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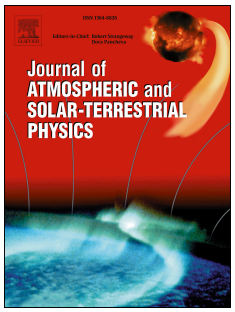

Upper air thermal inversion and their impact on the summer monsoon rainfall over Goa – A case study

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Upper air thermal inversion and their impact on the summer monsoon rainfall over Goa – A case study

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Abstract

Profiles of periodic GPS Radiosonde ascends collected from a station at the west coast of India (Goa) during summer monsoon months (June to September) of 2009 and 2013 have been used to analyze the thermal inversion statistics at various heights and their repercussions on the regional weather is studied. The interaction of contrasting air masses over the northern Arabian Sea often produces a two layer structure in the lower 5000 m close to the coastal station with warm and dusty air (Summer Shamal) occupying the space above the cool and moist Low Level Jet (LLJ) by virtue of their density differences. The warm air intrusion creates low lapse rate pockets above LLJ and modifies the gravitational stability strong enough to inhibit convection. It is observed that the inversion occurring in the lower 3000 m layer with an optimum layer thickness of 100-200 m has profound influence on the weather beneath it. We demonstrated the validity of the proposed hypothesis by analyzing the collocated data from radiosonde, lidar and the rain gauge during 16th July 2013 as a case study. The lidar depolarization ratio provides evidence to support the two layer structure in the lidar backscatter image. The presence of dust noticed in the two layer interface hints the intrusion of warm air that makes the atmosphere stable enough to suppress convection. The daily rainfall record of 2013 surprisingly coincides with the patterns of a regional break like situation centered at 16th July 2013 in Goa.

Keywords: Warm air intrusion, Low Level Jet, Two layer structure, Thermal Inversion, Monsoon