

REMOTE SENSING OF ATMOSPHERIC BOUNDARY LAYER COMPOSITION USING IASI OBSERVATIONS

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Introduction

Measuring the composition of the boundary layer (the closest layer to the surface, ABL) from space is essential for monitoring pollutants and understanding their impacts on our environment and climate [1]. Thermal infrared (TIR) sounders are usually considered inadequate for near-surface measurements. Recently, however, the demonstration was made that TIR sounders have a good sensitivity to trace gases (notably NH_3) in the boundary layer in case of high thermal contrasts between the surface and the air above it [2, 3].

In this work, we use the large negative thermal contrasts found in the Arctic to retrieve boundary layer SO₂ concentrations from IASI observations in the region around the industrial city of Norilsk (Figure 1).

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1400

1400

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Sensitivity studies

Retrieval of SO₂ concentrations in Norilsk

Based on the theoretical study, it appears that IASI has a better sensitivity to SO₂ in the boundary layer in the more intense v_3 band in winter, when thermal contrasts are highly negative (Figure 3) and humidity is low. Therefore, SO₂ concentrations have been retrieved in an area around Norilsk only for winter months, for the period 2009-2011 and using the Optimal Estimation method [4]. Spatial distributions (Figure 4) and time series (Figure 5) have been obtained for the first time, further highlighting the capability of IASI to monitor surface pollution, and possibly to help in inferring surface fluxes.

