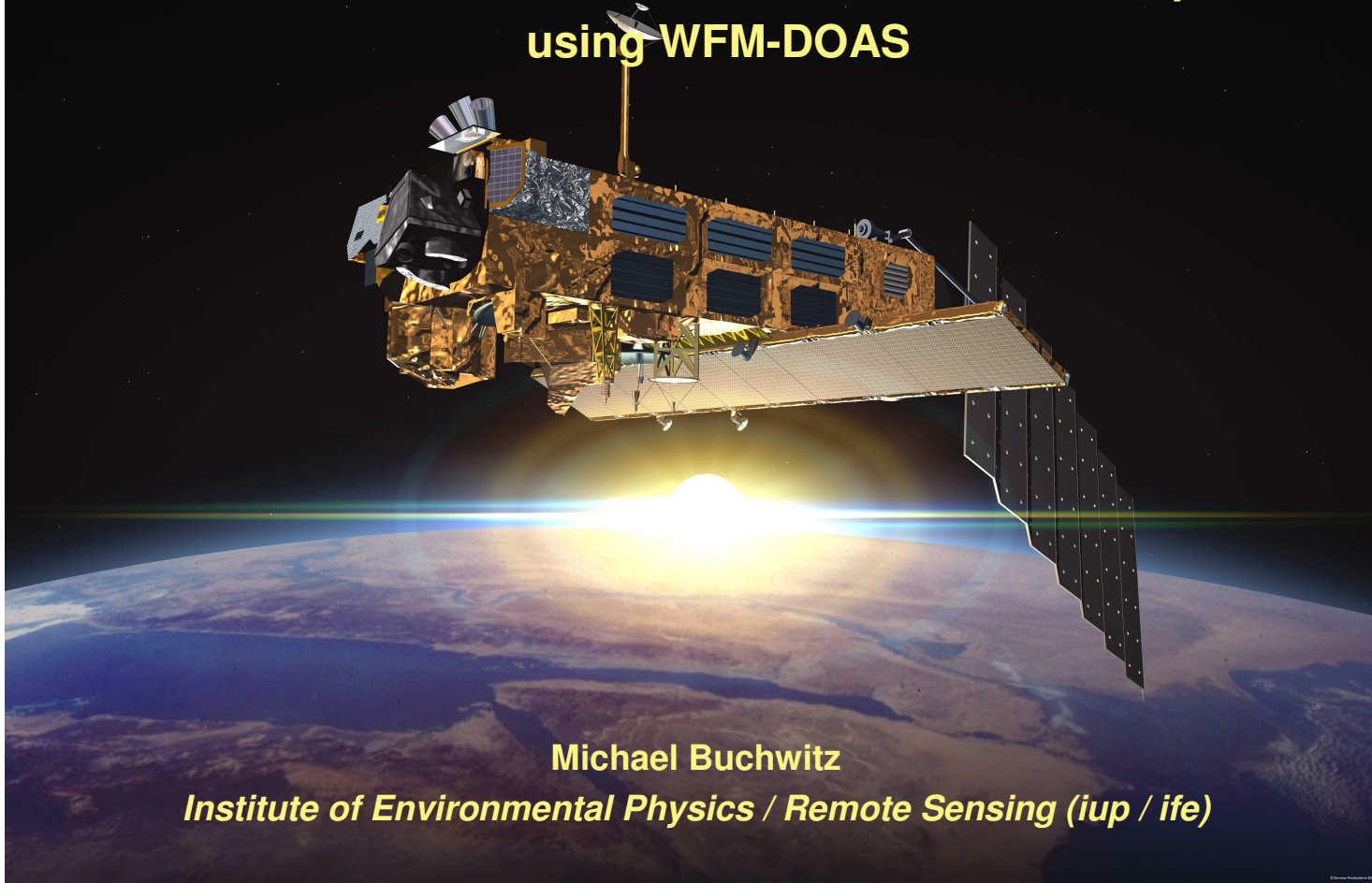


SCIAMACHY: First NIR Nadir Results

Retrieval of trace gas vertical columns
from SCIAMACHY/ENVISAT near-infrared nadir spectra
using WFM-DOAS



Michael Buchwitz

Institute of Environmental Physics / Remote Sensing (iup / ife)

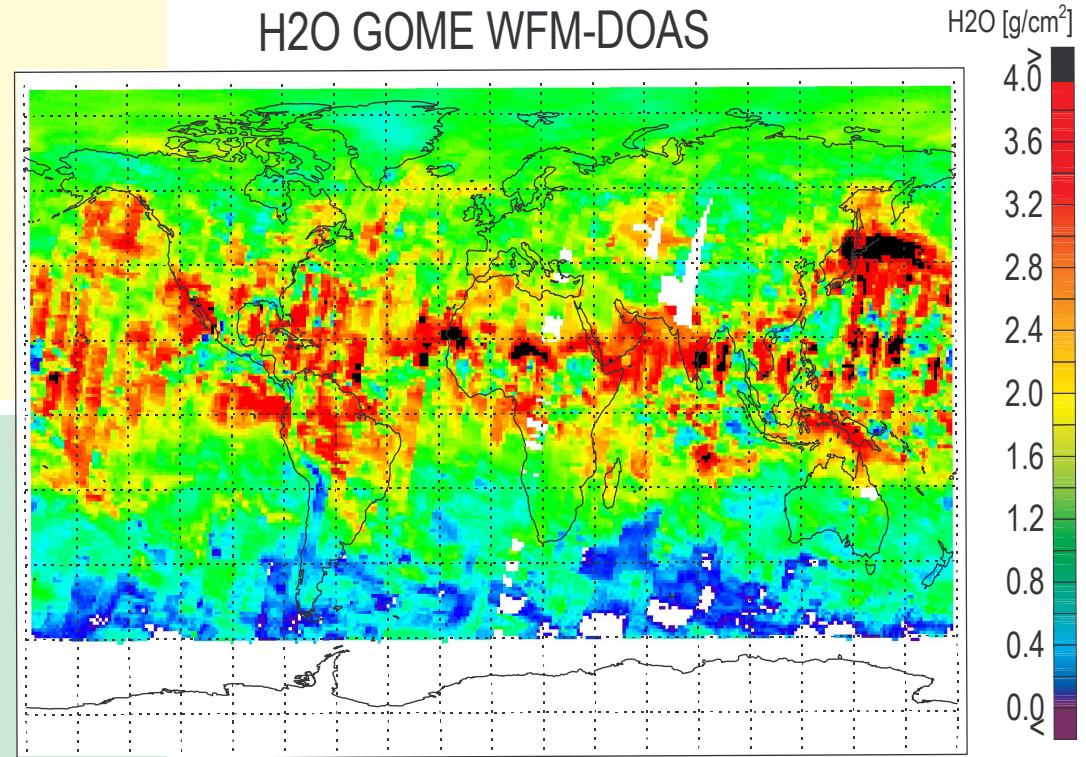
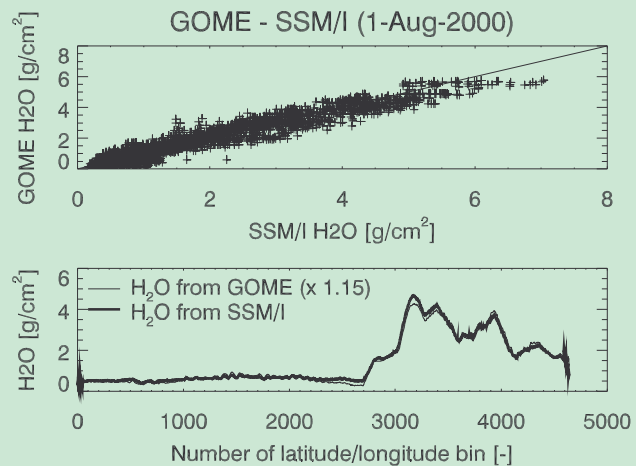
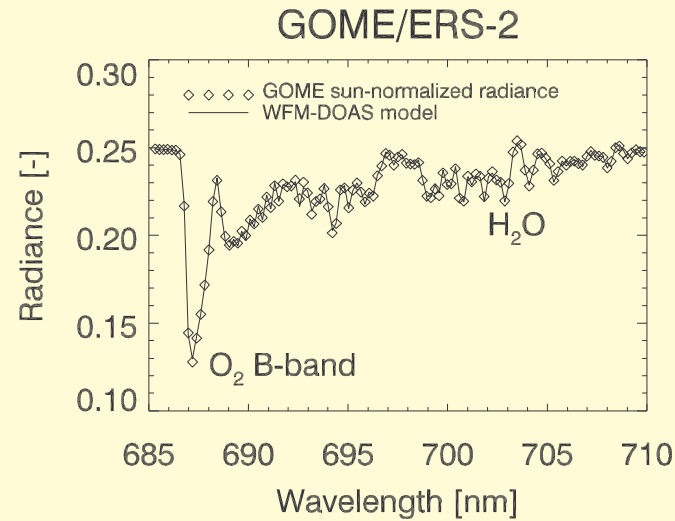
WFM-DOAS Approach

WFM-DOAS is based on linear least-squares fitting a linearized radiative transfer model plus a low order polynomial to the logarithm of the measured sun-normalized radiance:

$$\left\| \ln I_i^{obs}(\mathbf{V}^t) - \left[\ln I_i^{mod}(\bar{\mathbf{V}}) + \sum_{j=1}^J \frac{\partial \ln I_i^{mod}}{\partial V_j} \Big|_{\bar{V}_j} \times (\hat{V}_j - \bar{V}_j) + P_i(a_m) \right] \right\|^2 = \|RES_i\|^2 \rightarrow \min.$$

Current implementation: The WFM-DOAS reference spectra (radiance and derivatives) are pre-calculated (variable: SZA, surface elevation, water vapor column).

