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Synergy between atmospheric products with limb and nadir geometries: Comparison between MIPAS+IASI and MIPAS+GOME2 a posteriori fusion

In this study, we delve into the synergy between level 2 (L2) products obtained from satellite measurements with different geometries, utilizing the Complete Data Fusion (CDF) method. Specifically, we compare the fusion of data from MIPAS with IASI and the fusion of MIPAS with GOME2. This comparison allows us to analyze several key themes, including the characteristics of the CDF method and the products it generates, the differences between the products obtained by keeping the limb sensor (MIPAS) constant and varying the nadir sensor (IASI/GOME2), and the benefits that such a study brings in terms of knowledge and quality control of the involved products.

The CDF method, based on the Optimal Estimation (OE) algorithm, integrates individual retrievals from different instruments, leveraging their complementary features to enhance the accuracy and completeness of the resulting atmospheric profiles. We examine the various challenges that arise when applying the same algorithm to data from instruments with different geometries, and the strategies used to compare initially disparate situations, with particular reference to the a priori constraints adopted in the retrieval of atmospheric products.

The comparison between MIPAS+IASI and MIPAS+GOME2 fusion highlights the peculiarities of the obtained products, showing how the combination of different measurement geometries can influence the quality and reliability of atmospheric data. This study provides valuable insights for improving data fusion techniques and optimizing retrieval processes, contributing to a better understanding and management of the quality of atmospheric products.

Furthermore, the study discusses the implications of using different nadir sensors in conjunction with a constant limb sensor, focusing on the specific advantages and limitations of each combination. By maintaining MIPAS as the limb sensor and alternating between IASI and GOME2 as nadir sensors, we can observe how each configuration impacts the retrieval accuracy and overall data quality. This approach allows us to identify the strengths and weaknesses of each fusion strategy, offering guidance for future applications and research in atmospheric data fusion.

Ultimately, the findings of this study underscore the importance of considering measurement geometry in the fusion of satellite data. The insights gained from comparing MIPAS+IASI and MIPAS+GOME2 fusion not only enhance our understanding of the CDF method but also pave the way for more effective and reliable atmospheric data products. These advancements hold significant potential for improving climate models, weather forecasting, and environmental monitoring, thereby supporting a wide range of scientific and practical applications.

Topic

Current and past limb and occultation instruments: algorithms, products, validation

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