F18/38 Atmospheric Spectroscopy

Carsten Lüth   Michael Dorkenwald

December 5, 2018

1 Abstract

In this experiment the trace gases Nitrogen-dioxid (NO_2) and Ozone (O_3) are examined with DOASIS. These gases play an important role for life on earth. Therefore it is important to have a method to determine the concentration in the air. The DOASIS (DOAS Intelligent System) was developed at the Institut for Environmental physics at University Heidelberg

2 Introduction

explain how they effect our live on earth First, a Nitrogendioxid gas-cell is explored Second,

3 Background

3.1 Ozone and Nitrogendioxid

3.2 The DOAS Measurement System

4 Meassurements

4.1 Nitrogendioxid gas-cell

In this part of the experiment we measured the absorption of a NO_2 gas-cell in the spectrum of an Hg-lamp. Due to the nature of this measurement we could simplify the problem by using the fact that we have access to I_0 by taking a spectrum without the gas cell in the light path and then take a measurement with the gas-cell in the light path to measure I. After dark current and offset were corrected for both measurements we used the simplified lambert-beer law to get to equation.

$$\tau = \log(\frac{I_0(\lambda)}{I_0(\lambda)}) = \sigma_{NO_2} \cdot \rho \cdot L \qquad (1)$$

The reference convolution for NO_2 was then used to compute the SCD= $\rho \cdot L$. This was then used to compute the density $\rho = (2.81 \pm 0.07) \cdot 10^{-7}\frac{mol}{cm^3}$ and the mixture ratio $(6.29 \pm 0.39) \cdot 10^3$ppm.

4.2 Sunlight of a recorded daycycle

4.3 Sunlight different evaluations angles

5 Results

5.1 Nitrogendioxid gas-cell

After dark current and offset were corrected for both measurements we used the simplified lambert-beer law to get to equation.

$$\tau = \log(\frac{I_0(\lambda)}{I_0(\lambda)}) = \sigma_{NO_2} \cdot \rho \cdot L \qquad (2)$$

The reference convolution for NO_2 was then used to compute the SCD= $\rho \cdot L$. This was then used to compute the density $\rho = (2.81 \pm 0.07) \cdot 10^{-7}\frac{mol}{cm^3}$ and the mixture ratio $(6.29 \pm 0.39) \cdot 10^3$ppm.

5.2 Sunlight of a recorded daycycle

The DOAS least squares fit computes the SCD values for the different daytimes and traces gases, namely ozone and nitrogendioxid. Those values were then plotted and can be seen in figures ... asdfasdf

5.3 Sunlight different evaluations angles

6 Discussion