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## 利用北京GPS监测网分析夏季暴雨的水汽特征

Characteristics of Precipitable Water Vapor of Summer Rainstorm Based on Beijing GPS MET Network

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### 摘要:

利用覆盖北京地区的地基GPS水汽监测网数据反演的地基GPS大气柱水汽含量(precipitable water vapor,PWV),分析了2009年7月3次暴雨天气过程中大气柱水汽含量的水平分布特征;利用高空、地面常规气象资料以及加密气象自动站观测资料计算地面和高空比湿,结合温度、风等物理量分析3次暴雨天气过程中的大尺度水汽输送和中尺度局地辐合作用;对最大降水强度以及降水量的时间变化的分析表明:3次降水落区分布特征与降水前期大气柱水汽含量高值的水平分布较为一致;大气柱水汽含量曲线变化特征与各尺度天气系统造成的水汽输送和水汽辐合密切相关,大气柱水汽含量的大小与水汽来源密切相关;降水前4小时内大气柱水汽含量出现陡增,线性增速大于1.1 mm/h,最大降水强度出现在大气柱水汽含量峰值出现后的1~2 h。

关键词: [大气柱水汽含量\(PWV\)](#) [水汽输送](#) [切变线](#)

### Abstract:

Based on the inversion data of perceptible water vapor (PWV) from ground based GPS network in Beijing, the ichnography distribution characteristics of PWV before precipitation are analyzed. Using ground and upper air meteorological data from the routine AWS and IAWS, the specific humidity of different heights are calculated, which are associated with temperature and wind, the large scale vapor transportation and the local mesoscale convergence. The changes of PWV, occurrence time of precipitation, rainfall and hourly rain intensity are analyzed. According to the precipitation and the curve of PWV in July 2009, the rainfall are not correspond with the PWV value, but it is nearly associated with the vapor transportation and vapor convergence evoked by all kind scales weather systems. The value of PWV increases continuously before precipitation, sometimes there is a sudden increase an hour before precipitation. The ichnography distributions of high PWV value are accord with precipitation area. Curve change of PWV is nearly related with vapor transportation and convergence, and the PWV is related with vapor resource in 3 ways. There is large scale vapor transportation and local mesoscale convergence, the PWV is stably increasing, 4 hours before precipitation, the PWV rises sharply, the local precipitation will occur 2—3 hours after the value of PWV reaches above 50 mm. There is large scale vapor transportation, but there is not precipitation mechanism, the PWV has exceeded 50 mm, the vapor will increase continuously and maintain. The rain will not occur until the precipitation mechanism appears. There is no apparent resource of outer vapor, and the overall level of the PWV is not high. Effects of local apparent wind converge and shear, 2 hours before precipitation, the PWV value increases sharply. The PWV value will exceed 50 mm an hour before precipitation, and the precipitation area is relative convergence. Above all, it shows that if vapor conditions and precipitation mechanisms are suitable, the precipitation will occur 2—3 hours after PWV reaches 50 mm. Otherwise it will not rain even if the PWV value is greater than 50 mm until precipitation mechanism occurs. From the curve of PWV and timely change of precipitation, 4 hours before precipitation, the curve of PWV shows abrupt increase by larger than 1.1 mm per hour. The maximum of hourly rain intensity occurs 1—2 hours after the peak of PWV.

Keywords: [perceptible water vapor \(PWV\)](#) [vapor transportation](#) [shear line](#)

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