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COCOS

Report on the role of European observations in the context of global carbon observations

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Abstract

European observations are embedded in global networks. Data relevant for carbon cycle research is distributed among many projects, providers, and data bases. The separation is especially strong between the atmospheric, terrestrial, oceanic, and remote sensing domain. European observations contribute strongly to global carbon observations. The level of contribution, however, cannot be quantified easily.

European observations in the context of global carbon observations

COCOS has identified a detailed list (D1.5) of more than 300 observables contributing to the Essential Carbon Cycle Variables (ECCVs) set forth in the IGOS Carbon Theme report (Ciais et al. 2004). Carbon is linking many diverse aspects of the biosphere. Therefore, carbon observations are currently spread across many databases (Tables 1–2). The sets of ECCVs and Essential Climate Variables (ECVs) overlap so that many ECCV observations are found in climate observation programs.

Table 1. International Providers and Portals of carbon cycle-related data

- CDIAC (Carbon Dioxide Information Analysis Center)
- CLIVAR/Carbon Hydrographic Data Office (CCHDO)
- ECMWF (European Centre for Medium Range Forecasts)
- EEA (European Environmental Agency)
- ESA/LSA SAF: Eumetsat derived products
- FAO (Food and Agriculture Organization)
- GAWSIS (Global Atmosphere Watch Station Information System)
- GEO-Portal (Group on Earth Observation/GEOSS, Global Earth Observation System of Systems)
- GEOMon (Global Earth Observation and Monitoring of the Atmosphere)
- GOSIC (Global Observing Systems Information Center)
- JRC (European Commission: Joint Research Commission)
- ORNL/DAAC (Oak Ridge National Laboratory, Distributed Active Archive Center)
- SOCAT (Surface Ocean CO_2 Atlas)
- World Data Centers/World Data System
    - WDC for Atmospheric Trace Gases (at CDIAC)
    - WDC for Greenhouse Gases (at JMA)
    - WDC for Land Cover Data
    - WDC for Marine Environmental Sciences
    - WDC for Meteorology
    - WDC for Oceanography
    - WDC for Remote Sensing of the Atmosphere
    - WDC for Remotely Sensed Land Data
    - WDC for Soils

Table 2. Major data providers of European proxy or ancillary data of ECCVs

Variable	*Organization:department*	*Project*
▼❑ Fire	JRC: IES	EFFIS
• ❑ fire frequency distribution (hot spots, ≤ daily)		
• ❑ burned area		
▼❑ Soil	JRC: IES	SOIL
• ❑ organic carbon		
▼❑ Vegetation activity		
• ❑ LAI	ESA:LSA SAF	
• ❑ albedo	ESA:LSA SAF	
• ❑ Biomass		
• ❑ NDVI	NOAA	
• ❑ Ocean colour	JRC:IES	SeaWiFS
• ❑ drought index	JRC	Drought
• ❑ FAPAR – Fraction of Absorbed PAR	JRC:IES	FAPAR
▼❑ Land use, land change, land cover		
• ❑ CORINE land cover	JRC:IES	
• ❑ fossil fuel emission maps	JRC:IES	EDGAR
• ❑ N deposition	NitroEurope	
▼❑ Lateral transports		
• ❑ erosion	JRC	PESERA
• ❑ sediment discharge from European rivers	EEA	
▼❑ Climate, spatial		
• ❑ soil moisture	ESA:LSA SAF	SMOS
• ❑ precipitation	ESA:LSA SAF	
• ❑ surface temperature	ESA:LSA SAF	
▼❑ Static spatial data	UNEP	
• ❑ biodiversity		
• ❑ mean monthly temperature		
• ❑ mean monthly precipitation		
• ❑ NOAA/GVI vegetation indices		
• ❑ soil water holding capacity		
• ❑ forest – non-forest, 25 m, 5 years	GLS	
• ❑ elevation, 30 arcseconds		
▶❑ GeoMon atmospheric concentration data	GeoMon	

Many short-term scientific projects (Table 3) contribute to long-term goals set by international projects or organizations (Global Carbon Project, Group on Earth Observation. The multitude of projects and dispersed storage and ownership of primary and processed data make it tedious to locate and retrieve relevant data, especially of terminated projects. Deposition of project data in long-term archives with data becoming automatically available without involvement of the legal data owner after a reasonable time period would improve the situation and should be a requirement for projects funded by public institutions.

In addition to observation projects, there are several data synthesizing projects like CarbonTracker, CarbonTracker Europe, ESA-GlobCarbon, and Globalview and projects synthesizing statistics from regional, national, international, and economic organizations (e.g. EDGAR).

