RADAR REMOTE SENSING OF EARTH ATMOSPHERE – INDIAN SCENARIO

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Abstract: India has a long standing heritage in the Remote Sensing of Earth Atmosphere. Observations of anomalous propagation along the Indian coastline during Second World War by the radar systems on board the British Naval ships led to the development of modern Weather Radars. India Meteorological Department (IMD) has been operating a number of S Band Radar systems along the coast line for Cyclone detection and a few X band radars inland for wind determination using Radio/Rawinsonde techniques.

How ever, it is the development of MST Radar as a sequel to the Indian Middle Atmosphere Program (IMAP), a multi agency effort led by the Department of Space, that gave a tremendous boost to the research and development in the area of Radar Remote sensing of Earth atmosphere in India. Subsequent efforts like the Indo Japanese collaboration had broadened this scope by including Lidar observations of the middle atmosphere. INDOEX Project was another milestone in the Lidar based measurements of Atmospheric Aerosols & their effect on Radiative transfer, apart from the complementing observations on the atmospheric chemistry & related issues of interest to Global change Scenario. The development of a long range Doppler Weather and its commissioning at the Space Port of India viz. Satish Dhawan Space Centre (SDSC) , SriHariKota (SHAR) island on the east coast helped in characterizing precipitation and providing a long range coverage for detection and characterization of severe weather events like Thunderstorms and Cyclones, apart from helping in the now casting of weather for Launch Commit Criteria of major launch vehicle missions. Efforts were also made for the Inter comparison of Precipitation measurements from Ground based radars and Space based Precipitation Radar (PR) of the Tropical Rain fall Measuring Mission (TRMM), with a view to provide Ground Validation of Space based measurements. These efforts are planned to be continued in the context of future missions like Global Precipitation Mission (GPM). Proposed network of such Doppler Weather Radars at national level will not only enhance the quality of operational weather fore casts, but also provide a great opportunity for research in the area of radar remote sensing of Earth Atmosphere.

Currently a Multimode Clear Air Wind profiler is being designed for use at SDSC – SHAR, to provide an insight into prevailing winds & turbulence at Launch time for future launch vehicle missions like Geostationary Launch Vehicle , Mark –III (GSLV, Mk-III). Apart from generating climatology of winds and shears over different seasons with high resolution from Atmospheric Boundary Layer to marginally beyond Tropopause at this low latitude station,it is expected that this profiler will provide complimentary observations to MST Radar & the Lower Atmospheric Wind Profiler (LAWP) at Gadanki , in terms of movement of weather fronts from the Bay of Bengal to an inland location, which is essentially mountainous. Development of Ka band cloud radars is also planned at the national level, for ground based and space borne applications.

Highlights on all these Radar systems for remote sensing of atmosphere, along with some of the typical results from existing radar systems constitutes the contents of this paper.