



Comparison of wet tropospheric delay measurements from Raman lidar and GPS during the VAPIC campaign

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A pointing Raman lidar system has been developed jointly by Institut Géographique National and Service d'Aéronomie. GPS and lidar measurements will be used for two specific applications: the study of the of water vapor heterogeneity in the lower troposphere and the calibration of GPS measurements for high accuracy GPS positioning. The lidar provides humidity profiles (during nighttime only) up to 5 km in vertical pointing and 7 km on slant paths. Lidar profiles are typically averaged over 5 minutes. GPS provides integrated contents in either zenith direction (converted from zenith tropospheric delay - ZTD - parameters) or slant paths (reconstructed from ZTD, gradients and post-fit residuals). We present a GPS vs. lidar comparison from the VAPIC campaign (17 May - 15 June 2004). Wet tropospheric delays from both systems are compared to each other, as well as to radiosonde and microwave radiometer data. The agreement observed in zenith pointing is between 3 mm and 8 mm RMS (from 5 nights). Slant paths measurements agree within 10 mm RMS (also from 5 nights). The differences between GPS and lidar wet delays are believed to be mainly due to shortcomings in the GPS data procedure (tropospheric models) and instrumental error sources (multipath and GPS antenna phase center variations). Agreement is increased when correcting GPS slant delays for multipath effects modeled from post-fit residual stacking over one month. It is expected that using pointed (in direction of GPS satellites) lidar measurements for an external calibration of GPS data will allow achieving 1-mm accuracy or bettering in GPS heights.