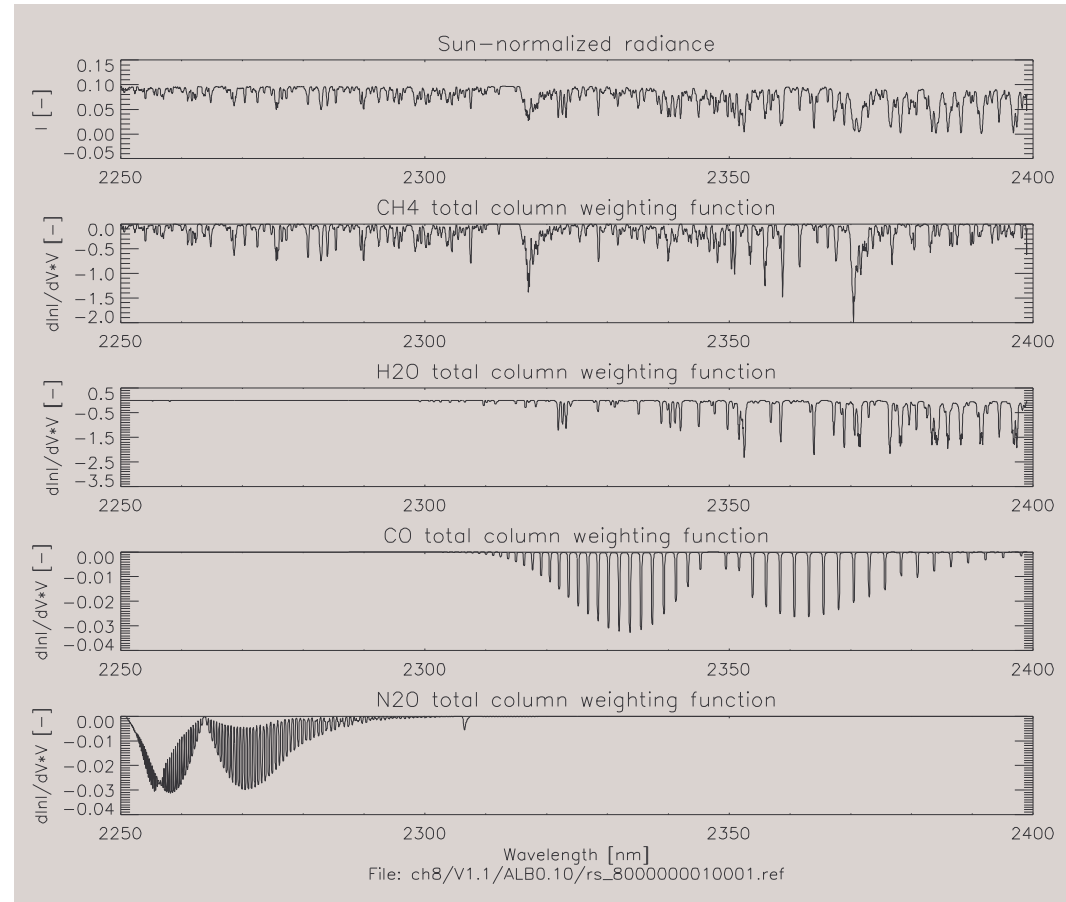
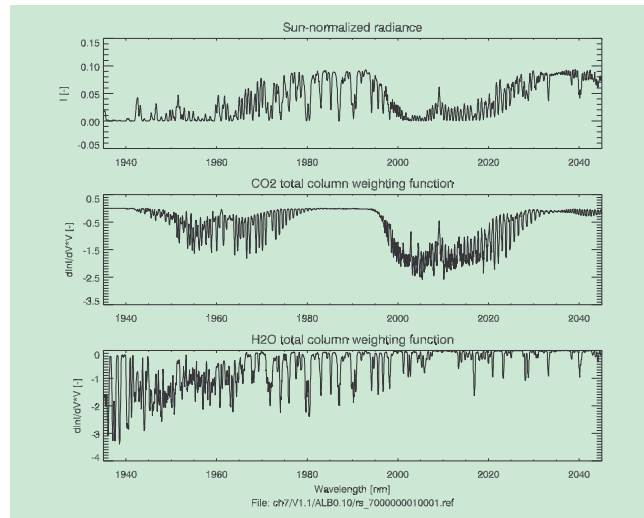
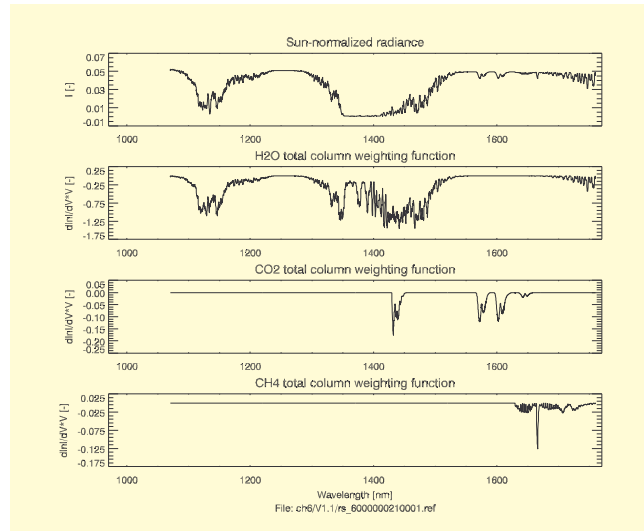
Initial WFM-DOAS verification: GOME H2O retrieval



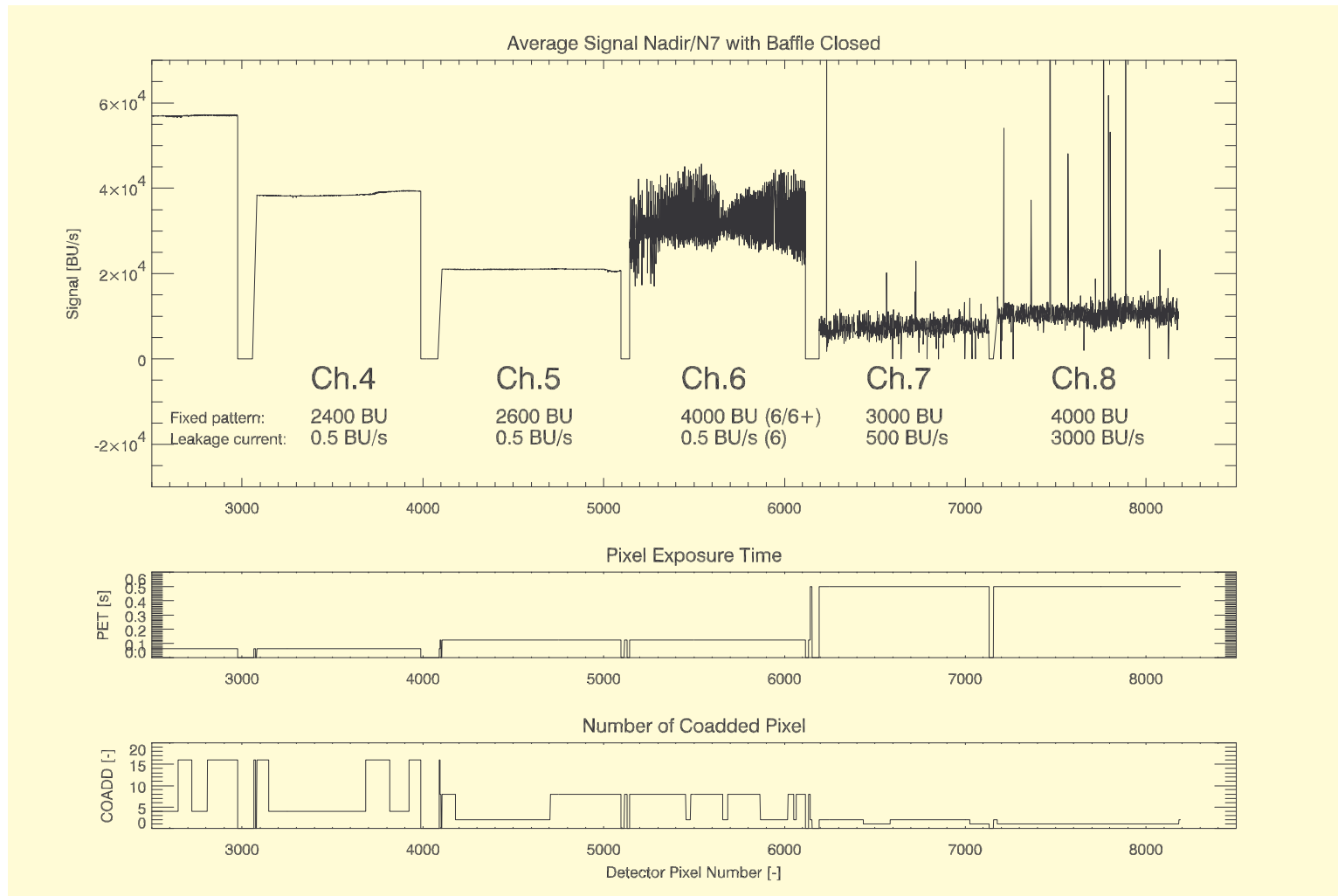
IUP/IFE University of Bremen Michael.Buchwitz@iup.physik.uni-bremen.de
GOME 1-3 August 2000 (proc. 11.03.02 0.5x0.5)

