

RADIO AND OPTICAL INVESTIGATIONS OF MIDDLE AND UPPER ATMOSPHERE OVER INDIA

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The Indian peninsular region has a unique geographical identity – the tropical convection is intense here resulting in a spectrum of convectively generated gravity waves. The latitudinal variation of the Coriolis frequency is such that certain long-period (of a few days) eastward propagating waves are trapped in the middle atmospheric region over these low latitudes. The short-period gravity waves carry significant energy and momentum flux and are able to propagate to great heights into the upper atmosphere. The ionized layers in the upper atmospheric region are influenced by the configuration of the geomagnetic field which becomes nearly horizontal as the tip of the Indian peninsular region is reached. Intense current jet in the lower E region, the plasma fountain encompassing the low latitude E and F regions, the ionization irregularities in the F region contributing to the Spread-F phenomena are the prominent features of the equatorial ionosphere. Upward propagating tides and gravity waves are important sources of variability of both middle and upper atmosphere, whereas the ionosphere-magnetosphere interactions at high geomagnetic latitudes during magnetic disturbances produce certain noticeable effects on the equatorial upper atmosphere. The Indian middle and upper atmospheric science communities have their strengths in pursuing intense experimental studies with state-of-the-art facilities available at a number of locations. This paper reviews some of the recent advances made by the Indian atmospheric science community in the pursuit of understanding the spatial and temporal variabilities of some of the dynamical and electrodynamical phenomena occurring in the middle and upper atmosphere over the Indian sector using radio and optical techniques.
