Geophysical Research Abstracts
Vol. 21, EGU2019-3110, 2019
EGU General Assembly 2019

Long-term monitoring of volatile organic compounds at the background and suburban sites in the Czech Republic (1995-2018)

Milan Váňa, Jitka Diskova, and Jaroslav Pekarek
Czech Hydrometeorological Institute, Praha, Czech Republic (milan.vana@chmi.cz)

Volatile organic compounds (VOCs) play an important role in atmospheric chemistry and thus in the oxidation strength of the atmosphere, affecting the condition of air quality. Together with nitrogen oxides, VOCs play the essential role in the process of formation of tropospheric ozone and other photo-oxidation pollutants. In 1993, regular monitoring of VOCs started within the Co-operative programme for monitoring and evaluation of the long-range transport of air pollutants in Europe (EMEP) at selected stations including Košetice Observatory (49 [U+F0B0] 35′ N; 15 [U+F0B0] 05′E; 534 m a.s.l), operated by the Czech Hydrometeorological Institute (CHMI). In 1995, CHMI started the same type of measurement at the Praha-Libuš station (50 [U+F0B0] 00′ N; 14 [U+F0B0] 27′ E; 301 m a.s.l), which represents the suburban area of the capital Prague. A homogeneous series of measurements has been maintained at both stations up to now. Since 2011, CHMI has been involved in the ACTRIS project. The aim of presented study is to detect the long-term trends of VOCs in the Czech Republic and to compare the VOCs pollution levels at the background scale and at the suburb of big city. Air samples are taken and put into steel cans for the later assay of VOC concentrations. The sampling has been implementing at 12 o′clock UTC every Monday and Thursday for the duration of 10 minutes. In the laboratory, a group of hydrocarbons is quantified by gas chromatography in a capillary column with a flame-ionisation detector. Following VOCs have been measured: alkanes (ethane, propane, butane, 2-methylpropane, pentane, 2+3 methylpentane, hexane, heptane, octane), alkenes (ethane, propene, total butenes, total pentenes, isoprene) and aromatic hydrocarbons (benzene, toluene, etylbenzene, m,p-xylene, o-xylene). The VOCs emissions in EU dropped in the period 1990-2016 by almost 60%. The descreasing trend in the Czech Republic was similar (more than 63%). Most of VOCs follow an annual course that reflects their emission levels, i.e. with maximums in winter and minimums in summer. Isoprene is an exception. Despite it's ranking among the most reactive VOCs, it is of natural origin (deciduous trees release it) and displays an inverse annual course. In general, the reduction of VOCs emissions in last 3 decades was reflected in decrease of concentrations at both regional and suburban level of the Czech Republic. The nonparametric Mann-Kendall method was used for statistical evaluation of trend significance. The most significant downward trend was found for almost all of measured VOCs at both stations. The ethane trend was more significant at suburban site than at the background level. The trend of isoprene concentrations is controlled first of all by natural conditions and shows different patterns as other VOCs. No significant trend was found under the period under review at Košetice observatory and slightly increasing trend was detected at Praha-Libuš. The concentrations of main VOCs at the suburb level were higher by 150-200% than at the background site in the nineties. In the last decade, the difference between suburban and background level was smaller, thanks to the considerable reduction of the VOCs anthropogenic emissions.