



First measurements of a suite of halogenated greenhouse gases over Eastern Europe

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Chlorofluorocarbons (CFCs) and its replacement compounds hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs) are used in a wide range of applications such as air conditioning, refrigeration, foam blowing and as aerosol propellants. Due to their harmful effect on the stratospheric ozone layer and their infrared-absorbing properties, the emissions of these compounds are restricted under the Montreal (CFCs and HCFCs) and the Kyoto (HFCs) Protocol, respectively.

Given the atmospheric persistence of these gases, their emissions can be estimated in a straightforward manner from ambient air concentrations, providing an independent tool to check for compliance with the above mentioned regulations. While such studies have considerably improved our understanding of halogenated greenhouse gas emissions in Western Europe, North America and Eastern Asia, the magnitude and share of Eastern European emissions remain subject to speculation.

To help filling this important gap, we conducted a half-year measurement campaign at a rural station in central Hungary (K-Pusztá, approx. 50 km southeast of Budapest). Ambient air concentrations of more than 20 halogenated compounds as well as methane, nitrous oxide, CO and Radon (²²²Rn) were continuously measured between March 2009 and October 2009. In combination with the meteorological data routinely assessed at the site, we use these data to estimate the emissions and principal sources of a variety of CFCs, HCFCs and HFCs.

As a first result, we estimate only minor on-going emissions of CFC-11 and CFC-12 (both used as refrigerant), indicating the successful ban of these compounds in Hungary as a consequence of the Montreal Protocol. Contrastingly, pronounced concentration peaks are regularly observed for various HFCs including HFC-125 (used in stationary cooling systems), HFC-134a (mobile air conditioning) and HFC-152a (foaming agent), suggesting an extensive usage of new generation halocarbons in this region.

To our knowledge, this study provides the first comprehensive data set of halogenated greenhouse gases in Eastern Europe, and the results potentially allow for an independent verification of the emissions submitted to UNFCCC under the Kyoto Protocol.