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Monitoring atmospheric greenhouse gases – results from a continental tall tower measurement station at Bialystok, Poland

E. Popa (1), E. Gloor (2), A. Jordan (1), U. Schultz (1), F. Haensel (1), T. Seifert (1), M. Heimann (1)

(1) Max Planck Institute for Biogeochemistry, Jena, Germany (2) University of Leeds, Leeds, UK

CHIOTTO – Continuous HIgh-precisiOn Tall Tower Observations of greenhouse gases – was an European Union-funded project, having as objective to build an infrastructure for the continuous monitoring of greenhouse gas concentrations across Europe above the surface layer using tall towers. For this purpose, a new analysis system for continuous atmospheric measurements was built and tested at Max Planck Institute for Biogeochemistry (Jena, Germany) and was installed at a 300m tower close to Bialystok, Poland (Lat 53˚14'N, Long 23˚01'E, Alt 180m), as part of the "CHIOTTO" tall tower network. Since July 2005 this system is measuring quasi-continuously the atmospheric mole fractions of CO_2, CH_4, CO, N_2O, SF_6 and the O_2/N_2 ratio, as well as meteorological parameters (atmospheric pressure, temperature, humidity; wind speed and direction) from 5 heights on the tower ranging from 5 to 300 m. The measurement devices are: an Oxzilla oxygen fuel cell analyzer, a LiCor-7000 NDIR CO_2 analyzer, an Agilent gas chromatograph (GC) with flame ionization detector (FID) and electronic capture detector (ECD) for CH_4, CO, N_2O and SF_6. The challenge was to build a reliable automatic system which can run continuously without assistance and to fulfill at the same time the high precision requirements for all the measured species.

A great variety of information can be extracted from the acquired measurement data. The air sampled at different heights carries information about different influence areas, from local to regional. The simultaneous measurement of different species allows observing the correlations between them, which can constrain their sources and sinks and the processes affecting them. The high temporal resolution captures short term

events and diurnal variability. In addition, the system is planned to run for at least several years in order to observe long-term trends as well.

We describe the main features of the measurement system and the region of influence of the station. In addition we present some of the measurement results, with the main accent on the species inter-correlation observed on various time scales and for different origins of the sampled air.