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Volatile organic compounds in the Uintah Basin, Utah: first results of the new PTR-MS system

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Volatile organic compounds (VOCs) are emitted into the Earth′s atmosphere from various sources. They are controlling the photochemical production of ozone (together with reactive nitrogen) or influencing directly (via e.g. acetone) or indirectly (via ozone) the Earth′s oxidation capacity. VOCs play the key role in a lot of different chemical processes that take place in every layer of the atmosphere and are therefore an important player in the Earth′s climate. The need for a better understanding of the dynamical and chemical processes with VOCs is for that reason obvious.

Measuring VOCs can be done accurately and fast with Proton-Transfer-Reactions Mass Spectrometry (PTR-MS). The presented measurements have been carried out with a newly developed PTR-MS system, which is extremely lightweight and compact compared to commercially available instruments. The weight and space savings have been possible by designing new vacuum chamber and electronics and are necessary for future deployments on the research aircraft HALO (High Altitude And Long Range Research Aircraft – German Science Foundation) and the passenger aircraft used during CARIBIC (Civil Aircraft for the Regular Investigation of the atmosphere Based on an Instrument Container – Lufthansa).

First deployment of the ultra-light-weight PTR-MS (ULW-PTR-MS) has been performed during the ground-based field campaign “Energy and Environment – Uintah Basin Winter Ozone Study” (E&E UBWOS 2012) in Utah (USA), together with $\sim$20 instruments from our research groups. This gave the opportunity to compare the instrument to standard PTR-MS and GC-MS. The Uintah basin has large oil and gas exploration which cause very high mixing ratios of VOCs and even wintertime ozone exceedances. Highly elevated values have been observed.

Preliminary results of the campaign and in particular of the PTR-MS measurements will be shown.