SSM/I data obtained from GHRS

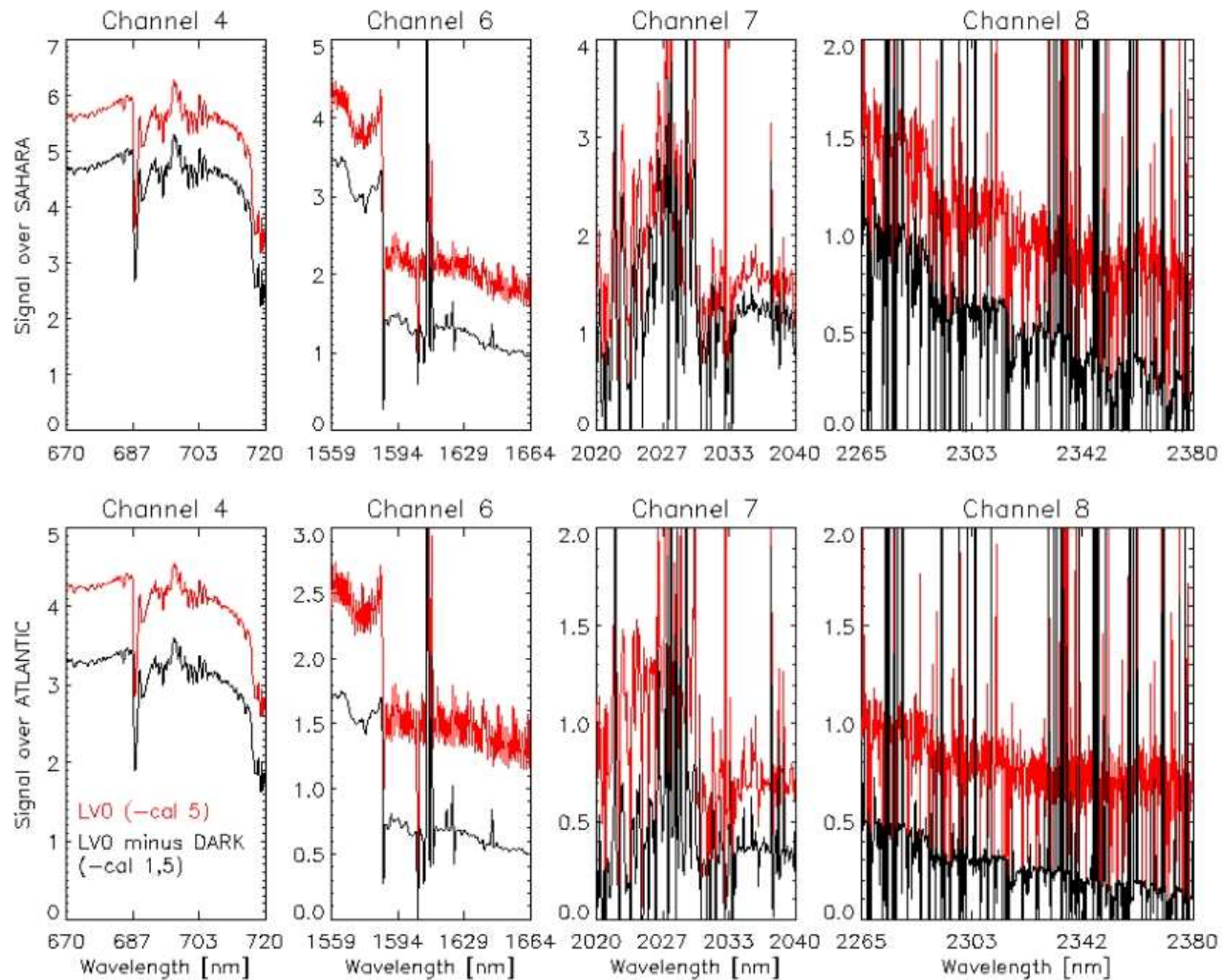
SCIAMACHY: Channels 6-8



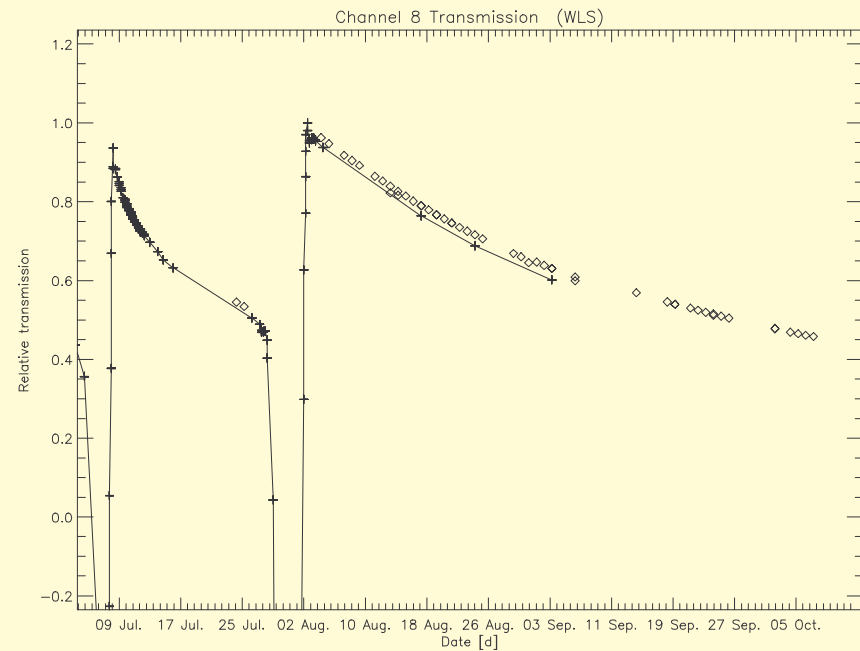
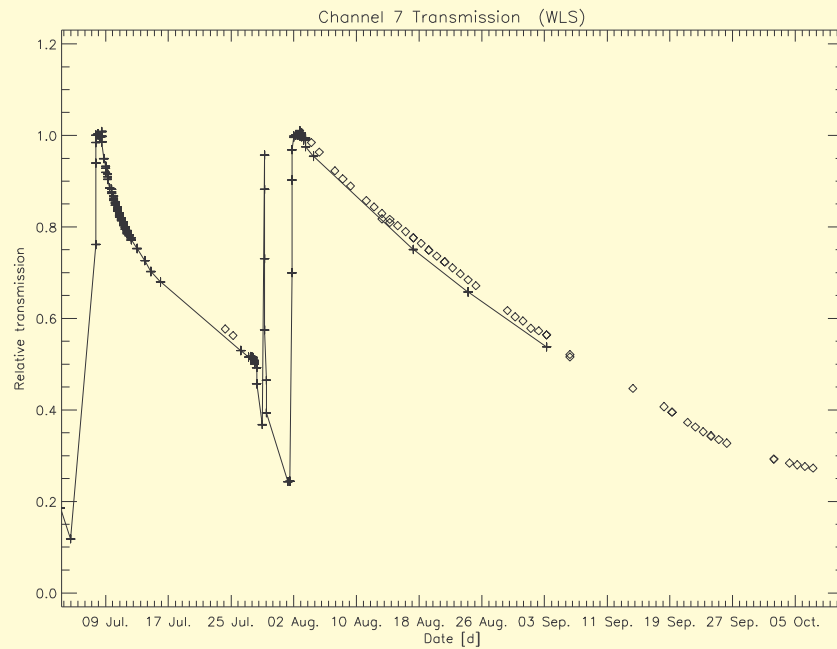
SCIAMACHY: Dark signal



SCIAMACHY: Dark signal (cont.)

