Measurements of H_2 vertical profiles at Cabauw tall tower station (NL)

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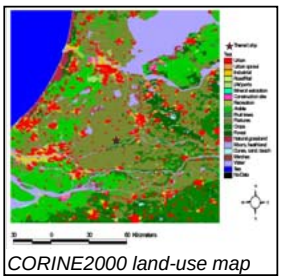
Cabauw station

Station code	CBW
Location	Lopik, NL
Coordinates	51°58'N, 4°55'E, -2 masl
Sampling heights	200, 120, 60, 20 m

In-situ measurements

CO_2 (LiCor 7000)
CH_4, CO, N_2O, SF_6 (GC – FID and ECD)
H_2, CO (RGA - 3)
^{222}Rn (ANSTO)
Meteorological parameters (KNMI)



CORINE2000 land-use map

H_2 and CO data overview

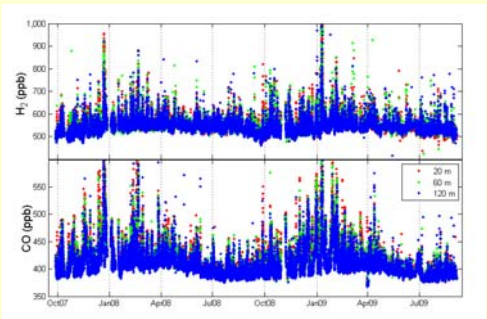


Fig. 1. H_2 and CO time series; the colors represent different sampling heights

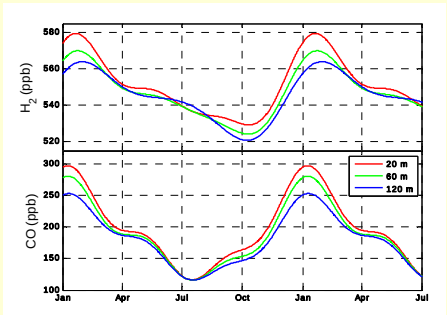


Fig. 2. H_2 and CO seasonal cycles

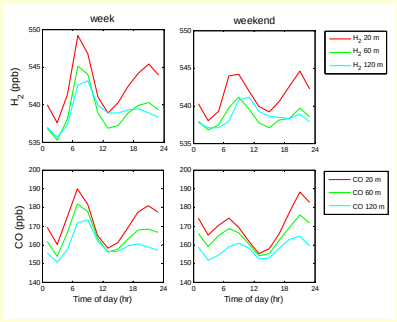
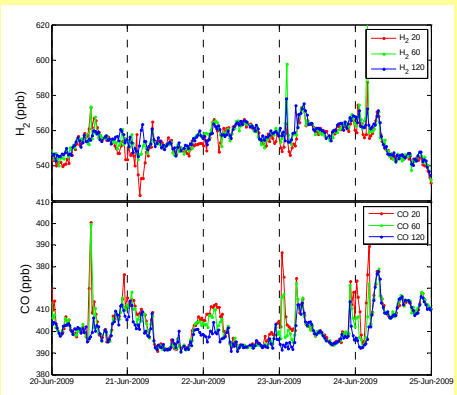
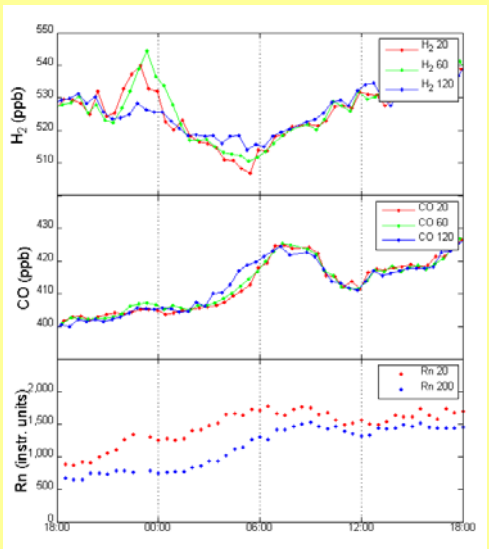


Fig. 3. H_2 and CO diurnal cycles, for week and weekend days. The difference between week and weekend was described by Steinbacher et al., 2007

H_2 short term variability

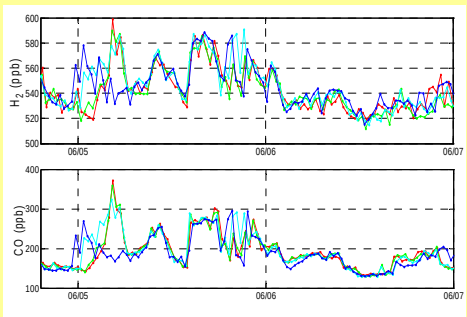


a)



b)

Fig. 4. Signature of H_2 soil uptake.
a) H_2 vertical gradients are diminished by source-sink compensation, but no decrease is observed in H_2 mole fraction
b) H_2 decrease during night, while CO and Rn are increasing. Rn tracer method (Hammer and Levin, 2009)



H_2 : CO slope		
	20 m	→ 0.34
	60 m	→ 0.35
	120 m	→ 0.37
	200 m	→ 0.38

Fig. 5. Two days H_2 and CO from four sampling heights. The computed H_2:CO ratios (not corrected for soil uptake) are consistent with values previously calculated (e.g. Hammer et al., 2009). The vertical variation of the H_2:CO suggests uptake of H_2 near the ground or CO consumption at high levels.

References

Hammer, S. and Levin, I. 2009. Seasonal variation of molecular hydrogen uptake by soils inferred from atmospheric observations in Heidelberg, south-west Germany. Tellus 61B, doi:10.1111/j.1600-0889.2009.00417.x.

Hammer, S., Vogel, F., Kaul, M. and Levin, I. 2009. The H2/CO ratio of emissions from combustion sources: comparison of top-down with bottom-up measurements in the Rhine-Neckar region in south-west Germany. *Tellus* **61B**, doi:10.1111/j.1600-0889.2009.00418.x.

Steinbacher, M., Fischer, A., Vollmer, M. K., Buchmann, B., Reimann, S. and co-authors. 2007. Perennial observations of molecular hydrogen (H2) at a suburban site in Switzerland. Atmos. Environ. 41(10), 2111–2124.

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