

Spatial Variation in Atmospheric Wet Delay Observed by a Ground-Based Dual-Channel Radiometer

*Yuei-An Liou*¹

Abstract

A ground-based water vapor radiometer (WVR) was utilized to investigate the influence of water vapor on the propagation of Global Positioning System (GPS) signals through the atmosphere. The influence is in general characterized as so-called "wet delay" (WD). WD were inferred from brightness temperatures at 23.8 and 31.4GHz observed by WVR installed at Taipei weather station from March 18 to 25, 1998, and the corresponding opacity depths. During the field campaign, the WVR was initially installed due east, while it was turned to north periodically. An elevation mirror is used to guide atmospheric emission to the antenna. It is designed to rotate perpendicularly to the WVR itself so that elevation angles can be automatically adjusted to scan the atmosphere every 15° at angles between 15° and 165°. In order to derive retrieval coefficients, radiosonde data collected at Taipei weather station in each March starting from 1988 to 1997 were used. WD from WVR measurements varies from 14.8cm for clear sky to 40.8cm for rainy/cloudy conditions at zenith. WD observations at angles from 15° to 165° indicate that stratified atmosphere becomes an less appropriate assumption with viewing angles departing from zenith. The deviation is increased to as much as 8.3cm at angle of 165°.

Keywords: Wet delay, Brightness temperature, Optical depth.

¹ Associate Professor, Center for Space and Remote Sensing Research, and Institute of Space Sciences, National Central University