



## **SI-traceable and dynamic reference gas mixtures for water vapour at polar and high troposphere atmospheric levels**

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In the framework of METAS' AtmoChem-ECV project, new facilities are currently being developed to generate reference gas mixtures for water vapour at concentrations measured in the high troposphere and polar regions, in the range 1-20  $\mu\text{mol/mol}$  (ppm). The generation method is dynamic (the mixture is produced continuously over time) and SI-traceable (i.e. the amount of substance fraction in mole per mole is traceable to the definition of SI-units).

The generation process is composed of three successive steps. The first step is to purify the matrix gas, nitrogen or synthetic air. Second, this matrix gas is spiked with the pure substance using a permeation technique: a permeation device contains a few grams of pure water in liquid form and loses it linearly over time by permeation through a membrane. In a third step, to reach the desired concentration, the first, high concentration mixture exiting the permeation chamber is then diluted with a chosen flow of matrix gas with one or two subsequent dilution steps. All flows are piloted by mass flow controllers. All parts in contact with the gas mixture are passivated using coated surfaces, to reduce adsorption/desorption processes as much as possible. The mixture can eventually be directly used to calibrate an analyser.

The standard mixture produced by METAS' dynamic setup was injected into a chilled mirror from MBW Calibration AG, the designated institute for absolute humidity calibration in Switzerland. The used chilled mirror, model 373LX, is able to measure frost point and sample pressure and therefore calculate the water vapour concentration. This intercomparison of the two systems was performed in the range 4-18 ppm water vapour in synthetic air, at two different pressure levels, 1013.25 hPa and 2000 hPa.

We present here METAS' dynamic setup, its uncertainty budget and the first results of the intercomparison with MBW's chilled mirror.