



## **Variation of molecular hydrogen tropospheric concentration over Southern Poland - results of the continuous chromatographic measurements.**

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Although hydrogen is one of the fundamental constituents of the earth's atmosphere its global balance is still poorly clarified. A few developed inventories diverging values for efficiency of sources and sinks of this gas. The European network for the hydrogen concentrations measurement is based on several unevenly spaced measurement points. While in 2009 MPI Jena has delivered accurate scale for hydrogen measurements and the techniques of analyses are well described, still large areas of Central Europe is uncovered by representative stations.

The first measurement point, established under the EUROHYDROS EU program, on the territory of Poland was Kraków city. Different laboratory setups was tested there and compared to each other. The Kraków area has significant car traffic and its geographical location implies frequent temperature inversions in lower troposphere leading to the accumulation of trace gases in atmosphere of the city. Observations launched in 2007 revealed that the concentration of hydrogen fluctuates strongly within diurnal and seasonal timescales. Its average concentration is three times larger than this, observed at the other stations. The European "background" concentrations of hydrogen are not reflected in the Krakow record.

An ideal place to carry out observation of the regional air composition for Central Europe is a research station located in the meteorological observatory at Kasprowy Wierch. Measurement point at the top of mountain peak with elevation of 2000m a.s.l. gives an access to the well mixed troposphere. The station delivers also the necessary facilities and logistics. Since year 1996 greenhouse gas measurement program has been operating at this point.

The first measurements of atmospheric concentrations of hydrogen at Kasprowy Wierch were performed in year 2010, based on dedicated gas chromatograph using RGD detector installed at the station. Analysis of hydrogen content in the outside air is performed without any enrichment process with precision better than 1ppb. But a temporary problems with UV lamp power supply module considerably hampers the research and adversely affect the reproducibility of the analysis. The results should be treated as a preliminary diagnosis of the diurnal and seasonal variation of the hydrogen concentration at the mountain site.

The average short term variation of hydrogen concentrations does not exceed 50ppb and reveals the periodic nature except special situations when the concentration abruptly rises up by 150ppb and returns to an average of 480-520ppb. It is possible to observe the variations with larger time constant probably related with mezo-scale circulation in atmosphere and slight seasonality in the level of hydrogen observed in autumn and in winter (with amplitude of 50ppb).

Measurements carried out at Kasprowy Wierch were also used to balance the hydrogen for the city of Kraków.

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