Geophysical Research Abstracts
Vol. 16, EGU2014-10997-1, 2014
EGU General Assembly 2014

A Consistent View on the Terrestrial Carbon Cycle through Assimilation of Multiple Data Streams

Thomas Kaminski (1), Gregor Schürmann (2), Simon Blessing (1), Wouter Dorigo (3), Ralf Giering (1), Jennifer Grant (4), Wolfgang Knorr (4), Christoph Köstler (2), Christoph Paulik (3), Marko Scholze (4), Klaus Scipal (5), Michael Voßbeck (1), and Sönke Zaehle (2)

(1) FastOpt, Germany, (2) Max-Planck-Institute for Biogeochemistry ,Germany, (3) Technical University of Vienna, Austria, (4) Lund University, Sweden, (5) ESA, Netherlands

ESA's CarbonFlux project assimilates the information from three Earth Observation (EO) data streams into two models of the terrestrial carbon cycle. The EO products are soil moisture provided by ASCAT/AMSR-E, Fraction of Photosynthetically Active Radiation (FAPAR) derived by the Two-stream Inversion Package (TIP) from MODIS broadband albedos, as well as column-integrated atmospheric CO_2 (XCO_2) derived from SCIAMACHY through the Bremen Optimal Estimation Differential Optical Absorption Spectroscopy (BESD) retrieval algorithm. Using the derivative-based variational Carbon Cycle Data Assimilation System (CCDAS) approach, these data streams are applied in a mathematically rigorous way together with prior information to act as simultaneous constraints on process parameters/initial conditions of the Biosphere Energy Transfer HYdrology Scheme (BETHY), and the Jena Scheme for Biosphere-Atmosphere Coupling in Hamburg (JSBACH). We describe the assessment of data uncertainties (i.e. observational and model-related) uncertainties as well as dedicated bias-correction schemes for each data stream. Using second-derivative information, we infer posterior parameter/initial state uncertainties and map them forward onto simulated net and gross surface carbon fluxes over multiple scales. This means CCDAS derives higher-level multi-year reanalysis products with uncertainty ranges from our EO input products, which allows us a rigorous assessment of the indirect constraint on carbon fluxes provided by the EO products. We present the CarbonFlux reanalyses products, validate them against independent observations and compare them with further CCDAS reanalysis products derived through assimilation of different data streams, such as SMOS L3 soil moisture products and flask samples of the atmospheric CO_2 concentrations.