研究課題名：CAI衛星解析とモデルシミュレーションの統合システムの構築（Development of a combined system for CAI-satellite imager analysis and model simulation）

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実施年度：平成 20 年度～平成 20 年度

1. Purpose

Our main purpose is to improve model prediction of global aerosol loads for the GOSAT mission. These aerosol loads are required for correct interpretation of the GOSAT FTS data. A secondary purpose is the improvement of the SPRINTARS global aerosol model.

2. Method

We will implement an ensemble assimilation system for SPRINTARS and use a variety of aerosol observations to improve modeled aerosol loads. Since aerosol emission inventories are considered unreliable, our first goal will be to improve aerosol loads by varying emission inventories.

3. Results

We have implemented a Local Ensemble Transform Kalman Filter (LETKF) for SPRINTARS that assimilates either ground-based or space-borne Aerosol Optical Depth (AOD) observations every 3^{hr} or 6^{hr}. The ensemble consists, at present, of 40 members that each have slightly different emission inventories (boundary conditions). The observations come from either the ground-based AERONET dataset or the CAI sensor aboard GOSAT.

In Fig. 1, we show results for an experiment with simulated GOSAT AOD. Here it is assumed that the assumed carbon and sulfate aerosol inventories are overestimated by 50%. Still, LETKF-SPRINTARS improves on the AOD error through assimilation of (simulated) observations.

In Fig. 2, we show AOD with and without assimilation if real AERONET 675 nm AOD observations are used. The comparison is made with an AERONET site (Toulon) that was not used in the assimilation. Clearly, assimilation can significantly improve the aerosol loads.

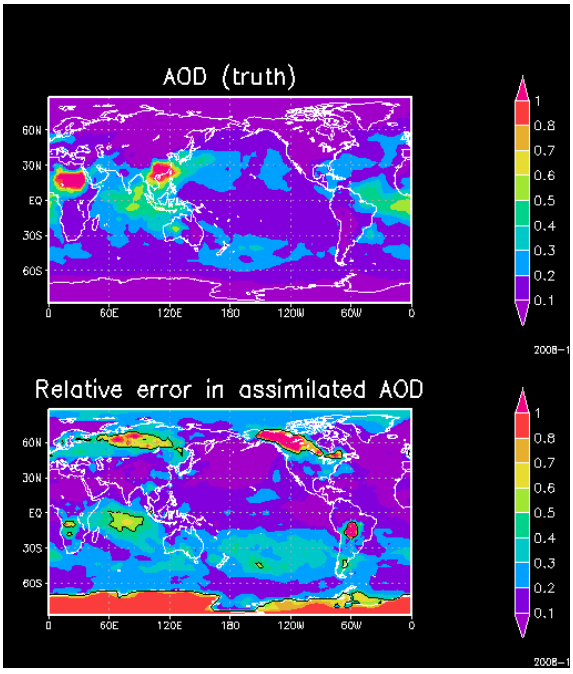

Fig. 1 Improvement in AOD after assimilation. Perfect model experiment with simulated GOSAT AOD at 675 nm.

4. Future plans

Sofar, we have used only simulated satellite observations, but soon we hope to conduct experiments with real MODIS AOD. The assimilated products can be validated through comparison with AERONET observations. Once sufficient GOSAT observations have become available, these may similarly be used (note that there are significant differences between MODIS and GOSAT). Also, it will be interesting to extend the assimilation system to allow direct retrieval of improved emission inventories, and to allow variation of several physical parameters such as those that govern wet and dry deposition.

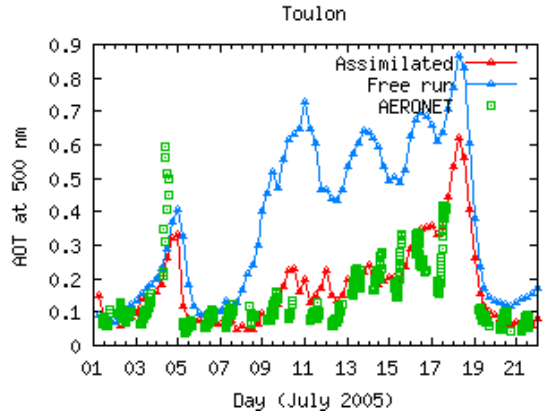

Fig. 2 Improvements in AOD after assimilation. Actual AERONET observations were used for both the assimilation and the validation.

5. CPU use in the current year (from April to October 2008)

4 users, CPU hours ＜1 node：114 hours,
1 node：38,049 hours, 2 node：0 hour,
total：38,163 hours

6. Summary of Research during the last year

6.1. Title

Development of a combined system for CAI-satellite imager analysis and model simulation

6.2. Purpose

The purpose of 2007 research is the same as that of 2008

6.3. Summary of Results

In 2007, we developed and implemented the assimilation system. In addition, comparative studies between observed and simulated aerosol characteristics for March, April & May 2005 in South-East Asia were conducted. These comparative studies focused on AOD observed by the ground-based SKYNET system and on attenuated backscatter observed by the LIDARS of the ADnet system.

6.4. CPU use in the previous year

4 users, CPU hours ＜1 node：18 hours,
1 node：31,725 hours, 2 node：142 hours,
total：31,866 hours