LIDAR observation of middle atmospheric gravity wave activity over a southern sub-tropical station, Reunion Island (21 S; 55 E)

V. Sivakumar (1,2), D. Faduilhe (1) and H. Bencherif (1)

(1) Laboratoire de l'Atmosphère et des Cyclones (LACy), CNRS–UMR 8105, Université de La Réunion, FRANCE.

(2) National Laser Centre (NLC), Council for Scientific and Industrial Research

(CSIR), Pretoria, SOUTH AFRICA.

(venkatv_siva@rediffmail.com)

Gravity Wave (GW) plays an important role in energy and momentum transport from troposphere to the upper atmosphere. The prevailing convective activity over tropics and subtropical regions acts as an important source for the generation of GW. Reunion Island (21˚S, 55˚E) is located in sub-tropics where a large number of convective phenomena occur. Hence, the GW studies at Reunion Island may contribute to a better understanding of middle atmospheric on seasonal and long term scales.

Rayleigh lidar station at Reunion provides a continuous temperature profile since 1993. It also acts as a secondary station for the Network of Detection for Stratosphere Change (NDSC). We make use of 10 years (1994-2004) of recorded high resolution Rayleigh lidar measurements for the present study. Temperature profiles are derived from raw photon count profiles and for the 30-65 km height range, with a vertical resolution of 300 m. The obtained temperature profiles are further subjected to extract and delineate the GW features. The present study documents the GW characteristics in terms of time (frequency) and height (wavenumber), associated Potential Energy and their seasonal dependences. The frequency and wavenumber spectra are obtained for about 300 days where timely continuous data sets of about $4^1/_2$ hours are found. Generally, the temporal evolution of temperature profile illustrates the downward phase propagation indicating that the energy is propagating upward. The dominant time period of GW is found to be greater than 2 $^1/_2$ hours and has been illustrated in the mesosphere at the 60-65 km height region and the lower periodicity of less than $\sim$2 hours are found in the upper stratosphere (30-45 km). The potential energy (P.E) for 3 different height regions (36-42 km, 45-51 km and 54-60 km) are calculated and analyzed. The seasonal variation of GW associated P.E has also been investigated. It shows two distinguished maxima during June and November months. Further, the obtained results are planned to compare with models and the other reported results from different stations.