

Retrieval of Water Vapor Anisotropy from GPS and it's Relation with Convective Precipitation

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Procedures for retrieving two indices indicating the degree of inhomogeneity of water vapor using the carrier phase of a Global Positioning System (GPS) have been introduced. One index describes the spatial concentration of water vapor (WVC); the other indicates higher order water vapor inhomogeneity (WVI). Horizontal scales of the two indices are roughly thought of as 60 km and 2-3 km, respectively.

The relationships between these indices and precipitation were examined statistically. The results indicate that the inhomogeneity indices are more strongly correlated with strong rainfall than PWV. PWV seemed to relate to precipitation of less than 10 mm/h but did not exhibit much of a relationship with precipitation greater than 10 mm/h. These relationships hold true for both present and imminent precipitation.

The spatiotemporal variations in the indices associated with an F3 tornado occurred on 6 May 2012 were also examined. WVI showed distinct variation around the event.

The results suggest that the two GPS-derived indices of water vapor inhomogeneity reflect local variations in the water vapor associated with the convection phenomena and could potentially be used for the monitoring of extreme weather like thunderstorms and tornados.

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