Table 3. Selected European projects contributing to carbon cycle observations

Aerocarb (2000-2003)
Camels (2002-2005)
CarboAge (2000-2003)
CarboChange (2011-2015)
CarboData (2000-2003)
CarboEuroFlux (2000-2003)
CarboEurope Accompanying Measure (2001-2004)
CarboEurope Cluster (2000-2005)
CarboEurope GHG (2002-2005)
CARBO-EXTREME (2009-2013)
CarboEurope IP (2004–2008)
Carbo-Invent (2002-2005)
CarboNorth (2006–2010)
CarboOcean (2005–2009)
CarboPeat (2007-2009)
Chiotto (2002-2005)
COCOS (2008–2011)
ERA-CLIM (2011-2013)
Eurosiberian Carbonflux (1998-2001)
EUROSITES (2008–2011)
Forcast (2000-2003)
GEOCARBON (2011–2014)
GLOMPCARBON (2006–2009)
geoland (2004-2007)
Greengrass (2002-2005)
ICOS (2008–2013)
IMECC (2007–2011)
Insea (2004–2005)
ISOCYCLE (2007–2011
LBA Carbonsink (2000-2002)
NitroEurope-IP (2006–2011)
Recab (2000-2003)
Tacos (2001-2004)
Tcos (2002-2005)

European observations of carbon cycle variables are embedded in global networks of observations like FLUXNET, International Ocean Carbon Coordination Project, International Oceanographic Data and Information Exchange, and Committee on Earth Observation Satellites (Fig. 3). Europe has the highest density of eddy-flux towers globally (15/Gm^2, 2010 data, Fig. 1). Europe is also contributing strongly to global oceanic and remote sensing measurements. It is, however, difficult to quantify the proportion of contribution in these fields (Fig. 2).

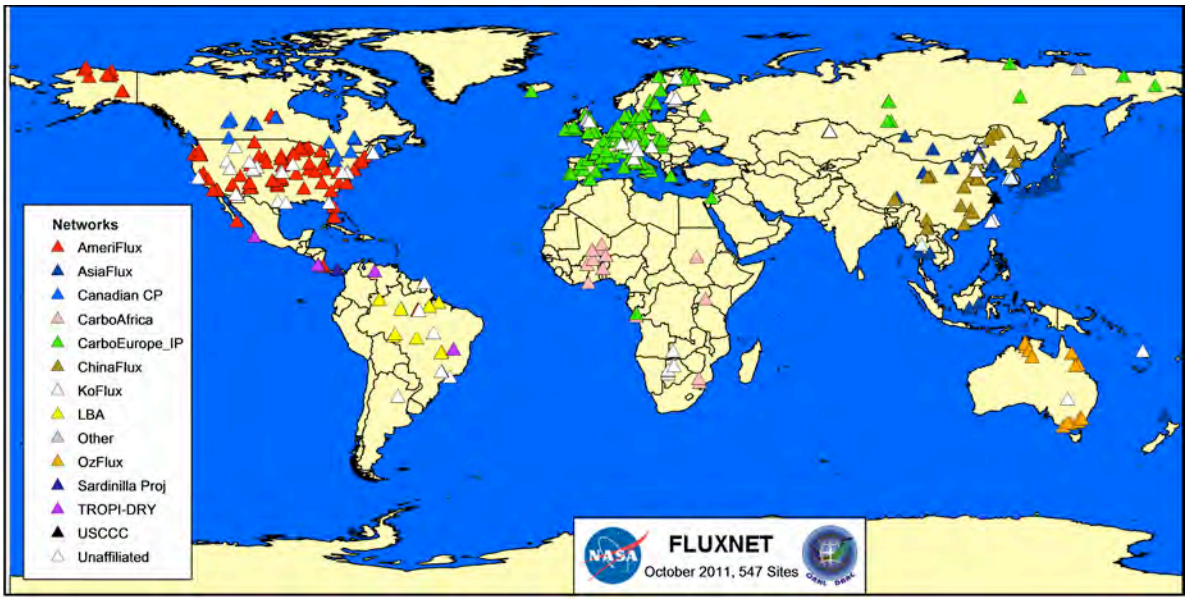

Fig. 1. Locations of eddy-covariance towers. Africa: 25, Asia: 104, Australia: 17, Europe 152, N America: 195, S America 30.

