Characteristics of Atmospheric Waves in the Stratosphere Revealed by GPS Radio Occultation (RO) Temperature Data

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ABSTRACT

Characteristics of Atmospheric Waves in the Stratosphere Revealed by GPS Radio Occultation (RO) Temperature Data

1. Basic Concept of GPS Radio Occultation
2. Global Distribution of Atmospheric Waves in the Equatorial Meteorology

3. Horizontal Distribution of PE in January 2007

4. PE in the Northern Hemisphere during 2006/07 Winter

5. Analysis of Vertical Energy Flows in the Equatorial Meteorology

6. Summary

1. Basic Concept of GPS Radio Occultation

GPS radio occultation (RO) can measure temperature profiles with a good height resolution and accuracy comparable to radiosondes. RO provides global temperature data on a daily basis with simultaneous radiosonde and CHAMP GPS measurements, which are used for active limb sounding of the atmosphere and ionosphere. GPS Signals received on a low earth orbiting (LEO) satellite are used for active limb sounding of the atmosphere and ionosphere.

GPS RO data are used to derive the potential energy from the radio rays between the GPS and LEO satellites at atmospheres and ionosphere. Satellites are used for active limb sounding of the atmosphere and ionosphere.

GPS RO and compared with T106L60 AGCM results.

COSMIC PE data are used to derive the potential energy. Vertical energy fluxes due to gravity waves are given for the CCE/CM prediction up to 12 km.

3. Horizontal Distribution of PE in January 2007

Mean potential energy (J/kg) in January 2007 is shown in the left figure. Note that the potential energy is given for the CCE/CM prediction up to 12 km. Vertical energy fluxes due to gravity waves are given for the CCE/CM prediction up to 12 km.

The polar night jet itself generates gravity waves which propagate upward and downward, as evident in (b) by the downward flux vectors on the polar side of the jet above 20 hPa.

Large PE above the jet core is distributed upward/poleward along the zonal winds contour lines.

Energy fluxes are due to gravity waves generated around the jet. On the other hand, the relatively low PE is observed where strong wave filtering above the jet stream core results in decreases of PE around the 0–10 m/s wind line.

The polar jet generates large PE above the jet core which is typically around the 0–10 m/s wind line. This is in good agreement with the background wind, an interpretation supported by an analysis of the AGCM results.

The PE directly above the Canadian Rocky Mountains is 1.2–1.6 J/kg. This is in a low 500–100 hPa wind level.

Mean PE above the jet core is 1.8–2.2 J/kg. This is in a low 500–100 hPa wind level.

Mean PE above the jet core is 1.8–2.2 J/kg. PE is highest over the polar jet and sub-tropical jet.

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