A 'Pool of Reduced Cloudiness' over the South Bay of Bengal during the Asian Summer Monsoon Season: Characteristics and Genesis

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Satellite observations of the monthly mean frequency of occurrence of clouds over the Indian subcontinent and the surrounding oceanic regions derived from the NOAA-AVHRR data during the period of 1996-2008 clearly reveals the presence of a large 'pool of reduced cloudiness' over the southwest Bay of Bengal near SriLanka during the Asian summer monsoon season (June-September). The frequency of occurrence of clouds in this region, which covers an area of about 0.4 million square km centered around 7°N, 82°E, during the July-August period is <50% while over the surrounding regions the cloud occurrence is in the range of 70-90%. The zonal and meridional cross sections of the altitude distribution of clouds derived from the CloudSat data show that this reduction in the frequency of occurrence of clouds is caused mainly by the absence of low- and middle-level clouds, while the frequency of occurrence of high-altitude clouds above ~8 km shows only a weak reduction. Remarkably, the areas surrounding the 'pool' are characterized by the deep convective clouds extending from ~2 km to ~14 km. Observations using CALIPSO and Kalpana-1-VHRR show that the frequency of occurrence of cirrus also does not show any decrease over this region. The 'pool of reduced cloudiness' is well separated from the Peninsular India and cannot be completely explained by the rain-shadow effect associated with the Western Ghats. The sea surface temperature (SST) over the west coast of SriLanka is ~1ºC lesser than the surrounding regions. However, the SST over most parts of the 'pool' is >28ºC, which is sufficiently high for the development of convection. Scatterometer observations of the surface wind over this region show large wind divergence, and the region of divergence has a spatial structure similar to that of the 'pool'. The mean circulation pattern over the 'pool' shows a descending of the airmass below about 5 km while the ascending of airmass prevails above. This completes a weak but persistent secondary circulation in the lower and middle troposphere around the 'pool', which might be primarily responsible for the genesis of this feature. The observed spatial and vertical distribution of clouds around the 'pool' would produce a differential heating of the atmosphere and could play an important role in the genesis of this secondary circulation and modulation of the mean summer monsoon circulation.