

论文

### 应用地基GPS遥感倾斜路径方向大气水汽总量

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**摘要** 应用地基GPS沿倾斜路径方向遥测大气水汽总量, 是获得测站周围水汽三维空间分布信息(水汽层析)的基础. 本文介绍了地基GPS沿倾斜路径方向遥感大气水汽总量的原理和方法: 首先用湿梯度、后处理残差联合计算接收机上空不同方位上大气水汽各向异性成分, 在此基础上重构倾斜路径水汽总量. 为验证GPS观测结果精度, 用微波辐射计(WVR)与GPS一起进行了联合观测, 不同观测地点和时间的对比结果表明, 二者root mean square (RMS)误差小于4mm, 证明应用此种方法地基GPS可较精确地反演出倾斜路径方向大气水汽总量, 而且这种反演方法适合于近实时大气遥感探测. 地基GPS测量具有全天候可连续观测等优点, 可以弥补常规观测的不足, 为气候研究提供高精度且连续的水汽数据资料; 组网观测可以为数值天气预报提供好的初始场, 提高模式预报精度.

**关键词** [全球定位系统\(GPS\)](#) [遥感](#) [倾斜路径](#) [水汽](#)

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### Remote sensing of the amount of water vapor along the slant path using the ground base GPS

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**Abstract** Remote sensing of the amount of water vapor along the slant path using the ground base GPS is the basis of getting the three dimensional distribution (water vapor tomography) of water vapor in the immediate vicinity of the site. The principle of remote sensing of water vapor along the slant path using GPS is described in this paper. First, the nonisotropic component of water vapor in different azimuth above the GPS receiver is calculated using the wet gradient and the post fit residuals, and then slant path water vapor is recreated. In order to prove the accuracy of GPS observation, water vapor radiometers (WVR) were used to observe together with GPS. Comparison between WVR and GPS observations at different sites and times shows that root mean square error is less than 4 mm. Therefore, the slant path water vapor amount can be accurately retrieved using this method, which is suited for nearly real time remote sensing and detection of the atmosphere. Ground base GPS measurements of water vapor have the advantage of all weather continued observations. It is a supplement to traditional water vapor observations and provides accurate continued water vapor data for climate research. It also can provide good initial conditions for numerical weather prediction if using GPS receiver network and improve the accuracy of forecasting.

**Key words** [Global Positioning System \(GPS\)](#); [Remote sensing](#); [Slant path](#); [Water vapor](#)

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