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ICOS

Existing data gaps and promotion of activities to close them

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Identification of gaps

A comparison of variables measured by ICOS with the Essential Carbon Cycle Variables mentioned in the IGOS Carbon Theme Report (Ciais et al. 2004) indicated several areas where external data is needed: vegetation activity, fire extent and frequency, soil carbon content, land use and land use change, C-fuel emissions, lateral transports, and nitrogen deposition. In addition, an explicit specification of Essential Carbon Cycle Variables with regard to spatial and temporal resolution, update cycle, and accuracy is needed. The ongoing FP7 project COCOS is targeting especially the specification of those ECCVs that do not overlap with the Essential Climate Variables. These include fine-grained spatial maps forest disturbances and soil organic carbon. It will also be necessary to bring in line the oceanic ECCVs with the atmospheric and terrestrials ECCVs. ICOS WP4 has cooperated closely with COCOS by preparing an explicit list of ECCVs from the narrative of the IGOS Carbon Theme Report (Ciais et al. 2004).

Vegetation activity

Many global satellite products are available for spatially integrating CO₂ fluxes, vegetation activity, and weather. These are listed in detail in the IGOS Carbon Theme Report (Ciais et al. 2004). The most suitable products will be selected for inclusion in the ICOS portal. Many of the products are available from the European Space Agency via LSA SAF.

Fire extent and frequency

The Global Fire Monitoring Center (GFMC, <http://www.fire.uni-freiburg.de>) is an activity of the UN International Strategy for Disaster Reduction (UN-ISDR). Within its framework several satellite products are currently available for the past: global burnt areas 2000-2007 (1 km, daily), global fire probability maps 1982-1999 (8 km, weekly), the ATSR World Fire Atlas 1995-present).

Soil carbon content

IIASA and FAO have recently published a new version of its Harmonized World Soil Database (version 1.1, <http://www.iiasa.ac.at/Research/LUC/luc07/External-World-soil-database/HTML/>). It has a resolution of 30 arcseconds (≈ 1 km at equator). Its content includes information on the organic C concentration and bulk density of the soil down to 100 cm. A specialized European product, the European Soil Database v. 1.2 contains information on C concentration in the upper 30 cm. A derived map with 1 km resolution is available. Additional information on soil depth and bulk density from the SPADE soil profile database allows estimating carbon content. The FP7 project iSOIL (<http://www.isoil.info>), started in 2008, will expand techniques for mapping soil fast and reliably. When those techniques are applied across Europe in the future, more reliable soil carbon maps may become available in the future.

Land use, land use change

The CORINE land cover data with a spatial resolution of 100 m is currently the best product available covering the EU. It exceeds the 1-km resolution of the Global Land Cover 2000 database. Specialized products for wetlands are provided by the GlobWetland project (<http://www.globwetland.org>).

C-fuel emissions

Maps of fossil fuel emissions are currently available as products of inverse modelling (T3 annual, EDGAR FT2000, EDG annual, IER hourly). A recent study (Peylin et al. 2009) concluded that “changes in the estimated monthly biosphere flux (Fbio) over Europe, using two inverse modeling approaches, are relatively small (less than 5%) while changes in annual Fbio (up to -0.15 Gt C/yr) are only slightly smaller than the differences in annual emission totals and around 30% of the mean European ecosystem carbon sink. These results point to an urgent need to improve not only the transport models but also the assumed spatial and temporal distribution of fossil fuel emission maps.”

Lateral transports

Maps of modeled soil erodability produced in the Pan-European Soil Erosion Risk Assessment project (PESERA, http://eusoils.jrc.ec.europa.eu/ESDB_Archive/pesera/pesera_cd) may be used until more specialized products become available. The GlobWetland project provides specialized maps that may allow calculating riverine transports and carbon storage in lake sediments.

Nitrogen deposition

The natural co-operation partner for measurements of nitrogen deposition is the NitroEurope project (<http://www.nitroeuropa.eu/>). ICOS sites should be established at existing NitroEurope sites or jointly with new NitroEurope sites. It is in the interest of ICOS that the N deposition measurements continue beyond the end of NitroEurope in 2011.