

QOS2016-123, 2016

Quadrennial Ozone Symposium of the International Ozone Commission

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Ozone depletion during the winter/spring season 2016 - Ground-based observations at IRF Kiruna

U. Raffalski (1), J. Gross (2), N. Ryan (3), and P. Eriksson (4)

(1) Swedish Institute of Space Physics, Atmospheric Physics Programme, Kiruna, Sweden (uwe.raffalski@irf.se), (2) Institute for Meteorology and Climate Research (IMK), Karlsruhe Institute of Technology (KIT), Germany, (3) Institute of Environmental Physics, University of Bremen, Germany, (4) Chalmers University of Technology, Gothenburg, Sweden

The millimeter wave radiometer MIRA2 of the Karlsruhe Institute of Technology was installed for continuous operation at the Swedish Institute of space physics in Kiruna in November 2012. MIRA2 operates at around 278 GHz and a number of stratospheric trace gases are present in that frequency region, such as ozone and ClO. In this paper we focus on ozone observations during the recent winter period from January to March 2016.

Due to the unusually stable Polar Vortex and the constant low temperature inside the vortex model calculations predict a strong ozone depletion. Our ground-based measurements present vortex averaged measurements which should observe this ozone depletion very well since we only use measurements which are well inside the polar vortex according to the 'Equivalent Latitude' method by Nash et al.. In order to correct for diabatic subsidence which can partly mask chemically induced ozone loss we use Odin vortex mean values of N₂O as tracer and calculate the ozone volume mixing ratio on N₂O isopleths.

The partial column that we derive between 10 and 60 km can be compared to the model simulations by for instance the Chemical Lagrangian Model of the Stratosphere (ClAMS), where the ozone depletion in the column between 12 and 22 km altitude already reached 80 DU at the end of February, which is roughly 20 days earlier than in the record ozone loss winter 2011. Given a long lived polar vortex the ozone loss can further develop becoming the largest ever observed over the Northern hemisphere.