An Introduction of Mountain-based GPS Radio Occultation Experiments in China

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Mountain-based GPS radio occultation is to receive the radio signals from GPS satellites with very low elevations or even negative elevations with a receiver at the top of mountains. These radio signals are refracted and bended due to the atmospheric refractivity. Measurements of the carrier phases can be used to estimate the bending angles, and to retrieve the atmospheric refractivity profiles below the altitude in which the receiver is located. According to calculations, one receiver can track about 80-100 GPS occultation events with a 360° field of view per day. Locations of observation profiles are distributed within a circular area with a radius of about 100km. It is an economic and potential technique exploring local lower atmospheric refractivity profiles.

An experiment of the mountain-based GPS radio occultation was conducted at Yaogu mountaintop (29°23'N, 113°41'E, ∼1240m) on Dec. 17, 2003. The JAVAD EU80 dual frequencies receiver was used in this experiment with the JAVAD MARANT antenna and a sampling rate is of 10Hz. Half-hour data and three occultation events were obtained. On July 24, 2004, another experiment was held in Jiugong mountaintop (29°.64'N, 114°.22'E, ∼1550m). Three and half-hours data and eleven occultation events were obtained with the same receiver used in the Yaogu experiment. The scientific data processing techniques for both space-based and mountain-based radio occultation have been developed in CSSAR. The software for mountain-based occultation data processing is used to retrieve the atmospheric refractivity profiles.

Validation experiments were conducted in Wuling mountaintop (40.60°N, 117.48°E, ∼2118m) in Aug., 2005. Almost one-month data were obtained. At a county near the mountaintop, the atmospheric vertical profiles were obtained with the radiosonde in the same period. The radiosonde data are used to compare with the GPS radio occultation data for validations. Simultaneous profiles measured with the GPS radio occultation and the radiosonde show good agreements.