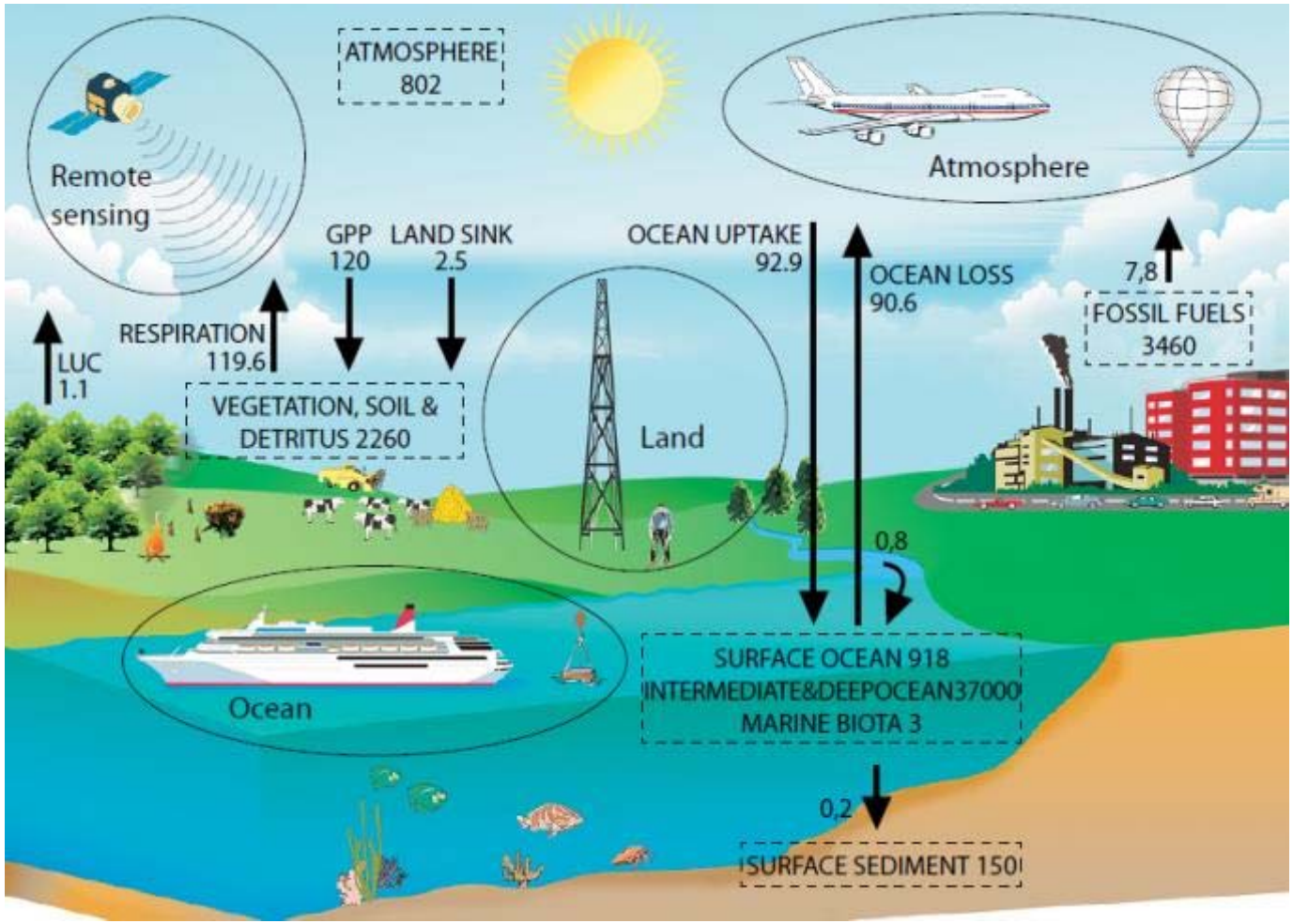
A. Bombelli[1], J.H. Butler[2], J.G. Canadell[3], P. Ciais[4], P. DeCola[5], A.J. Dolman[6], R.M. Duren[7], D.-G. Kim[8], W.L. Kutsch[9], S. Houweling[10], J.V. Lavrič[9], H. Loescher[11], H. Muraoka[12], A. Obregón[13], B. Pfeil[14], S.E. Plummer[15], N. Saigusa[16], R.J. Scholes[17], T. Tanhua[18], M. Telszewski[19], A.T. Vermeulen[20], L. Yi[21]

[1]CMCC, Italy, [2]NOAA, US, [3]CSIRO, Australia, [4]LSCE, France, [5]SIGMA, US, [6]VU University Amsterdam, Netherlands, [7]JPL-NASA, US, [8]Wondo Genet College, Ethiopia, [9]ICOS, Finland, [10]SRON, Netherlands, [11]NEON, US, [12]Gifu Univ., Japan, [13]GEO-Sec, int., [14]UIB, Norway, [15]ESA Climate Office, UK, [16]NIES, Japan, [17]Witwatersrand Univ., South Africa, [18]GEOMAR, Germany, [19]IOCCP, int., [20]ICOS, Lund Univ., Sweden, [21]IAP/CAS, China

