



Estimation of the Characteristics of Gravity waves over a Tropical Station, Cochin using ST Radar and ERA5 reanalysis data

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Abstract

The dynamics of the Earth's atmosphere are controlled by several fundamental physical processes. Most of these processes involve transferring energy and momentum from lower to upper layers. The waves are generated due to the rotation of the atmospheric medium which gravitationally restores the displaced atmospheric parcels to a state of equilibrium. These waves are known as the gravity waves. Wind profiler radars widely study these gravity waves. These radars provide wind profiles at very high temporal resolutions which enable the study of gravity waves originating in a wide range of frequencies. A stratosphere-troposphere (ST) wind profiler at 205 MHz is operational at the Advanced Centre for Atmospheric Radar Research (10.04°N; 76.33°E), Cochin University of Science and Technology, India provides AGW signature in the upper troposphere and lower stratosphere (UTLS). Wind measurements have been made with fine height and time resolutions using the ST radar. To obtain the wind fluctuation the time series data are averaged for the entire time period and subtracted from the individual values. The frequency spectra are obtained by the Fast Fourier Transform of the wind fluctuations. Finally, the power spectral density of the zonal, meridional, and vertical velocities are calculated. The hodograph analysis is used for the wind fluctuations, to obtain the vertical wavelength and propagation direction of gravity waves [1, 2]. The vertical (altitudinal) perturbations were computed from the vertical temperature profiles of ERA5 reanalysis data. The GW activity is characterized in terms of potential energy per unit mass [3, 4]. Here we present the simultaneous observation and characteristics of AGW activity from CUSAT ST radar and ERA5 reanalysis data in the UTLS region.

References

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