



## **ARIES ST Radar (ASTRAD) at a mountain site (Nainital) in the central Himalayas**

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Nainital is ideally located in the central Himalayan region for studies on meteorology, dynamics, including stratosphere-troposphere exchange, long range transport of trace species and atmospheric waves. Globally, there are networks of radar available for studying the Stratosphere and Troposphere regions. In India, Himalayan region is void of such observational facility and the locations of ARIES, Nainital is best suited for this purpose. Nainital falls just to the north of the monsoon trough, essentially in the low level easterlies. This region is also dominated by western disturbances during winter and spring. Therefore, continuous monitoring of vertical structure in the wind is necessary to understand the total meteorology of this very interesting region for frontline atmospheric research.

In the reference of above, A Stratosphere-Troposphere Radar (wind profiler @ 206.5 MHz) has been installed at ARIES, Nainital (29.4N, 79.5E, ~1800 m amsl) in the central Himalayan region. It is an Active Aperture Distributed Phased Array that uses Solid State TR module and Digital Signal Processing techniques. Three elements Yagi-Uda antenna in quasi-circular aperture and triangular grid is used to arrange 588 elements in 12 clusters where each cluster consists of 49 elements. This radar has provision for two modes of operation, i.e. the Doppler Beam Swinging (DBS) and Spaced Antenna Drift (SAD). Peak power of this radar is ~ 235 kw and beam width is ~ 3°. Initially, a miniature version of this ARIES ST Radar (ASTRAD), with a single cluster of 49 elements was operated at Hyderabad. Following its successful demonstration, the radar system was moved to ARIES Nainital and more numbers of clusters were added one-by-one. Seven clusters of ASTRAD were made ready in September 2014 followed by 48 hours continuous operation and comparison of radar winds with winds from GPS radiosonde. Results were not encouraging due to presence of strong signal (clutter patch) close to 0 Hz, which was spreading over entire Doppler window with increase of power. Problem was identified and installation of the clutter fence was made around the antenna array during 2016-17. Following this, the ASTRAD was operated for about 570 Hrs with its seven/ten clusters and captured wind data up to height ~14 Km. During this period, extensive comparisons between radar winds and winds from GPS radiosonde were made. These results will be presented during the conference. Some other results from ASTRAD are also being presented in few companion papers.



**Figure 1.** Antenna array on the roof-top of the ASTRAD building with clutter fence along the periphery of the antenna array.