4, 10133 Torino, Italy

A coupled aerosol-atmosphere-ocean-seaice model is used to analyse the relationship between aerosol and the Asian summer monsoon. In this analysis the elevated heat pump hypothesis and the solar dimming effect associated with aerosol loading are verified and are found to be consistent with our simulations. When increased aerosol loading is found on the Himalayas slopes in the pre-monsoon period (April-May), an intensification in early monsoon rainfall over India is obtained. An increase in rainfall and cloudiness during the early monsoon has a cooling effect on the land surface. Here it is verified that this cooling is produced also through the solar dimming effect by the presence of more dust from the deserts brought by an increased westerly flow in early monsoon season. A subsequent reduction in monsoon rainfall over India is found, with a beginning of this decrease in northern India. As these results, obtained with a fully coupled model, reproduce a reasonably realistic pattern, it is possible to consider absorbing aerosols as a possible source of seasonal predictability of the Asian summer monsoon over the Indian subcontinent.