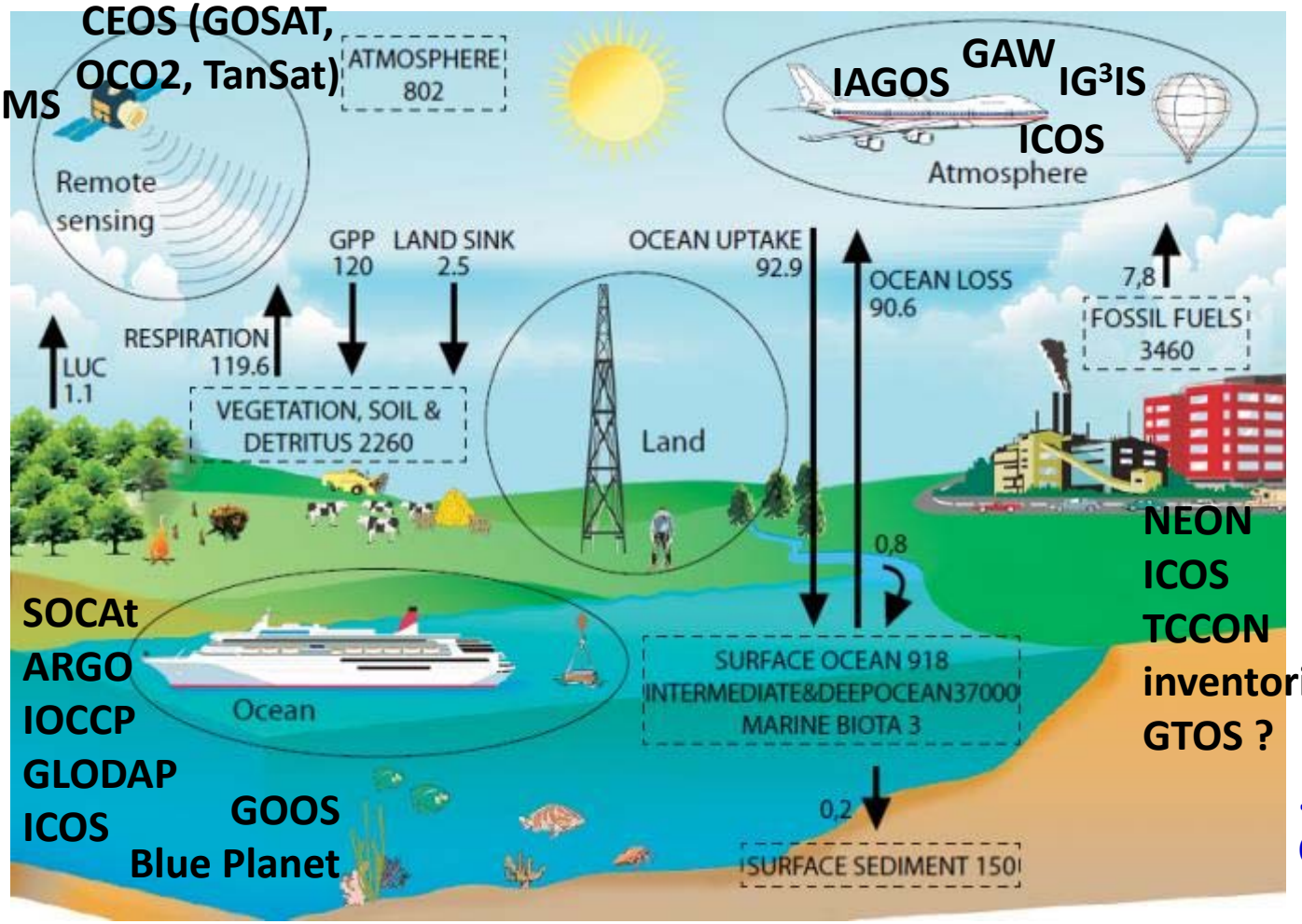
The GEO Carbon and GHG Initiative: toward policy-relevant global carbon cycle observation and analysis

The Global Carbon Cycle: a complex interaction of different systems in different domains – directly linked to climate change



(Source: GEOCARBON Project)

A complex story….



CEOS (GOSAT, OCO2, TanSat)

NASA CMS

IAGOS GAW IG³IS ICOS

GCOS

GCP

NEON
ICOS
TCCON
inventories
GTOS ?

SOCAt
ARGO
IOCCP
GLODAP
ICOS

GOOS
Blue Planet

… and many OTHERS!

(Source: GEOCARBON Project)