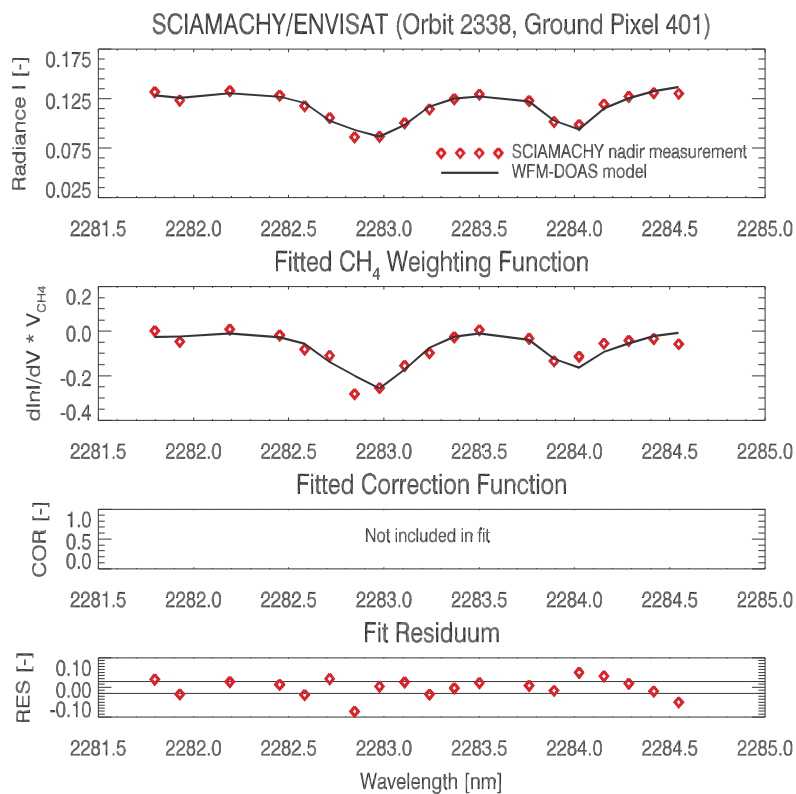


Channel 7 and 8 transmission losses

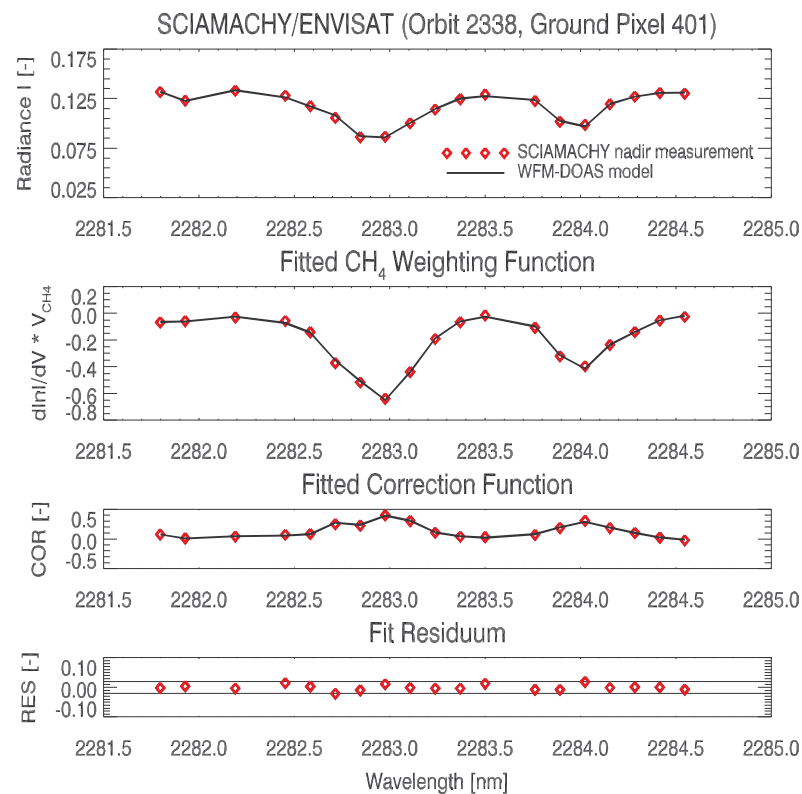


Source: G. Lichtenberg, SRON

Channel 8 methane retrieval



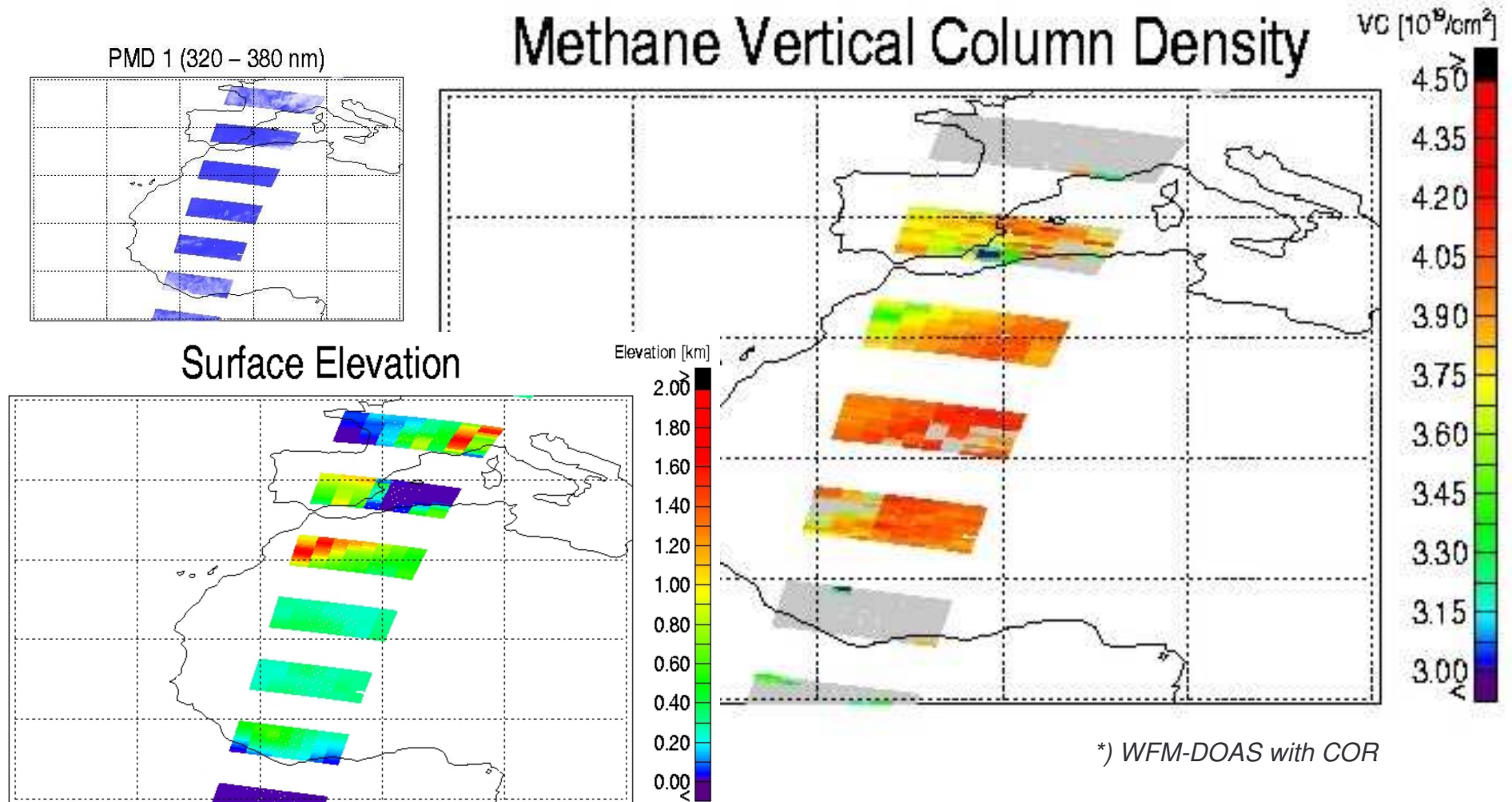
1.49×10^{19} molec./cm² +/- 14%



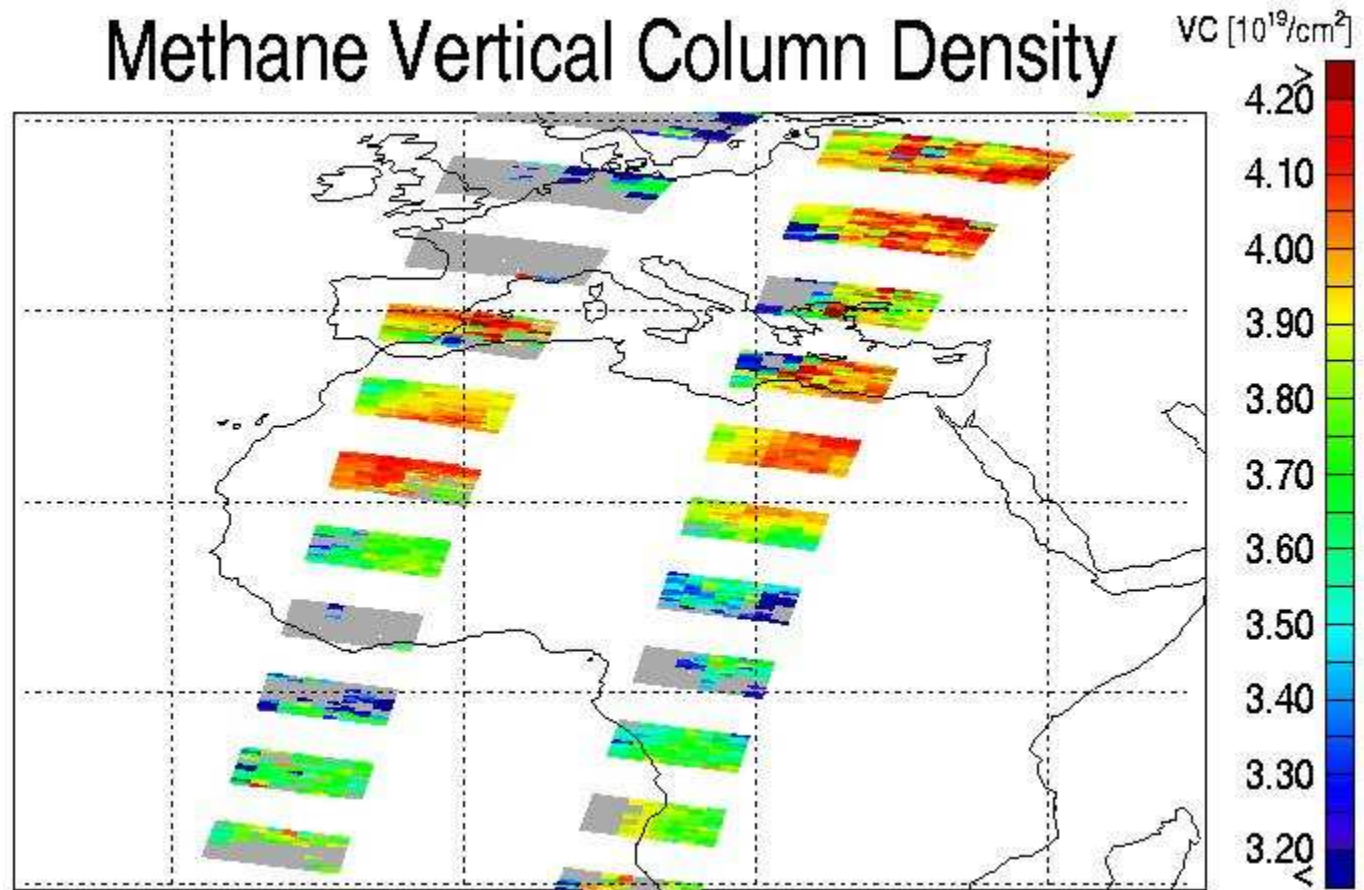
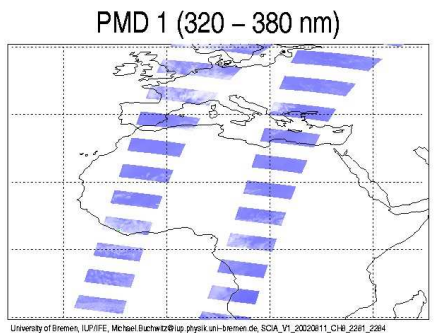
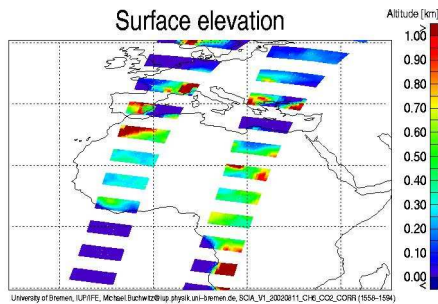
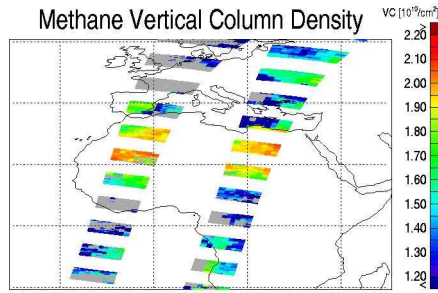
3.76×10^{19} molec./cm² +/- 6%

