Geophysical Research Abstracts, Vol. 9, 00510, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-00510

Carbon Dioxide Concentrations from Solar Absorption FTIR Spectrometry and Inferring CO2 Sources and Sinks using the STILT/ROAM

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Remote sensing measurements of CO2 from space are likely to become important constraints on carbon cycle processes in the near future. These measurements cannot be validated with in situ measurements, because in situ measurements are of a single point and the satellites measure a weighted column integral. The measurement of solar absorption via ground-based Fourier transform infrared (FTIR) spectrometry can measure the same column integrals as the satellite but do so at a fixed point, making it amenable to direct comparison with aircraft or in situ observations.

Inferring sources and sinks of CO2 involves backward particle trajectories to determine regions that influence the measurement. This is done using the Stochastic Time-Inverted Lagrangian Transport / Receptor Oriented Atmospheric Model (STILT / ROAM). As of now, STILT / ROAM accommodates for single point receptor (measurement point) locations used for in situ and aircraft measurements. In order to also adapt for column measurements, STILT / ROAM was modified to include multiple receptor locations. By combining FTIR data and the STILT / ROAM, much more information and insights may be gained regarding atmospheric carbon dioxide concentrations.

Results of solar absorption measurements performed during the CarboEurope Regional Experiment in France as well as long-term trends of carbon dioxide in Bremen, Germany are presented. First results of inferred CO2 sources and sinks using the STILT / ROAM are also discussed.