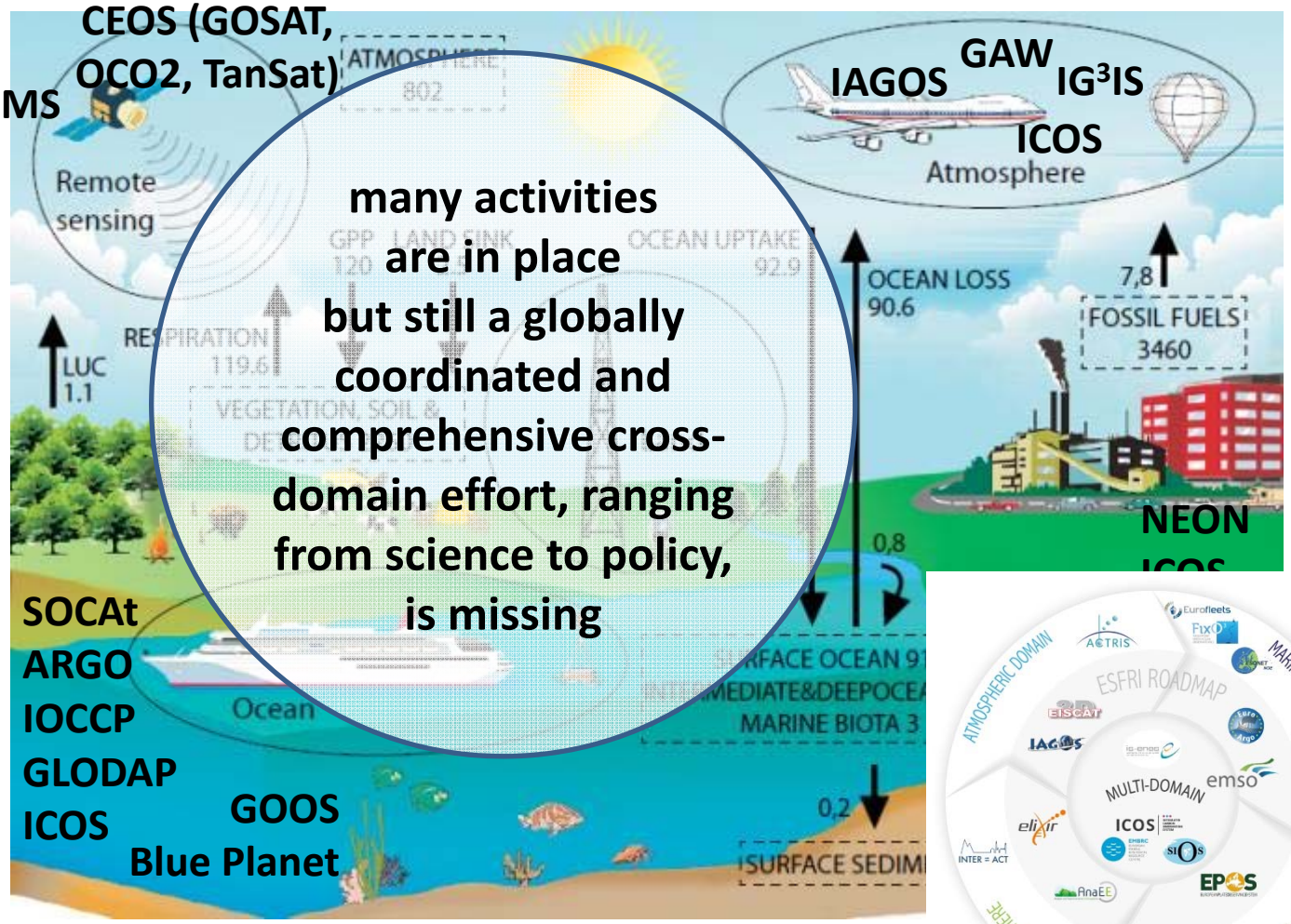
Source: ENVRI+

CEOS (GOSAT, OCO2, TanSat)

