Validation of ammonia satellite retrievals with ground-based FTIR

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Abstract

Global emissions of reactive nitrogen have increased due to human activities and are estimated to be a factor four larger than pre-industrial levels. Concentration levels of NOx are declining, but ammonia (NH3) levels are increasing globally. At its current concentrations NH3 poses a large threat to both the environment and human health. Still relatively little is known about the total budget as well as the global distribution. Surface observations are sparsely available, mostly for north-western Europe, the United States and China, and are limited by the high costs and poor spatial and temporal resolution. The lifetime of atmospheric NH3 is short, in the range of several hours to a few days and the existing surface measurements are not sufficient to estimate global concentrations. Space-based InfraRed-sounders such as the Infrared Atmospheric Sounding Interferometer (IASI) and the Cross-track Infrared Sounder (CrIS) enable global observations of atmospheric NH3 which can overcome the limitations of existing surface observations. One challenge with satellite NH3 retrievals is that they are complex and requiring extensive validation. Presently only a limited number of satellite NH3 validation campaigns have been performed with limited spatial, vertical and temporal coverage. In this study we demonstrate the use of a recently developed retrieval methodology for ground-based Fourier Transform Infrared Spectroscopy (FTIR) instruments to obtain vertical concentration profiles of NH3. We will use the retrieved profiles from eight stations with a range of NH3 pollution levels to validate satellite NH3 products.

Key Words

Ammonia, atmosphere, retrieval validation, FTIR, retrieval strategy