Intercomparison of IWV measurements from radiosonde, sunphotometer, FTIR, and GPS instruments at Uccle

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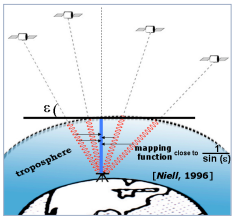
AIM

→ Obtain a better monitoring and understanding of the changing water vapor content in the atmosphere.
→ Assess the '*quality*' of the different measurements: the precision - accuracy - performance.
→ Characterize and improve the quality of the integrated water vapor (IWV) measurements.

GPS system



CIMEL

INSTRUMENTS

→ Cimel sunphotometer : ● direct sun measurements @ 940 nm (and @ 675 and 870 nm for aerosol correction)
● clear sky only
● level 2 data from the AERONET website (http://aeronet.gsfc.nasa.gov)

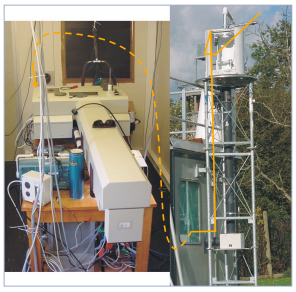
→ GPS system: ● Global Navigation Satellite System (GNSS)

→ Radio sondes: ● Vaisala RS80 and RS9X
● launched around 12:00 UT

→ FTIR - Fourier Transform Infrared spectrometer: ● solar absorption mode measurements
● 1 line @ 4198 cm^{-1}, belonging to spectra covering the region 3950-4300 cm^{-1}
● clear sky only

Radio sonde

FTIR

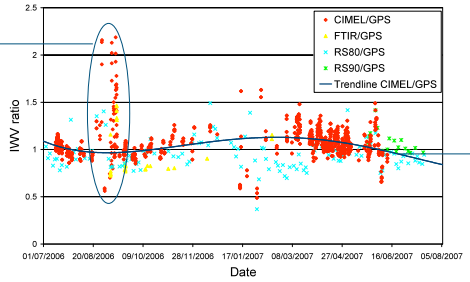


LOCATION & PERIOD

→ June 2006 - July 2007
→ UCCLE (Belgium, 50°48'N, 4°21'E, 100 m asl)

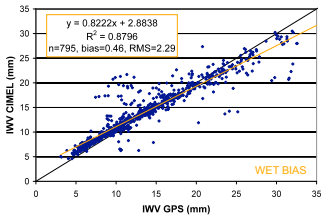
RESULTS

Large difference between CIMEL and GPS data during the period from 26/08 to 12/09

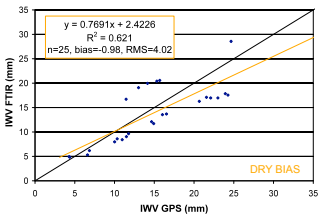


CIMEL/GPS data shows some seasonal variations

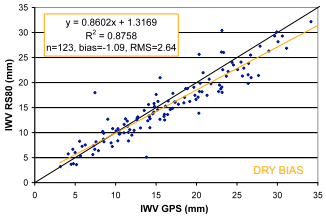
CIMEL vs. GPS



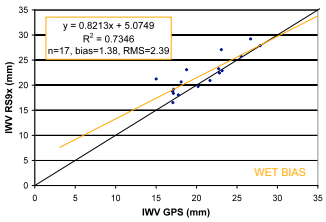
FTIR vs. GPS



RS80 vs. GPS



RS9x vs. GPS



DRY → RS80 → FTIR → GPS → CIMEL → RS9x → WET

SUMMARY & CONCLUSIONS

→ The bias between CIMEL and GPS IWV data is generally relatively small.
→ In the period from 26/08 to 12/09 a larger discrepancy is observed between CIMEL and GPS data:
● Non-hydrostatism of the troposphere can result in an underestimation (up to max . 3 mm) of the GPS IWV values.
● Part of the overestimation of the GSP IWVs could be explained by the presence of hydrometeors *[Brenot et al., 2006]*.
→ The ratio between CIMEL and GPS data exhibits a seasonal variability.
→ For large IWV values (>15 mm) the GPS measurements appear to overestimate the IWV (regression slopes 0.7-0.9).
→ The RS80 radio sonde data have the largest dry bias. This can be explained by the observed dry bias in vertical relative humidity profiles.

ACKNOWLEDGEMENT

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