$$COR_i = \left\langle COR_i^k \right\rangle_{k=1,K} = \left\langle RES_i^k + \sum_{j=1}^J \left. \frac{\partial \ln I_i^{mod}}{\partial V_j} \right|_{\hat{V}_j} \times (\hat{V}_j^k - V_j^t) \right\rangle_{k=1,K}$$

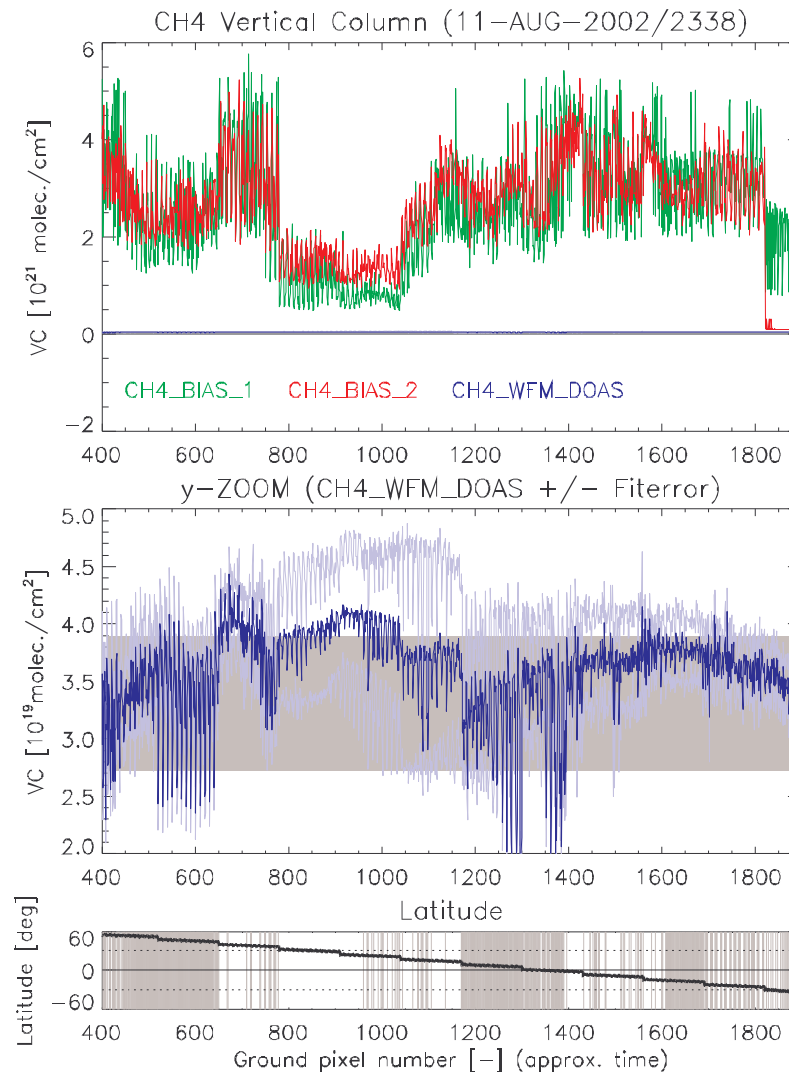
Channel 8 methane retrieval (cont.)



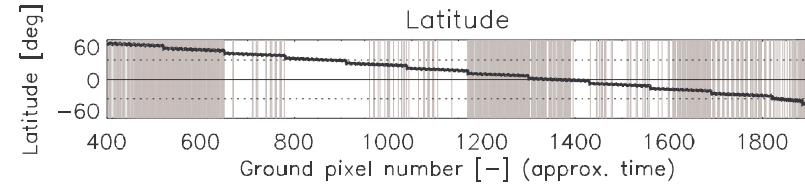
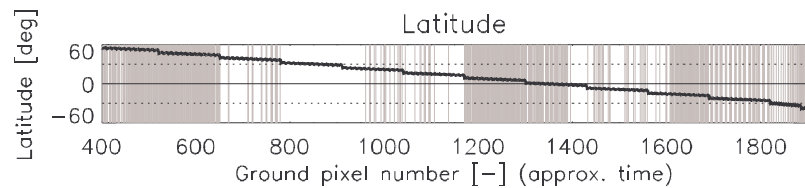
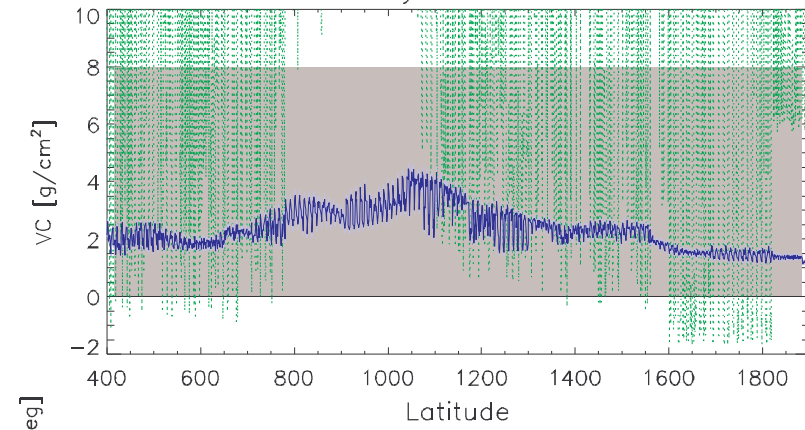
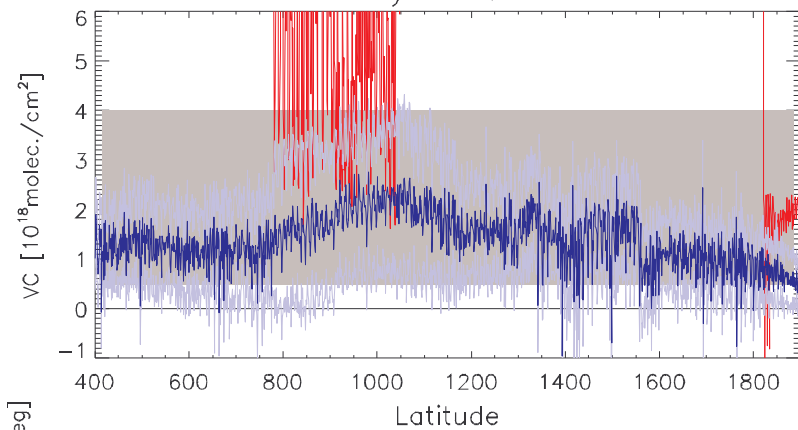
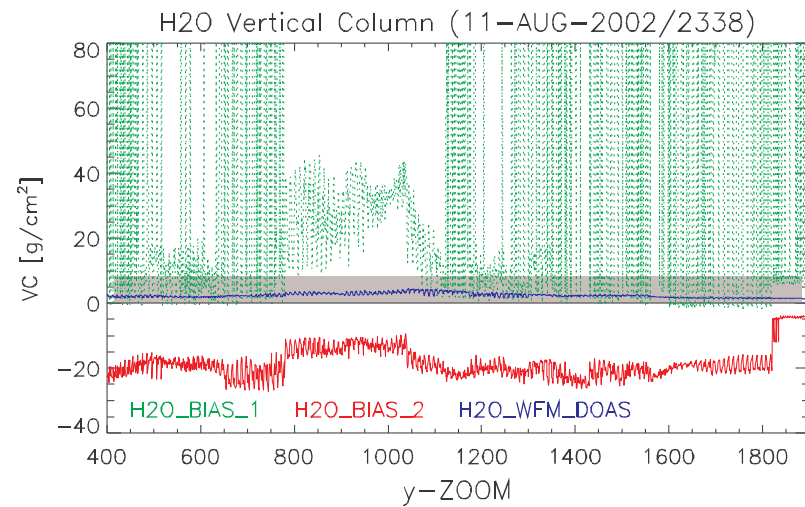
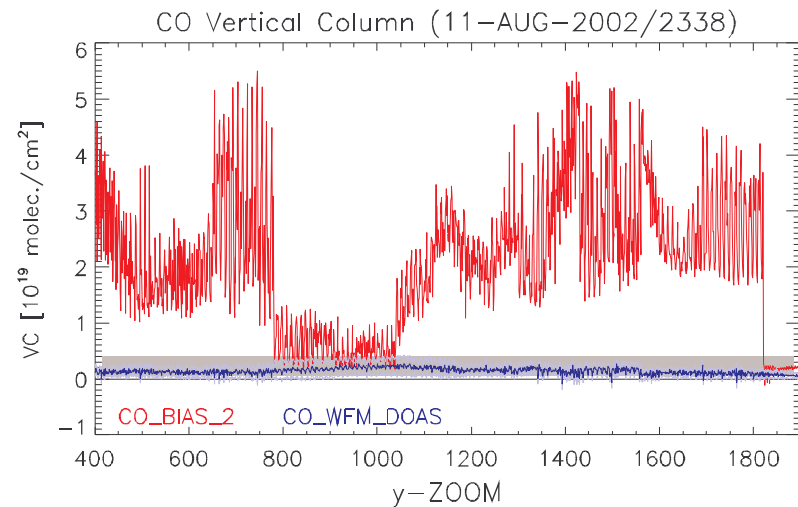
Channel 8 methane retrieval (cont.)



