Geophysical Research Abstracts
Vol. 20, EGU2018-252, 2018
EGU General Assembly 2018

Regional versus remote dust transport over the northeast Indian Ocean

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It is being increasingly recognized that mineral dust undergoing long-range transport can influence the climate of places far away from dust source regions. The Bay of Bengal (BOB), the northeast part of the Indian Ocean, receives dust from multiple sources: the Thar Desert which is the most important regional source and from remote sources like southwest Asia including the Arabian Peninsula and northeast Africa. Using a suite of remote sensing data, vertical profiles of atmospheric thermodynamics and regional climate model simulations, we explore the different transport pathways and relative importance of regional and remote dust sources over the BOB. While over the northern BOB dust from the regional sources contribute more than 50% to the total dust load during the southwest monsoon period (June to September), interestingly, the remote dust sources dominate rest of the year. Over the southern BOB, on the contrary, dust transported from the remote source regions dominate throughout the year. Originating primarily from northeast Africa and the southern part of the Arabian Peninsula, dust from remote sources reaches the southern BOB after traversing over the southern Indian peninsula. During the southwest monsoon period, dust is transported across the Indo-Gangetic Plain to the northern BOB in a dry elevated layer (between 850 and 700 mb pressure levels) and is comprised largely of dust from the Thar Desert. The interaction of this dust-laden air with the southwest monsoon wind system gives rise to a complex structure in the vertical over western India with dust from remote sources trapped in between two layers of dust from the Thar Desert. This signature of dust from different sources can also be discerned in the radiosonde profiles over India. Since dust originating from distinct source regions have different mineral composition (hence optical properties) and undergo distinct changes during atmospheric transport (depending on the transport routes), it is important to understand source-specific dust contribution and transport pathways to address dust-climate feedback over a region.