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Long-term measurements of CO, NO, NO_2, organic compounds and PM_{10} at a motorway location in an Austrian valley

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Vehicle exhaust emissions can have a large impact on air quality in both urban and rural areas. Air quality in mountainous landscapes in particular is additionally strongly influenced by local meteorology. Horizontal dilution within in a mountainous valley is limited and calmer wind situations and longer lasting inversion layers compared to flat terrain restrict vertical mixing, often leading to an accumulation of air pollution in the boundary layer. To gain an insight into VOC concentrations in a mountainous river-valley location a proton-transfer-reaction mass spectrometer (PTR-MS) was set up in the Alpine River Inn valley (Tirol, Austria) to measure key VOCs, such as benzene and toluene, complimenting routine data acquisition of CO, NO_x and PM_{10}. Measurements of wind speed and direction at this location, as well as collection of temperature profile data of the lower troposphere allowed the meteorological situation to be studied for this site. Furthermore, motorway vehicle abundance data were available for incorporation into the data analysis.

Measurements began in February 2004 and are currently ongoing. Preliminary data indicate a strong correlation between NO_x and heavy duty vehicle abundance. Similarly, the aromatic compounds are well-related to light duty vehicle frequency. Levels of CO, NO_x, PM_{10} and VOCs are strongly influenced by local meteorology, with concentrations higher over prolonged periods when weather conditions limit boundary layer mixing. Furthermore, maxima in concentrations and their relative diurnal variations follow a distinct annual pattern, being higher and occurring earlier in autumn

and winter when there is little solar irradiation (NO maxima of 500-550 μg m^{-3} for March and October 2004) as compared to the summer months (NO maxima of 350 μg m^{-3} for June).