Geophysical Research Abstracts
Vol. 18, EGU2016-14350-1, 2016
EGU General Assembly 2016

Affect of a clear-sky bias on inversions of XCO_2

Julia Marshall, Martin Jung, Christian Rödenbeck, and Martin Heimann
Max Planck Institute for Biogeochemistry, Biogeochemical Systems, Jena, Germany (marshall@bgc-jena.mpg.de)

Since GOSAT XCO_2 data have become available, several studies have illustrated the systematic differences seen in flux patterns based on inversions of surface measurements vs. those based on satellite measurements. Across retrievals, transport models, and inversion setups, a clear shift towards larger sources from the tropics and a stronger sinks from the extratropics is seen, often so marked that the two results are not statistically consistent with one another within uncertainty bounds. Some studies have attributed this redistribution of fluxes to biases in the measurements, perhaps the result of inappropriately defined prior covariance assumptions in the satellite retrieval, while others have argued that the result is robust. One aspect that has not been explored thoroughly is the possibility that this difference might be the result of a clear-sky bias in the measurements. By measuring only when there are gaps in the cloud, the satellite measurements are skewed toward sampling in conditions of higher uptake. Analysis using flux tower data shows the effect of this to be regionally dependent with a strong seasonal signal, resulting in an overestimation in uptake in the northern hemisphere extratropics. We extend the analysis using upscaled products to assess the impact on the cumulative NEE fluxes at the time of satellite overpass, comparing the all-sky values to those with clear-sky conditions. This difference in cumulative fluxes is translated into an offset in XCO_2, and the impact on inverted fluxes is shown. Potential strategies to overcome such a systematic bias are discussed.