ATMOSPHERIC RESEARCH LAB (ARL)

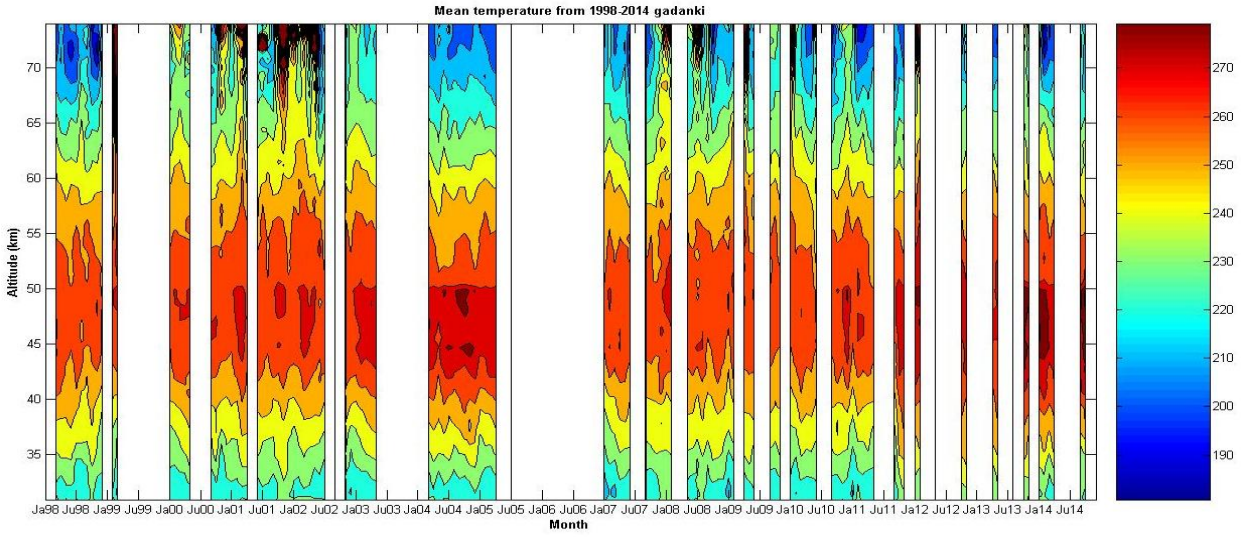
Atmospheric Research Lab (ARL) is a developing capability to predict the behavior of the atmosphere through Lidar and Radar observations and is involved in carrying out fundamental and applied research in Atmospheric Sciences. ARL was started on April 26, 2012 and inaugurated by Manchu Narayana Swamy, father of great visionary 'Padmasri' Manchu Mohan Babu, Chairman, Sree Vidyanikethan Educational Trust. ARL is administered by Principal, SVEC and Dr. P. Vishnu Prasanth, Research Coordinator. A Scientific advisory committee consisting of eminent scientists in the field of Atmospheric science, monitors the research activities and progress of ARL and provides future directions.

In ARL, the main objective is to study atmospheric gravity waves(GW) and their spectral characteristics in troposphere, stratosphere and mesosphere using a high power and highly sensitive coherent pulsed Doppler VHF Radar and Lidar facilities located at Gadanki, a northern hemisphere and lidar at Reunion Islands, France, a southern hemisphere site and also to study the wave coupling processes in the Mesosphere and Lower Thermosphere (MLT) region over a tropical station, Gadanki/Tirupati, which is located in the Northern hemisphere. No study exists to the best our knowledge dealing with the wave coupling between lower and MLT region during cyclone activity. Since our location is close to the Bay of Bengal (BoB), many episodes exist where the effect of tropical cyclones originated over BoB have signatures of GWs in the observations made over Gadanki using Mesosphere, Stratosphere and Troposphere (MST) radar and Rayliegh Lidar. Since Meteor radar is added to fill the gap region of 70-110 km, the proposed study is timely and will contribute to the better understanding both vertical and latitudinal coupling particularly during disturbed conditions. The study will focus on the following :

- Study the gravity wave characteristics in terms of time (frequency) and height (wave number), associated potential energy and their seasonal dependences based on large data set(14 years) using Lidars located at Gadanki and Reunion Islands, Reunion.
- Study to estimate gravity wave vertical wave number spectra and to compare them with model spectra using Indian MST radar observations of zonal, meridional and vertical winds.
- Study of climatological characteristics of the middle atmospheric temperature structure and its relation to different aspects, like, stratopause, tropopause, temperature warming and cooling.
- Investigate the tropical cyclone generated GWs and their role in altering the MLT dynamics and mean circulation.

