Plinius Conference Abstracts,
Vol. 11, Plinius11-162, 2009
11th Plinius Conference on Mediterranean Storms

Improving the Knowledge of Summer Monsoon Storm Genesis on the Mumbai Region

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Over the Indian Subcontinent, almost 75% of the annual precipitation is expected to fall during the South Asia Monsoon (SAM) season, conventionally defined between June 1 and September 30. While precipitation patterns show a very strong spatial heterogeneity, the maximum annual values (which may exceed 4000 mm) occur in the Western Coast of Indian Peninsula. This is mainly associated with orographic forcing, in particular of the Western Ghats and the Ganges and Brahmaputra valleys. Extreme rainfall events during the SAM season may be particularly intense and long-lasting, causing great damages both in terms of life and economic losses.
We aim at identifying large-scale meteorological patterns associated with the triggering of extreme rainfall events affecting the Mumbai area (approximately 18-20°N, 72.5-73.5°E), a very highly populated region (around 20 million people), during the SAM season. Seventy years of daily rainfall data are analyzed and compared to a database of damage-causing precipitations. Event days are selected with a twin-threshold function related to daily rainfall height and soil moisture content. To detect typical large-scale features, event days are compared to non-event days by analyzing MSLP, SST, and vertical wind profiles. Further, the storm-related processes are analyzed with moisture sources (via backtracing) and moisture flux convergence fields. First results on selected event days show that they are typically characterized by remote moisture sources (from S-W Arabian Sea) and increased lower level westerly winds which cause enhanced moisture flux convergence, leading to precipitable water's enhancement.