NASA CMS

GCOS

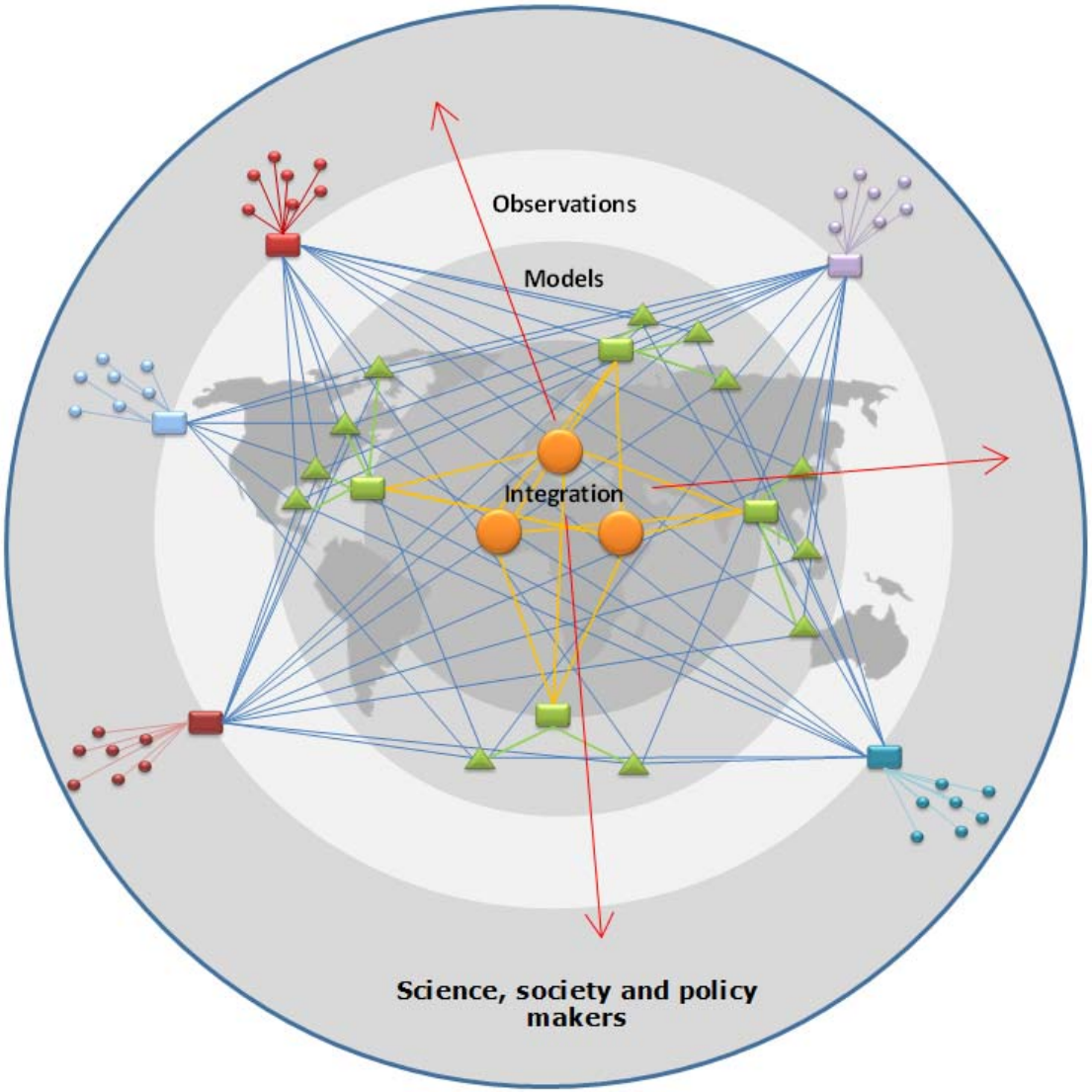
GCP

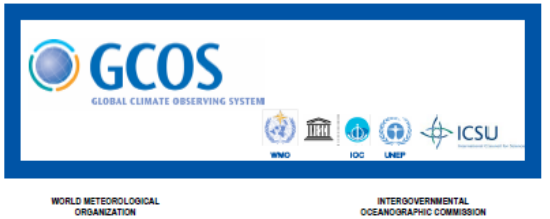


many activities are in place but still a globally coordinated and comprehensive cross-domain effort, ranging from science to policy, is missing

GHG and carbon cycle research:

- uncertainties
- Non-CO_2 GHG
- Tipping points
- critical hotspots
- sustainability of networks
- global coverage
- interoperability
- communication
- …


Observations
Models
Integration
Science, society and policy makers



Biogeosciences, 11, 3547–3602, 2014
www.biogeosciences.net/11/3547/2014/
doi:10.5194/bg-11-3547-2014

Biogeosciences

Current systematic carbon-cycle observations and the n
implementing a policy-relevant carbon observing system

P. Ciais[1], A. J. Dolman[2], A. Bombelli[3], R. Duren[4], A. Peregon[1], P. J. Rayner[5], C. Miller[4], N. Gobr
G. Marland[8], N. Gruber[9], F. Chevallier[1], R. J. Andres[10], G. Balsamo[11], L. Bopp[1], F.-M. Bréon[1],
R. Dargav[12], T. J. Butler[15], J. G. Ca
R. B. Cool eimann[22], A. He
B. Law[25], [8], C. Nussli[29], M
D. Ojima[3] gan[24], P. Rayme
M. Reichs [3], R. Wang[1], G
D. Wickla

Strategy Towards an Architecture for Climate Monitoring from Space

GROUP ON EARTH OBSERV

United Nations
Framework Convention on Climate Change

FCCC/CP/2015/L.9/Rev.1

Distr.: Limited
12 December 2015

Original: English

Conference of the Parties
Twenty-first session
Paris, 30 November to 11 December 2015

Agenda item 4(b)
Durban Platform for Enhanced Action (decision 1/CP.17)
Adoption of a protocol, another legal instrument, or an agreed outcome with legal force under the Convention applicable to all Parties

ADOPTION OF THE PARIS AGREEM

Proposal by the President

Draft decision -/CP.21

The Conference of the Parties,

Recalling decision 1/CP.17 on the establishment of the Durban Platform for Enhanced Action,

Also recalling Articles 2, 3 and 4 of the Convention,

Further recalling relevant decisions of the Confere decisions 1/CP.16, 2/CP.18, 1/CP.19 and 1/CP.20,

Welcoming the adoption of United Nations G A/RES/70/1, "Transforming our world: the 2030 Agenda for particular its goal 13, and the adoption of the Addis Ababa International Conference on Financing for Development and Framework for Disaster Risk Reduction,

Recognizing that climate change represents an urgen threat to human societies and the planet and thus requires the by all countries, and their participation in an effective a response, with a view to accelerating the reduction of global g

Also recognizing that deep reductions in global emissi to achieve the ultimate objective of the Convention and empl in addressing climate change,

Acknowledging that climate change is a common co should, when taking action to address climate change, respect respective obligations on human rights, the right to health, the

GE.15-21932(E)

ESA ATMOS 2015, Heraklion, Greece

Greenhouse Gases (GHG) and Future Missions sessions:

Summary of Discussion and Recommendations to ESA

ESA ATMOS 2015

http://seom.esa.int/atmos2015/files/Recommendations_GHG_FutureMissions_ESA-ATMOS2015_FINAL.pdf

August 2010
GCOS-138

An Advance Planning
"Pre-Decadal Survey" Workshop
The Carbon-Climate System

15-18 March 2015
University of Oklahoma
Norman, Oklahoma
USA

Conveners
Berrien Moore III
Dave Schimel
Piers Sellers

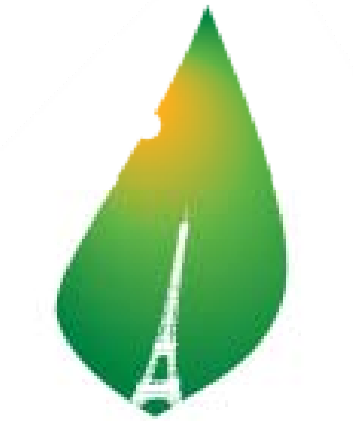
Support:
Earth Sciences Division
NASA

„Norman Report"

Article 7.7

Parties should strengthen their cooperation … including with regard to: …

(c) Strengthening scientific knowledge on climate, including research, systematic observation of the climate system and early warning systems, in a manner that informs climate services and supports decision-making.