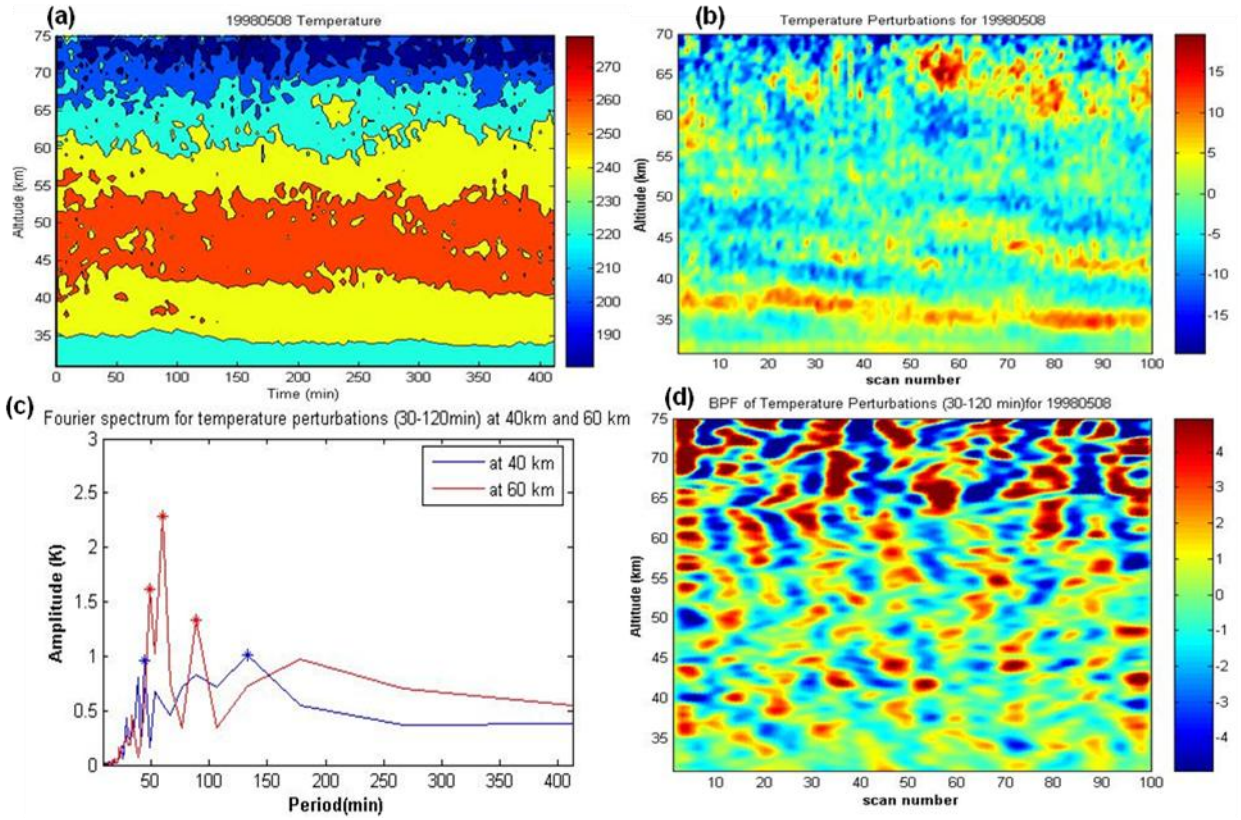
- Identifying the exact source for the generation of various GWs that are propagated to the MLT region using Ray Tracing technique (vertical coupling).

Inauguration of ARL by Shri Manchu Narayana Swamy garu



Contour plot of monthly temperature from 1998 - 2014 at Gadanki, NARL

Contour plots of (a) Vertical profile of temperature of a typical day (19980508) (b) Temperature Perturbations of a typical day (19980508) (c) Fourier Spectrum for temperature perturbations BPF (30-120m) (d) Band Pass Filtered (BPF) data for (30-120 min) of Temperature Perturbations



Ten-years climatology of Zonal, Meridional and vertical winds over Gadanki

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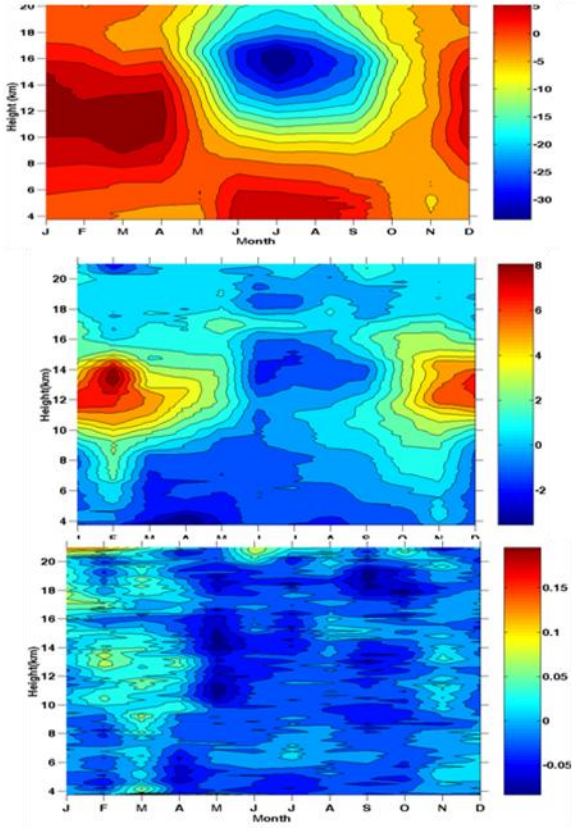

➢It is very interesting to observe the features of the Tropical Easterly Jet (TEJ) in the upper tropospheric region (13– 17 km), which is a well-established gravity wave source apart from atmospheric convection and orography over the present observational site.

➢Meridional winds in the upper troposphere (10–15 km) show a pronounced annual oscillation with a southerly direction during October–March and a northerly during April–September.

➢It can be seen that for direction almost all the months except for a few, the mean vertical motions are downward, which is consistent with earlier MST radar observations from other geographical locations.