Comparison BIAS WFM-DOAS: CH4

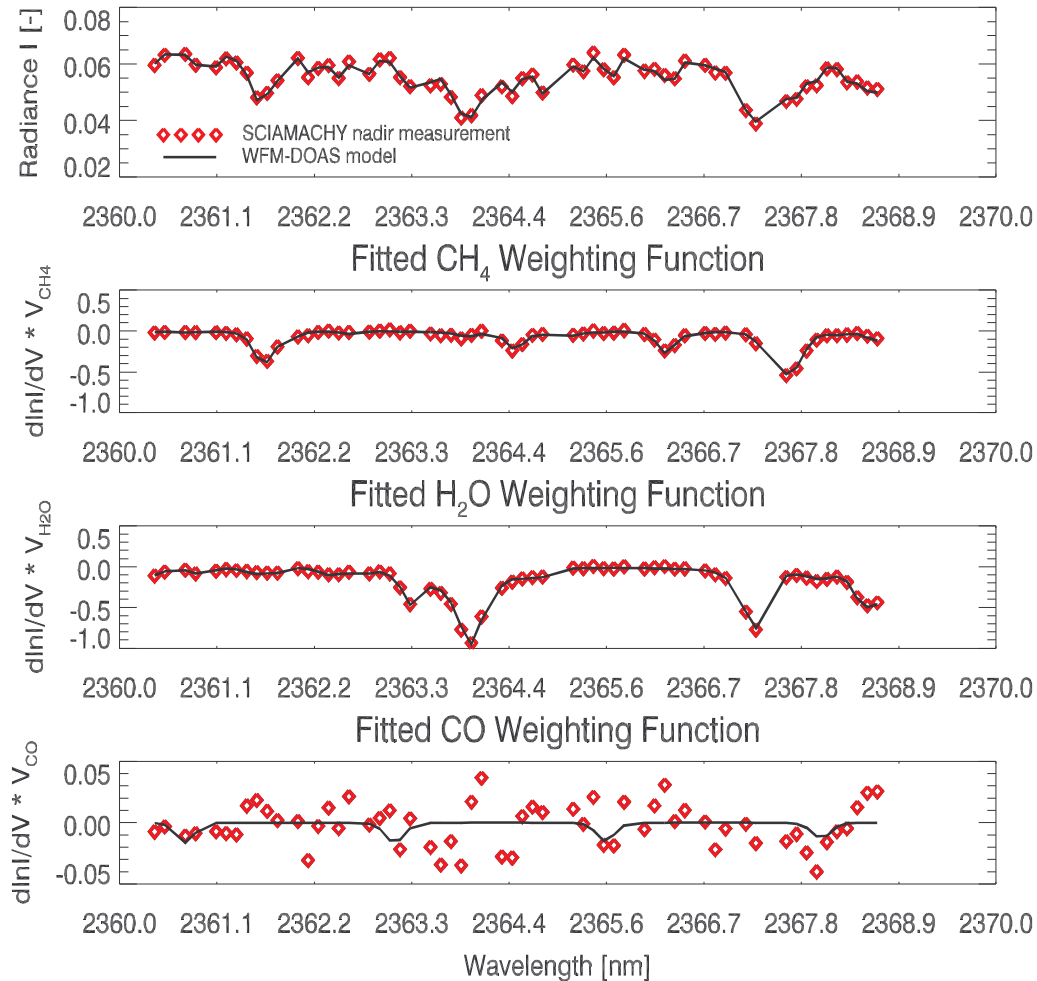


Comparison BIAS WFM-DOAS: CO + H2O



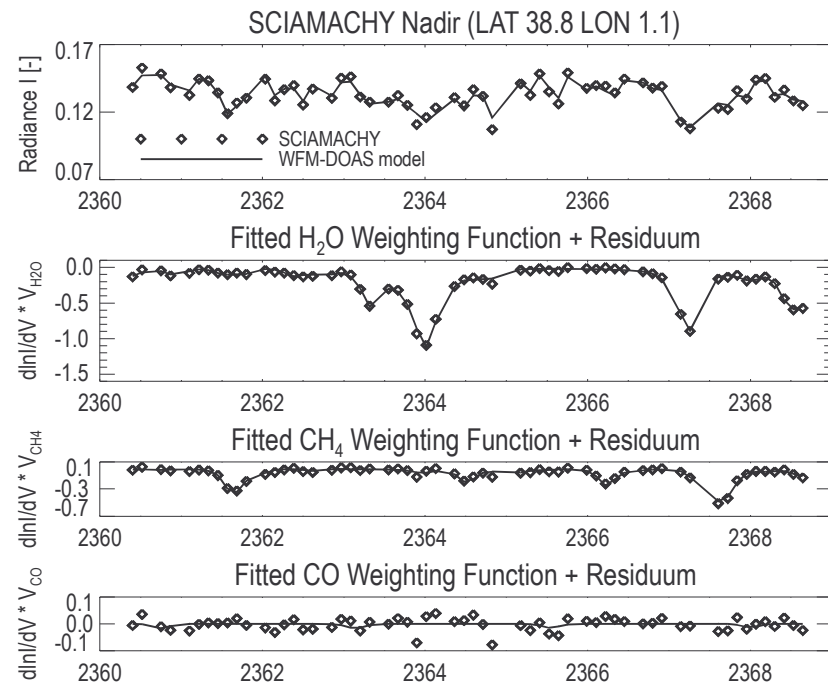
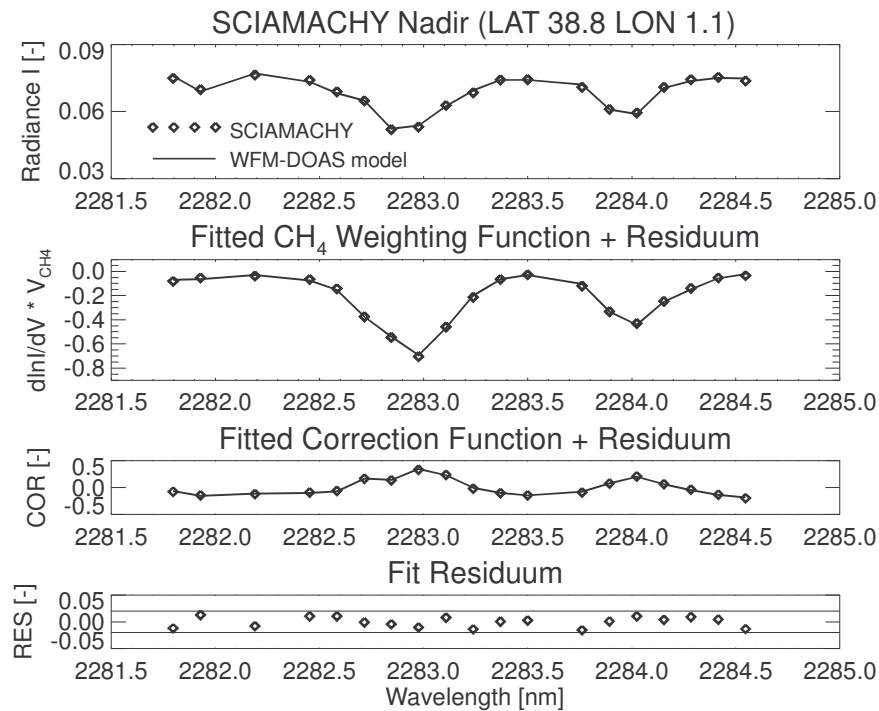
Channel 8 CO window

