



Towards a European budget of atmospheric molecular Hydrogen

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Quantitative knowledge of the global atmospheric molecular hydrogen (H_2) budget is still limited due to the lack of precise long-term atmospheric observations in background air and in particular over continental areas. Also, systematic process studies on major H_2 sources and sinks are still very sparse. In the frame of the European research project EUROHYDROS we performed continuous atmospheric observations of H_2 and other trace gases, e.g. carbon monoxide (CO) and ^{222}Rn , to investigate the regional H_2 sources and sinks in the catchment area of the site. These observations were supplemented by dedicated field studies of the mechanisms determining the soil sink. From these process studies we could find a quantitative dependence of the H_2 soil sink on soil humidity (which limits the diffusive transport of H_2 to the enzymes responsible for oxidation). This will allow up-scaling of the H_2 sink process - responsible for about two thirds of the total global H_2 sink - to larger areas, based on soil texture distribution and soil humidity variations. Representative uptake rates, well comparable in size to the direct field measurements, could independently be derived from our atmospheric observations using the Radon-tracer-method during strong night-time inversion situations. Deposition velocities varied between 1 and $8 \cdot 10^{-2}$ cm/s with a long-term mean value of $3.4 \pm 1.4 \cdot 10^{-2}$ cm/s. These atmospheric measurements also yielded representative H_2 /CO emission ratios from combustion sources (mainly traffic) which agreed well to respective measurements in the direct vicinity of the sources. These results can be used to reliably estimate the combustion source of H_2 from CO emissions inventories for polluted areas in Europe.