UTILITY OF OCCULTATIONS FOR ATMOSPHERIC WAVE ACTIVITY STUDIES: RESULTS OF GPS/MET DATA ANALYSES AND FUTURE PLANS

T. Tsuda *(1), K. Hocke (2), and H. Takahashi (3)

(1) Radio Science Center for Space and Atmosphere, Kyoto University, Kyoto, Japan
(2) Communications Research Laboratory,Tokyo, Japan
(3) INPE, Sao Paulo, Brazil

GPS/MET (Global Positioning System/Meteorology) experiment initiated by UCAR has successfully provided profiles of humidity, atmospheric temperature and electron density fluctuations in the troposphere, stratosphere and ionosphere, respectively, by means of radio occultation observations of GPS signals. We have extracted meso-scale temperature perturbations in the lower stratosphere from individual GPS/MET profiles, and estimated potential energy (Ep) caused by atmospheric gravity waves. Our analysis shows that the largest Ep values at 20-30 km are generally centered around the equator between 25° N and 25° S with considerable longitude variations, and they are particularly enhanced over Indonesia, Africa and south America. That is, the enhancement is associated to areas of increased tropospheric water vapor pressure regarded as a measure of tropical convection. Further, electron density perturbations in the ionospheric E region are observed to be highly correlated to gravity wave activity in the lower stratosphere and to tropical convection zones. Our result strongly suggests that upward propagating atmospheric gravity waves, generated by active tropical convection, reach up to ionosphere, and generate ionospheric irregularities by an interaction between the waves and background geomagnetic fields.

In collaboration with the Brazilian space agency (INPE), we are proposing to conduct GPS occultation measurements on a LEO satellite, named EQUARS (Equatorial Atmosphere Research Satellite), which will be launched in 2005-6. As the inclination angle of EQUARS is less than 20 degrees, we will be able to obtain a dense data-set of temperature, humidity and electron density in the tropics, which will be very useful for the studies of vertical coupling processes in the equatorial atmosphere through upward propagating atmospheric waves.