SCIAMACHY/ENVISAT (Orbit 2338, Ground Pixel 401)

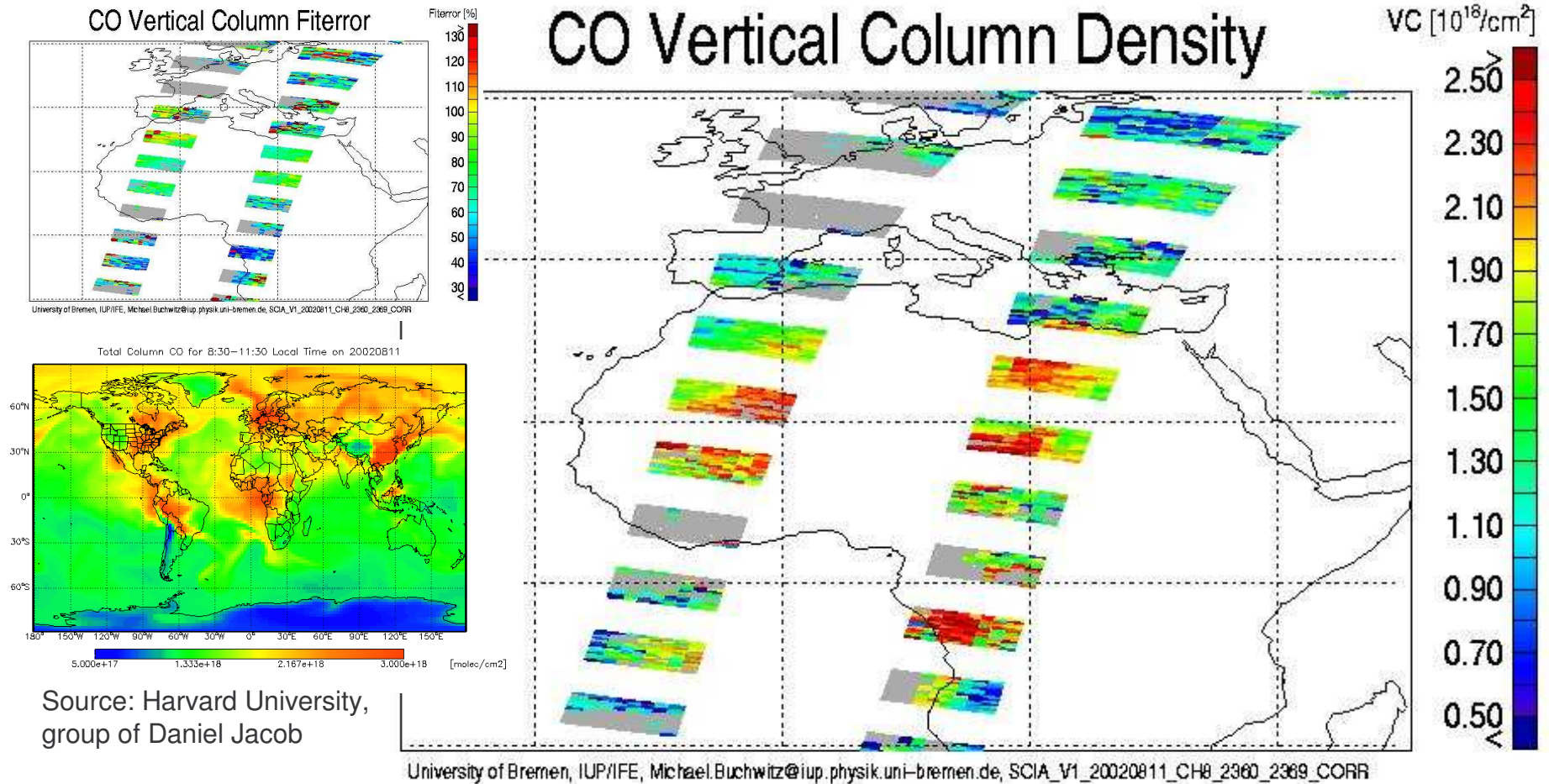


*) WFM-DOAS with COR

Channel 8 WFM-DOAS fits

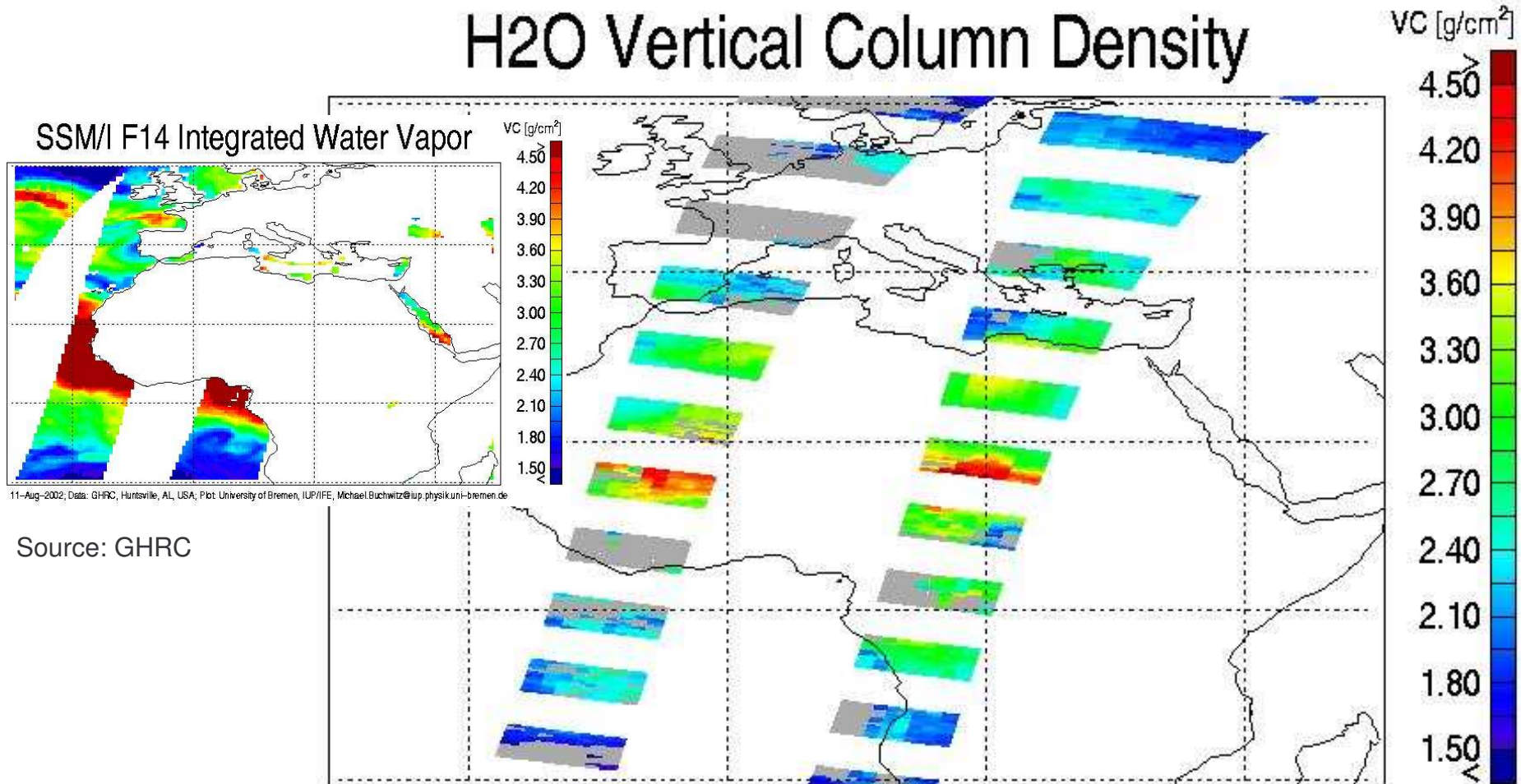


Channel 8 CO window (cont.)



Channel 8 CO window (cont.)

