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Ground-based FTIR measurements at Ile de La Réunion: Observations, error analysis and comparisons with satellite data.

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Ground-based Fourier-transform infrared (FTIR) spectroscopy is a powerful remote sensing technique to obtain information on the total column abundances and on the vertical distribution of various constituents in the atmosphere. Many of these species are essential for the investigation of important atmospheric phenomena, such as the overall greenhouse effect or the stratospheric ozone decrease and recovery.

In the frame of the Network for the Detection of Atmospheric Composition Change (NDACC), such observations have been made since many years at several measurement stations for the worldwide long-term monitoring of the atmospheric composition.

In this work, we present the results from two short-term FTIR measurement campaigns in 2002 and 2004 at the Ile de La Réunion (21˚S, 55˚E), a complementary NDACC site in the subtropics, in the Indian Ocean. All spectra were recorded in solar absorption mode.

The results discussed here concern the direct greenhouse gases methane (CH_4), nitrous oxide (N_2O) and ozone (O_3), and the indirect greenhouse gases carbon monoxide (CO) and ethane (C_2H_6), as well as hydrogen cyanide (HCN) and stratospheric

hydrogen chloride (HCl), hydrogen fluoride (HF) and nitric acid (HNO_3). For the latter species (HCN, HCl, HF and HNO_3), we show time series of total column amounts from the surface up to 60 km. For CO, CH_4, N_2O and O_3, it is possible to derive additionally independent information on a few partial columns; these time series are discussed as well. A complete error budget of the retrieval products is given.

Temporary mutually correlated enhancements of CO, $C_2H_6$and HCN have been observed. They have been traced back to biomass burning events in southern Africa and Madagascar using the FLEXPART model.

Comparisons of our retrievals with correlative data from satellite experiments, such as ACE and MOPITT, and with available ozone soundings, show generally good agreements between the different data sets.

Keywords: *ground-based FTIR, remote sensing, solar absorption spectroscopy, greenhouse gases, satellite validation, atmospheric chemistry*