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Identification of the main moisture sources for India through a lagrangian approach

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Climate change is expected to alter significantly India's hydroclimatic regime over the 21st century. It is widely agreed that (except parts of theIndo-Gangetic basin) India may also receive more rain than in the past, but this increase is likely to be accompanied by greater temporal variability along the year. Water budget is the most fundamental aspect of the hydrological cycle. Traditionally, not much attention has been paid to this question, partly due to the lack of the data needed for water balance estimation, especially over oceans. Currently, due to the availability of high-resolution atmospheric data, attempts have been made to address these problems calculating the vertical integrated moisture transport (VIMT) and its divergence (namely the atmospheric water balance method). In the present work it is used a lagrangian dispersion particle model to implemented a dynamical analysis of the water transport towards India.

Moreover, most previous works have been focused on the summertime features of moisture transport, while less attention has been paid to other seasons that are also of importance, because parts of India also receive rainfall in the pre- and post-monsoonal periods. Hence, this work examines the main sources of moisture over during the whole year.

Moisture source regions for Eastern and Western India regions were analyzed using a lagrangian model during the period between Jan 1st, 2000 and Dec 31st 2004 (1827 days). Some authors have outlined that various large-scale factors can influence the rainfall, showing a different behavior over Eastern and Western India. It has been calculated (for each day) the evolution of moisture of the particles going to India up to 10 days before arrival to the mentioned areas.

Results affirm that between January and April, the moisture recycling is highly significative, being the main source for both western and eastern India. The Arabian Sea and the Bay of Bengal are net moisture sources for the two zones and Western India is, also, a moisture source for Eastern India. The analysis during the months from May to September shows, in agreement with previous studies, that the main supply of moisture, for both Western and Eastern India, is a flow known as the Somali Jet, which crosses the equator by the West Indian Ocean. The magnitude of the contribution of moisture from the jet is lower in the Eastern Indian side and moisture transported from the western to the eastern part is important during this time. It seems that the recycling in the western part plays an important role as a moisture source during September. The Bay of Bengal and the whole India are big net sinks of moisture throughout the summer period. The last months of the year (October to December) the situation is approximately similar to that which occurred during first months, the recycling of moisture dominates. Finally, there is another moisture source, located on land in the territory bordering on the north western India (into Pakistan), which present positive values of (E-P) during the ten days before to the entry of particles in the areas of study.