H2O Vertical Column Density

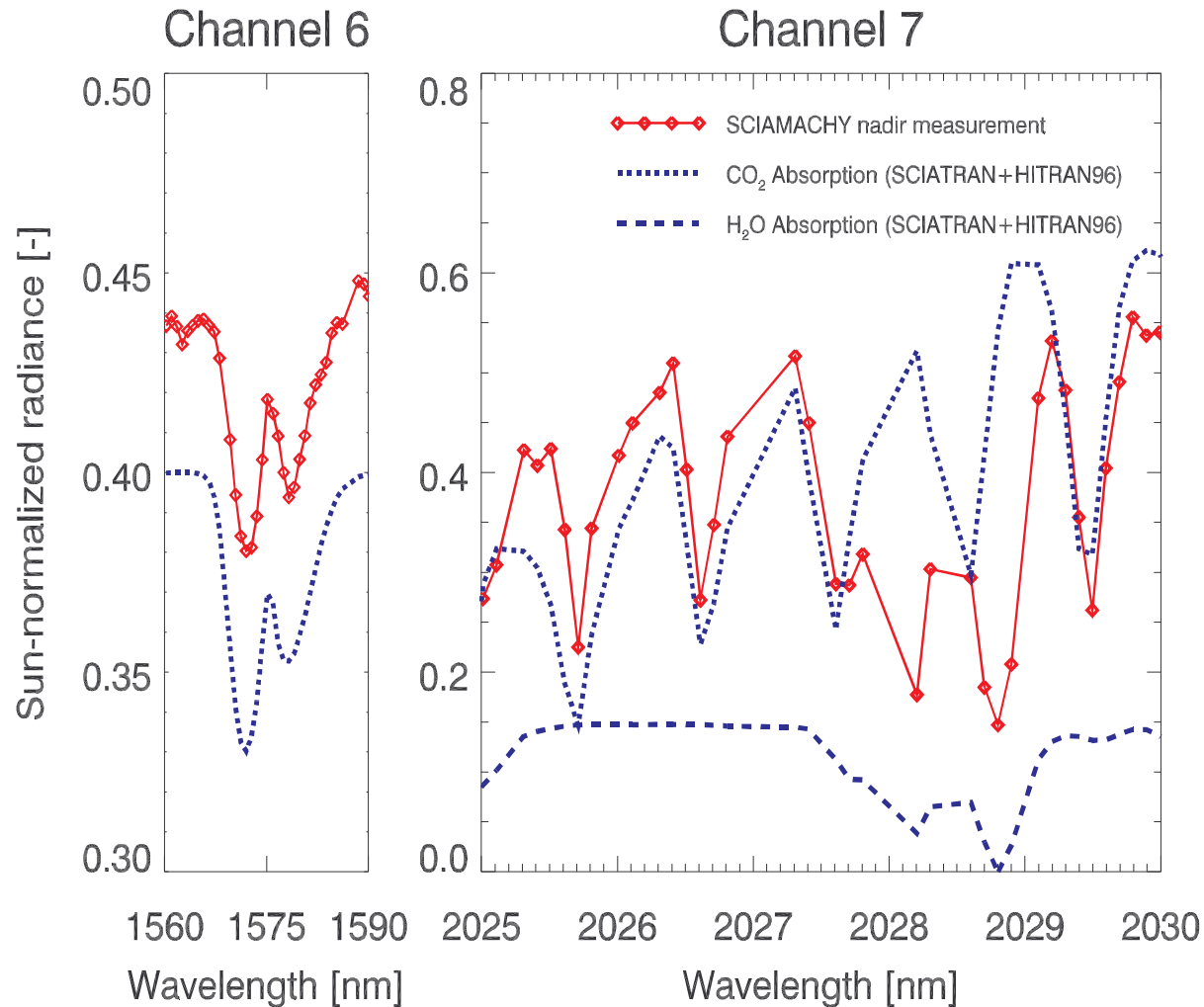


11-Aug-2002; Data: GHRC, Huntsville, AL, USA; Pibt University of Bremen, IUP/IFE, Michael.Buchwitz@iup.physik.uni-bremen.de

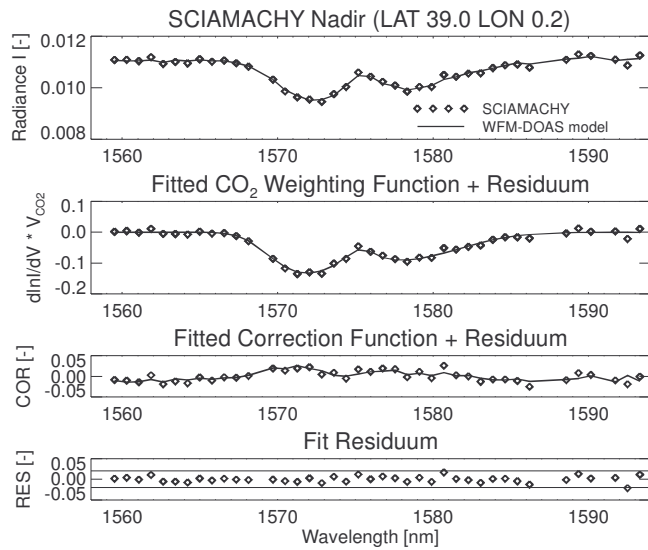
Source: GHRC

University of Bremen, IUP/IFE, Michael.Buchwitz@iup.physik.uni-bremen.de, SCIA_V1_20020811_CH8_2360_2369_CORR

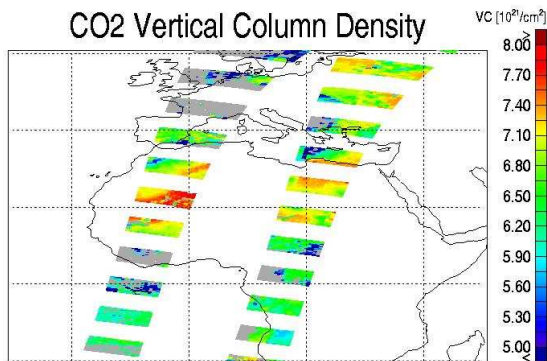
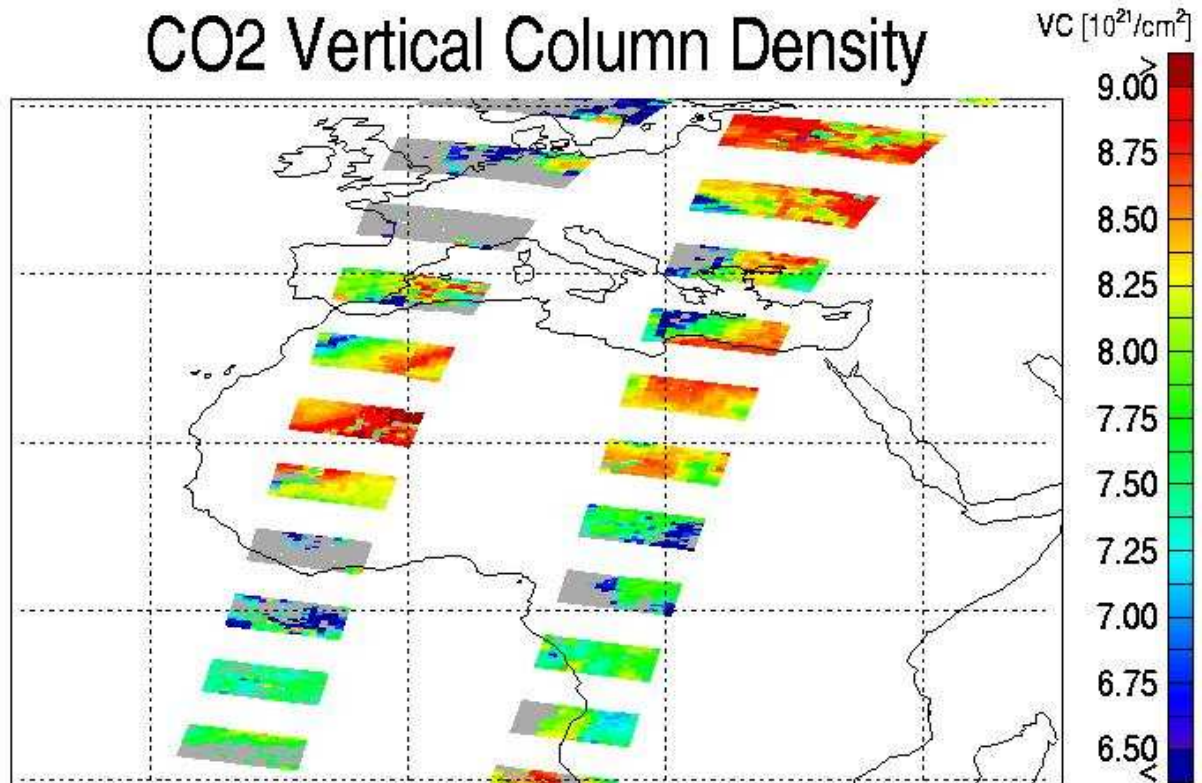
Channel 6 and 7 CO₂



Channel 6 CO2



CO2 Vertical Column Density



University of Bremen, IUP/IFE, Michael.Buchwitz@iup.physik.uni-bremen.de, SCIA_V1_20020811_CH8_CO2_CORR (1558-1594)

University of Bremen, IUP/IFE, Michael.Buchwitz@iup.physik.uni-bremen.de, SCIA_V1_20020811_CH8_CO2_NOCORR (1558-1594)