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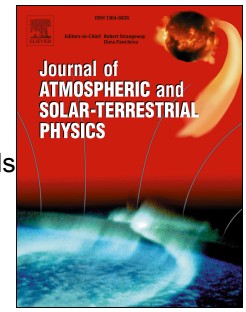


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# Parameterization of water vapor using high-resolution $GPS$ data and empirical models

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**Abstract**

The present work evaluates eleven existing empirical models to estimate Precipitable Water Vapor ($PWV$) over a high-altitude (4500 m amsl), cold-desert environment. These models are tested extensively and used globally to estimate $PWV$ for low altitude sites (below 1000m amsl). The moist parameters used in the model are: water vapor scale height ($H_c$), dew point temperature ($T_d$) and water vapor pressure ($E_{s0}$). These moist parameters are derived from surface air temperature and relative humidity measured at high temporal resolution from automated weather station. The performance of these models are examined statistically with observed high-resolution GPS ($GPS_{PWV}$) data over the region (2005-2012). The correlation coefficient (R) between the observed $GPS_{PWV}$ and Model $PWV$ is 0.98 at daily data and varies diurnally from 0.93 to 0.97. Parameterization of moisture parameters were studied in-depth (i.e., 2 hrs to monthly time scales) using $GPS_{PWV}$, $T_d$, and $E_{s0}$. The slope of the linear relationships between $GPS_{PWV}$ and $T_d$ varies from 0.073°C$^{-1}$ to 0.106°C$^{-1}$ (R: 0.83 to 0.97) while $GPS_{PWV}$ and $E_{s0}$ varied from 1.688 to 2.209 (R: 0.95 to 0.99) at daily, monthly and diurnal time scales. In addition, the moist parameters for the cold desert, high-altitude environment are examined in-depth at various time scales during 2005-2012.

*Key words:* `Precipitable water vapor; high-altitude; GPS; scale height; Parameterization`

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