# Applications of GPS occultation technique for monitoring the atmosphere

# Toshitaka Tsuda[1]

[1] RASC, Kyoto Univ.

Various properties of the Earth's atmospheric and ionosphere can be derived by analyzing propagation characteristics of GPS radio waves. In particular, a profile of refractive index is retrieved from the bending of ray path for GPS signals, passing through the atmosphere at low and negative elevation angles, which is called the GPS occultation technique. This active limbsounding measurement has been realized by using a GPS receiver aboard a low-earth orbiting (LEO) satellite. Recent LEO missions such as CHAMP and SAC-C have achieved significant progress in measuring water vapor and temperature profiles in the troposphere and stratosphere. The GPS occultation technique is also applicable to the planetary boundary layer by using GPS receivers on top of high mountains and aboard aircrafts (this is referred to as down-looking GPS occultation). The GPS remote sensing has become a powerful tool for scientific research, and provided valuable data-sets for assimilation into climate and numerical weather prediction models. As one theme of the project, Application of precise satellite positioning for monitoring the Earth"s environment, we are developing the new technique for monitoring the atmosphere with the GPS occultation technique. In collaboration with the Brazilian space agency (INPE) and UCAR, GPS-LEO occultation experiment will be conducted by EQUARS (Equatorial Atmosphere Research Satellite), which will be launched in early 2006. Inclination angle of the EQUARS orbit is planned to be less than 20o so we will be able to obtain a dense data-set of temperature, humidity and electron density in the equatorial region. In order to realize EQUARS project, we are developing the onboard GPS receiver. On the other hand, the mountain-based GPS occultation measurements have done on the top of Mt. Fuji from 2001 to 2003. The some water vapor and temperature profiles below 4km are obtained. We also have started airborne GPS occultation experiment by using a new GPS receiver developed for this measurement. For the effective utilization of these GPS occultation data, a data transfer and analysis system of GPS occultation data is constructed. Since the atmospheric parameter such as the refractive index retrieved from GPS occultation data will be assimilated into the numerical prediction model operationally after 2006, we will develop the data assimilation method in order to improve the accuracy of weather forecast. We discuss recent status in this project.