Art 14.1

The parties "shall periodically take stock ("global stocktake") of the implementation of this Agreement to assess the collective progress … It shall do so in a comprehensive and facilitative manner, considering mitigation, adaptation and the means of implementation and support, and in the light of equity and the best available science.

Long term and high precision observations and analysis of GHG cycles in the different domains (atmosphere, ocean, land), considering also anthropogenic emissions, are required (more than ever) to better:

i. quantify the GHG sources and sinks
ii. understand the feedbacks with the climate system and
iii. address mitigation and adaptation actions.

Support to an independent monitoring and evaluation system

Policy needs reliable GHG-related information!

New GEO Work Plan & Carbon

"Climate" from a GEO Societal Benefit Areas (SBA) to a cross-cutting focus incorporated into each SBA.

Adaptation to, and mitigation of, climate change have to be part of all SBAs.

CLIMATE (& Carbon)

"Carbon" shares a cross-cutting position with "Climate"

We need a Carbon/GHG-Initiative/Flagship (GEO-C)

The GEO Strategic Plan 2016-2025 implementing the GEO activities through different implementation mechanisms:

- **GEO Community Activities**
- **GEO Foundational Tasks**
- **GEO Initiatives**
- **GEO Flagships**

2016: Transitional year (and transitional plan)

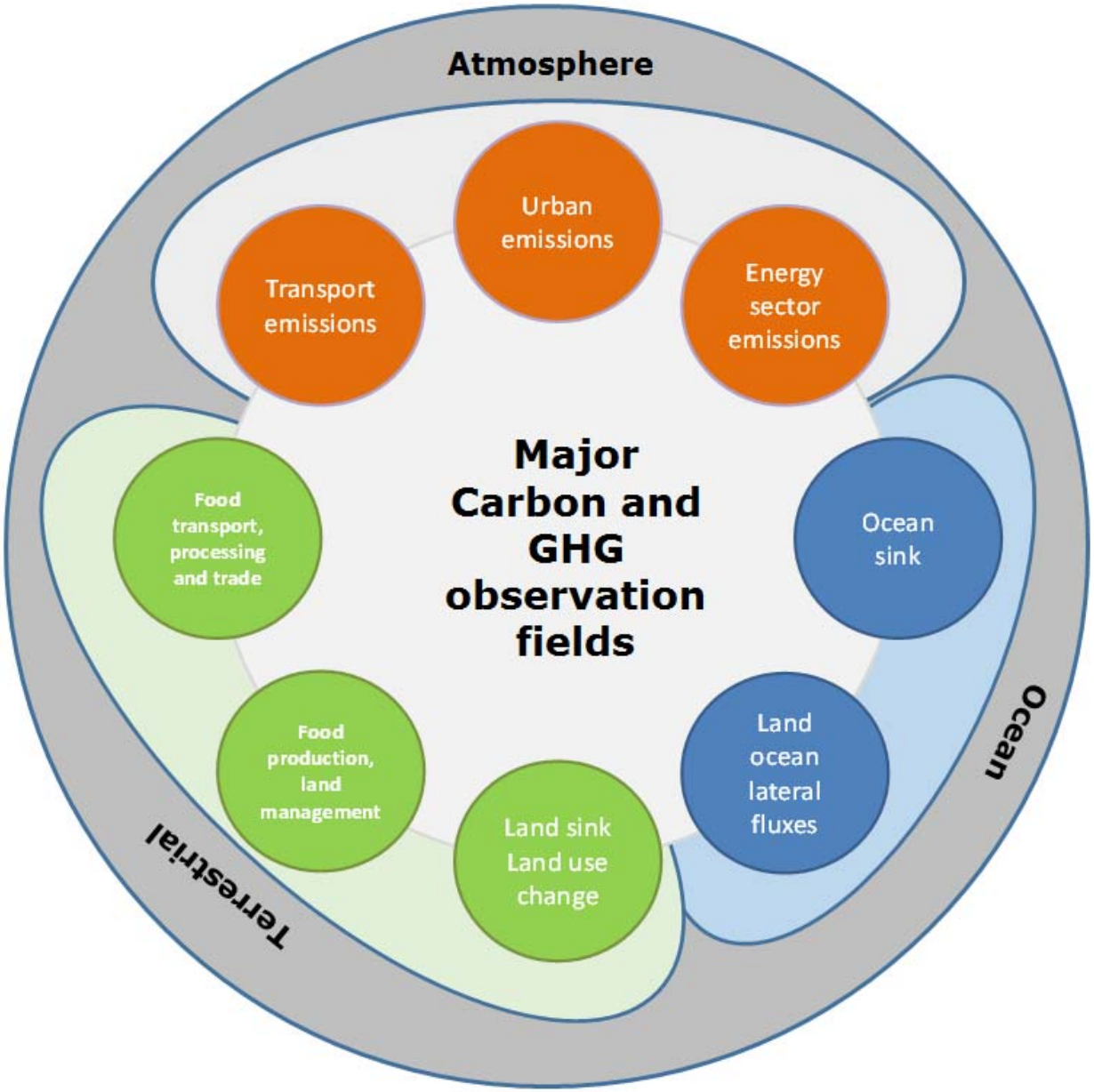
2017-2025: three 3-years Work Programmes

