



Aspects regarding vertical distribution of greenhouse gases resulted from in situ airborne measurements

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In the last decades the air quality, as well as other components of the environment, has been severely affected by uncontrolled emissions of gases – most known as greenhouse gases (GHG). The main role of GHG is given by the direct influence on the Earth’s radiative budget, through Sun light scattering and indirectly by participating in cloud formation. Also, many efforts were made for reducing the high levels of these pollutants, e.g., International Panel on Climate Change (IPCC) initiatives, Montreal Protocol, etc., this issue is still open. In this context, this study aims to present several aspects regarding the vertical distribution in the lower atmosphere of some greenhouse gases: water vapours, CO, CO₂ and methane.

Bucharest and its metropolitan area is one of the most polluted regions of Romania due to high traffic. For assessing the air quality of this area, in situ measurements of water vapours, CO, CO₂ and CH₄ were performed using a Britten Norman Islander BN2 aircraft equipped with a Picarro gas analyser, model G2401-mc, able to provide precised, continuous and accurate data in real time. This configuration consisting in aircraft and airborne instruments was tested for the first time in Romania. For accomplishing the objectives of the measurement campaign, there were proposed several flight strategies which included vertical and horizontal soundings from 105 m to 3300 m and vice-versa around Clinceni area (20 km West of Bucharest). During 5 days (25.08.2015 – 31.08.2015) were performed 7 flights comprising 10h 18min research flight hours. The measured concentrations of GHS ranged between 0.18 - 2.2 ppm for water vapours with an average maximum value of 1.7 ppm, 0.04 - 0.53 ppm for CO with an average maximum value of 0.21 ppm, 377 – 437.5 ppm for CO₂ with an average maximum value of 397 ppm and 1.7 – 6.1 ppm for CH₄ with an average maximum value of 2.195 ppm. It was noticed that measured concentrations of GHG are decreasing for high values of sounding altitude, this aspect showing a non-uniform mixing of GHG in the lower atmosphere.

These results are part of the 2nd campaign of the project AROMAT - Airborne ROmanian Measurements of Aerosols and Trace gases founded by European Space Agency –ESA, whose objective consist in testing the most recent developed instruments able to provide a 3D representation of the state of the atmosphere for the validation of Sentinel 5P and Sentinel 5 observation systems.