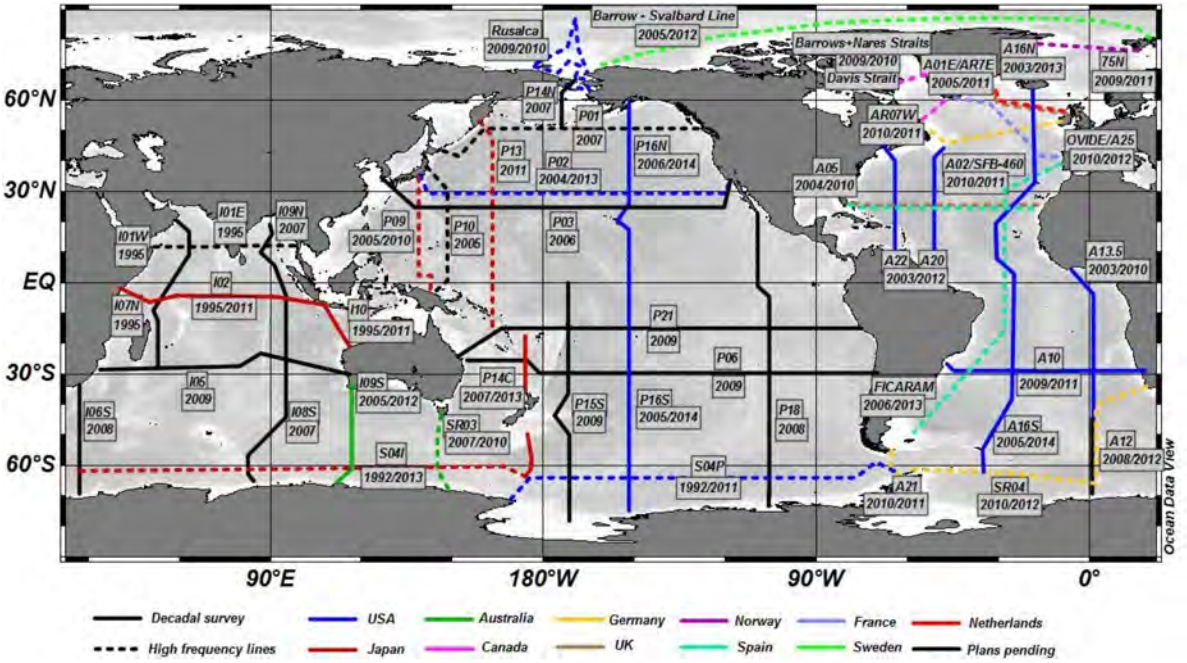

Fig. 2. Routes of GO-Ships by nationality. http://www.go-ship.org/RefSecs/GOSHIPMap_April2011.pdf

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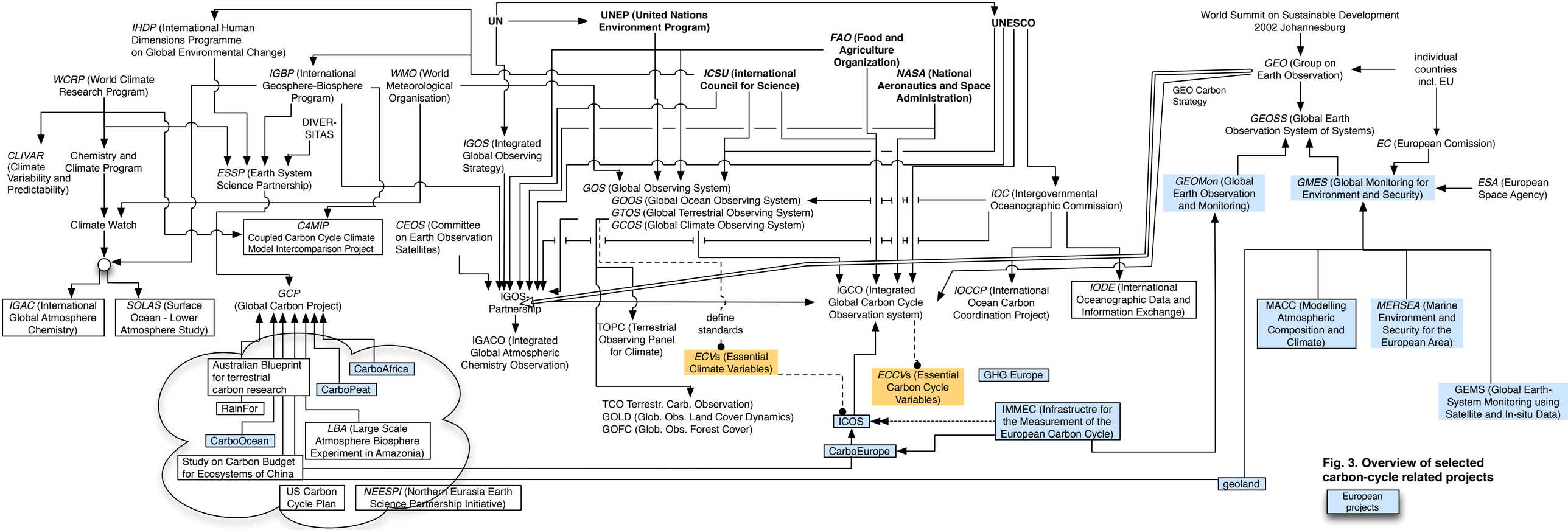

Fig. 3. Overview of selected carbon-cycle related projects