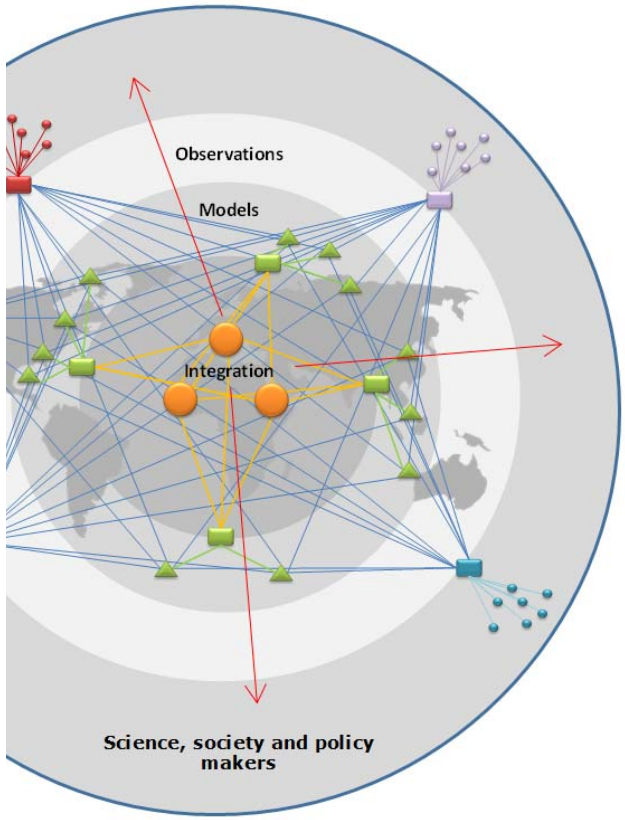
GROUP ON EARTH OBSERVATIONS

Overview of Implementation mechanisms

	GEO Flagships	GEO Initiatives	GEO Community Activities	GEO Foundational Tasks
Purpose / character	**pre-/near-operational** service(s) top-down	**pilot or prototype** service(s); top-down	develop, test, or demonstrate application(s); bottom-up	enabling or support function(s) top-down
Initiated by	Specified Members, Participating Organization		GEO Community	GEO Secretariat
Accepted by	Plenary	GEO Programme Board	GEO Secretariat Director	Plenary (with GWP)
Criteria	• Policy mandate • Near-operational • Satisfies user need • User institutions specified • Resources identified and committed	• Development, demonstration, pilot • Targets user need • Some users identified • Resources identified and committed	• Relevance to GEO's Strategic Objectives	• Implements/supports GEO Core Function • Sufficient resources, identified and committed in GWP
Management and coordination	Dedicated mechanism; coordinator		Community-based	GEO Secretariat or Working Group
User engagement	**Specifically identified**, fully engaged, role in steering.	Target user groups **generally identified**, with at least an advisory role.	May vary, depending on activity.	May vary, depending on Task.

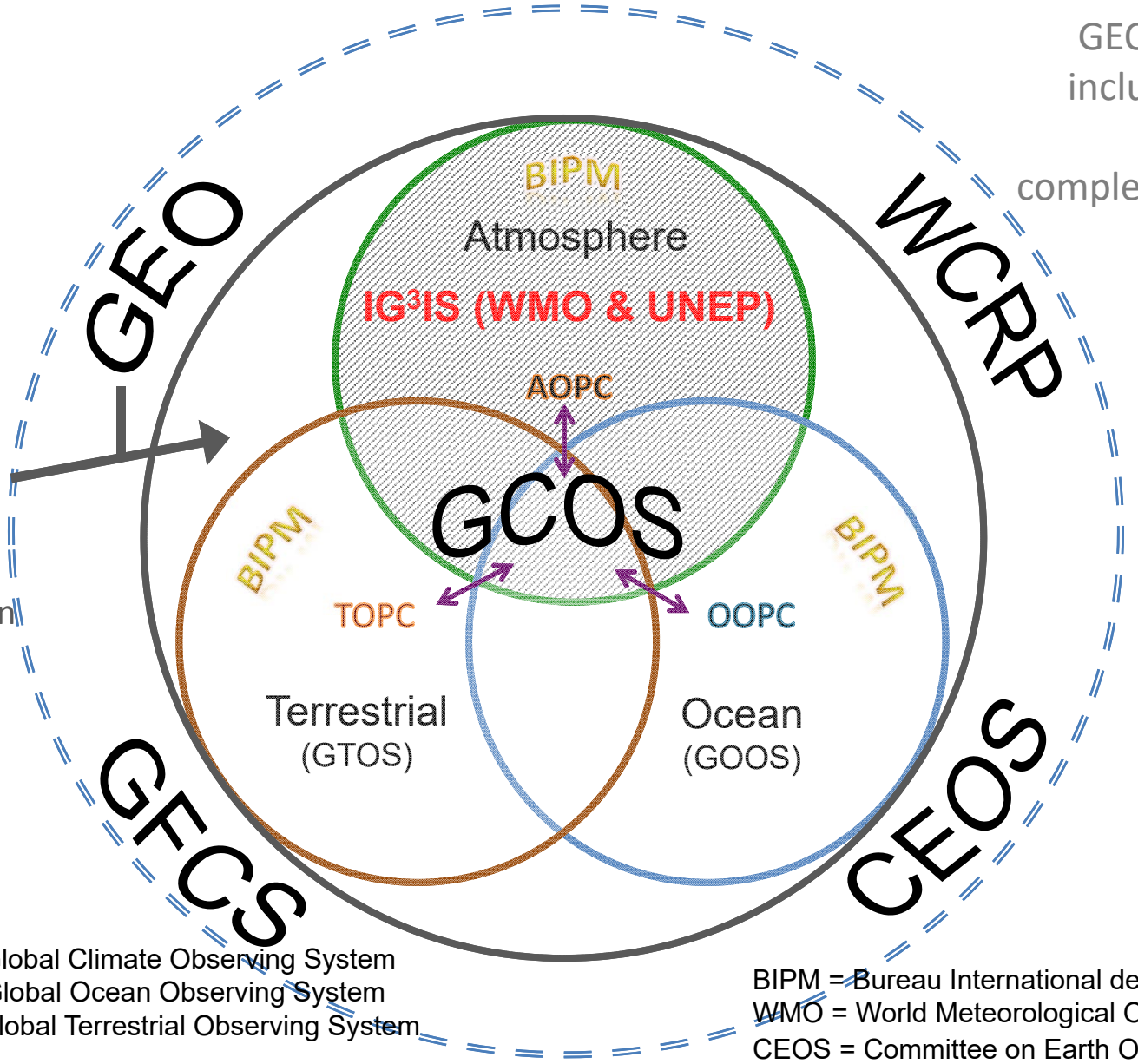
Source:
GEO Strategic Plan 2016-2025


Atmosphere
Urban emissions
Transport emissions
Energy sector emissions
Major Carbon and GHG observation fields
Food transport, processing and trade
Ocean sink
Food production, land management
Land ocean lateral fluxes
Land sink Land use change
Terrestrial
Ocean


Observations
Models
Integration
Science, society and policy makers

The landscape

GEO-C aims to be inclusive of all the systems, complementing each other



GEO-C

- No duplication
- Specific focus on C & GHG
- Domain-overarching

GCOS = Global Climate Observing System
GOOS = Global Ocean Observing System
GTOS = Global Terrestrial Observing System

AOPC = Atmospheric Observation Panel for Climate
OOPC = Ocean Observation Panel for Climate
TOPC = Terrestrial Observation Panel for Climate

BIPM = Bureau International des Poids et Mesures
WMO = World Meteorological Organization
CEOS = Committee on Earth Observation Satellites
GEO = Group on Earth Observations
GFCS = Global Framework for Climate Services
WCRP = World Climate Research Programme

ICOS SCIENCE CONFERENCE HELSINKI 2016 27–29 SEPT

GEO-C

A common platform for coordination of interfaces and joint work

The GEO-C Initiative will provide cross integration among the different pieces of the global system, acting as the coordination of the interfaces (between: atmosphere, ocean and terrestrial domains; space-based, air-borne and in-situ monitoring systems; other initiatives with global relevance inside and outside GEO) and promoting interoperability.

It will establish a common platform to plan joint strategies and implement joint activities.

Final aim: a global, integrated, comprehensive, financially sustained, long-term observational system for carbon cycle and GHGs providing data for scientists and knowledge for policy makers and society.

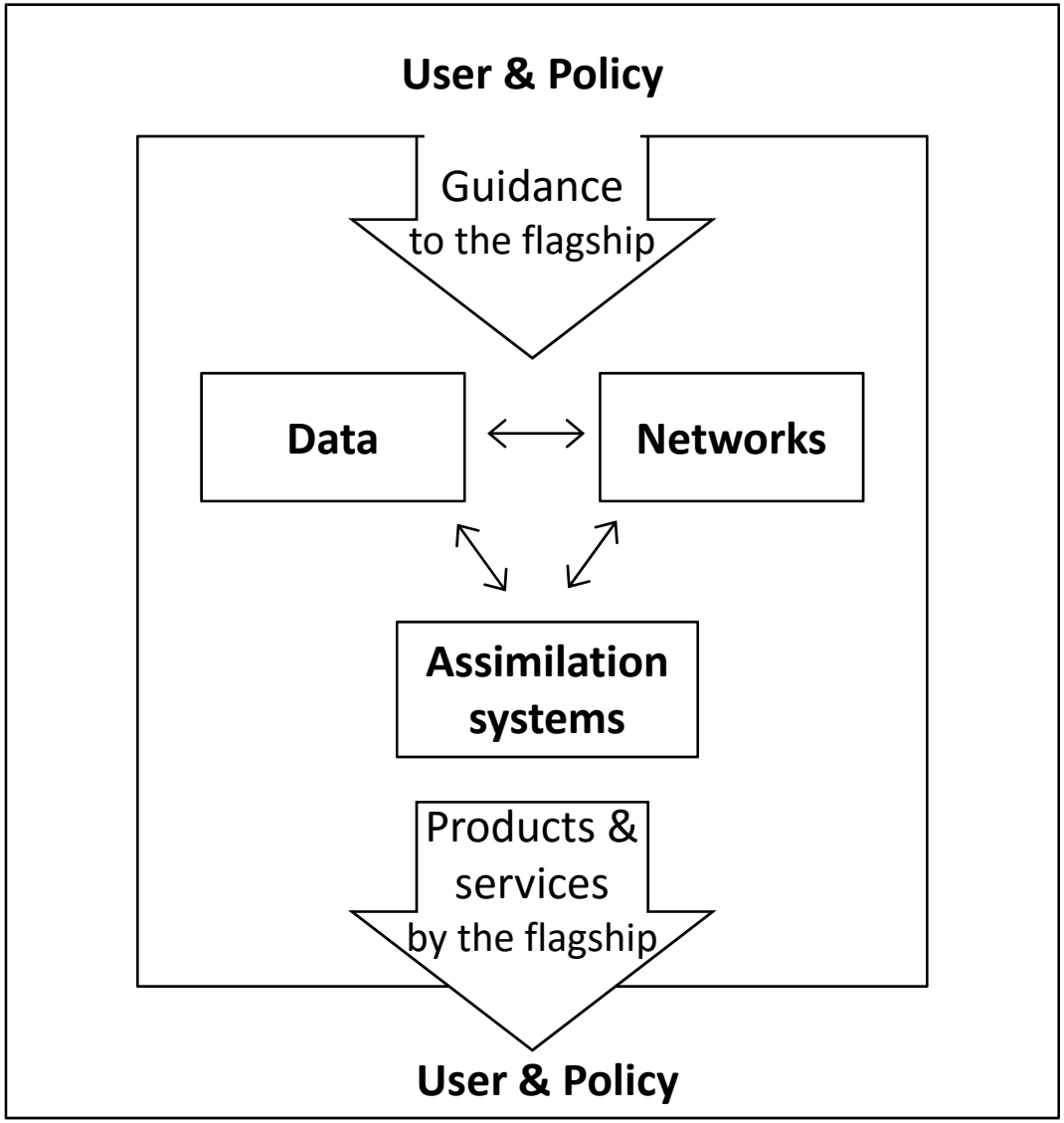
Flagship's General Objectives

- provide more inclusive coordination among the main actors monitoring carbon cycle and GHG at global level, *in order to*
- develop a connected and interoperable system of systems for carbon cycle and GHG observations and analysis, *in order to*
- provide decision makers with data, information and products needed to address climate policies and tackle global change

GEO-C

Tasks

- User needs and policy interface
- Data access and availability
- Optimization of observational networks
- Data assimilation



Resources?

The preparatory phase sustained mainly by in-kind resources from the institutions willing to participate in the GEO-C.

The implementation phase (2017-2025) will be sustained by resources to be raised.

Work Schedule

First steps: mainly at organizational level, to set up the framework for implementing GEO-C

2016: preparatory phase

- Set up a Coordinating Team and a Steering Committee (end of 2016). *The CT team will be responsible for coordinating and running the 2016's activities and fundraising. The SC will ensure the control and evaluation of the proper implementation and provide scientific review and guidance.*
- Develop an Implementation Plan (IP) to be submitted for endorsement by the GEO-XIII Plenary
- The IP has to be based on concrete and easily achievable targets.
- Fund raising: budget required to support the CT and carry out the IP. Involved partners shall ensure commitment.

2017-25: implementation phase

- roles, activities, deliverables and the required budget
- focus on 3-years activities, with 3 triennial updates.

Who can join

Anybody:

- with a mandate on C and GHG observations and/or analysis
- with international relevance and geographical focus from regional to global level
- with a role in GEO
- having responsibilities on relevant monitoring site(s) or network(s) and/or satellite mission(s)
- managing (or contributing to) relevant datasets
- developing relevant models and other products
- with expertise on science-policy interface
- willing to commit own resources (in kind, human, financial,…) for the 2016-2025 period

Possible Partnership

- CEOS, Committee on Earth Observation Satellites (representing the various satellites agencies)
- ESA
- CMCC, Euro-Mediterranean Center on Climate Change
- GCP, Global Carbon Project
- ICOS, Integrated Carbon Observation System <<<
- IG^{3}IS, Integrated Global Greenhouse Gas Information System
- NEON, National Ecological Observatory Network (US)
- US Carbon Cycle Science Program
- Other research centers already actively involved in the GEO Carbon Task (i.e. GEOMAR, LSCE, VU, NIES, GIFU University, AIST, WITS, MPG, etc.)
- COPERNICUS

Complete / consolidate /fine tune = Initiative -> Flagship

Questions?

The GEO Carbon and GHG Initiative

CONTACT

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Jošt Lavrič

(ICOS ERIC Head Office, Finland; jost.lavric@icos-ri.eu)

What the C-Flagship can be/do (1/3)

- The implementing mechanism for the CEOS C-strategy
- The umbrella that link relevant different carbon-related initiatives
- Link with other GEO communities: Agriculture, Disasters, Energy, Water, etc.
- Promote actions to address the unresolved questions in C-cycle
- Identify gaps, priorities and actions effectively achievable in 5 to 10 years' time frame
- Advocate for the need of an independent GHG verification system and promote FF emissions direct measurements (GEO is not designated to report to UNFCCC, so it is really independent!).
- Provide assistance for capacities development in GEO members' countries.
- Support monitoring infrastructures and networks, improving cross-communication and integration.

What the C-Flagship can be/do (2/3)

Users oriented

- Link scientific and observational communities with users: activities will be oriented according to users' needs.
- Provide global coordination of C-data portals with metadata open access
- Ensure the compliance with the GEOSS Data Sharing Principles.
- Advocate for the need of data, networks, infrastructures, new platforms, etc.

Communication

- Communicate carbon-related information to mass media

What the C-Flagship can be/do (3/3)

Policy relevance

- Communicate carbon-related information to mass media

- Focus on short term delivery (time scale needed by policy)

- Act as science/policy interface, liaising science with policy to address the policy agenda (from national to global scale) in the frame of GEO, UNFCCC and other relevant international arena.

- Synthetize scientific results to turn them into reliable and timely policy relevant information and recommendations in an operational way, as a decision support service.

- assist GEO-members in improving their carbon monitoring, reporting and verification system.

- assess cost-estimates and benefits of the proposed system.