climate change initiative

BIOMASS

Introduction to ESA's CCI Biomass

Frank Martin Seifert

biomass cci

The CCI Biomass Consortium

UNIVERSITY OF LEEDS

GAMMA REMOTE SENSING

PRIFYSGOL ABERYSTWYTH UNIVERSITY

CESBIO

UNIVERSITY OF LEICESTER

International Institute for Applied Systems Analysis IIASA

THE UNIVERSITY of EDINBURGH

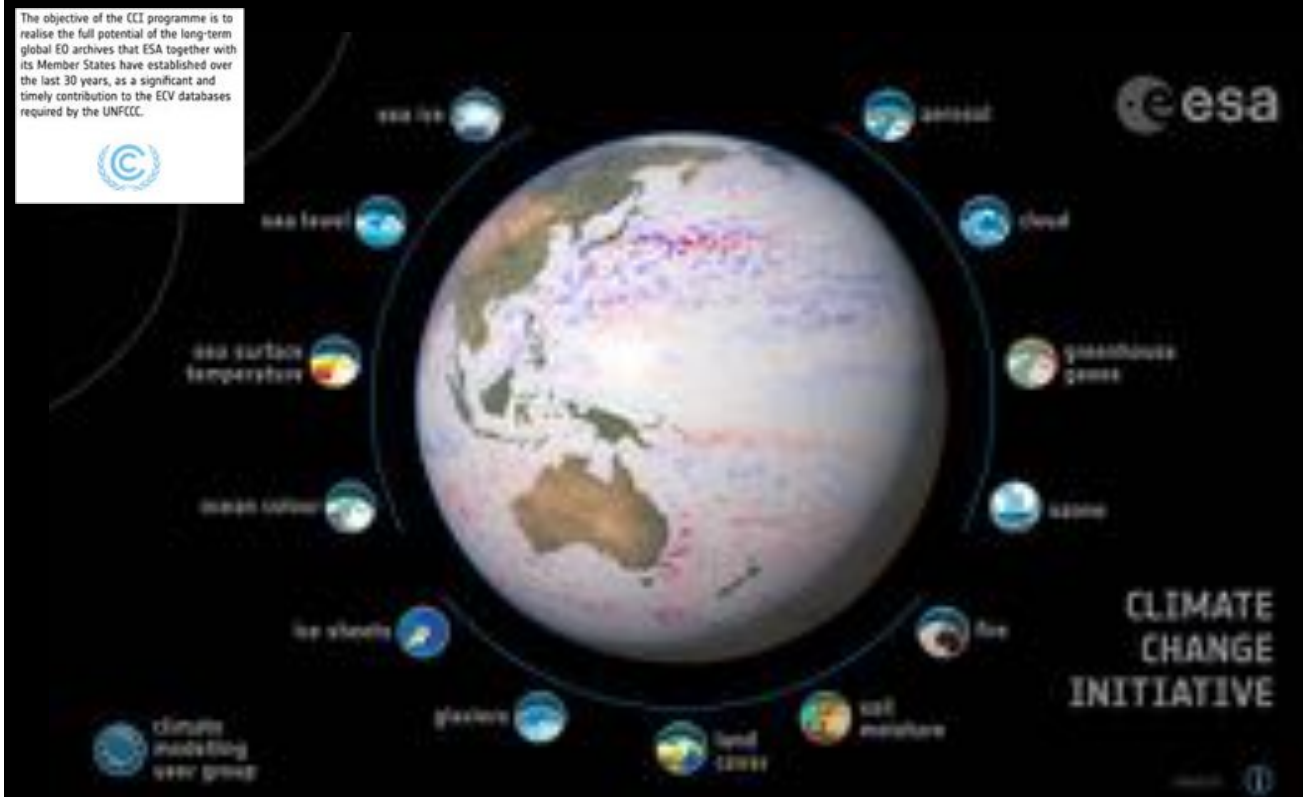
The University Of Sheffield.

WAGENINGEN UNIVERSITY & RESEARCH

Laboratoire des Sciences du Climat et de l'Environnement LSCE (UMR 8212)

ESA’s Climate Change Initiative (CCI)

The objective of the CCI programme is to realise the full potential of the long-term global EO archives that ESA together with its Member States have established over the last 30 years, as a significant and timely contribution to the ECV databases required by the UNFCCC.



- biomass cci
- lakes cci
- land surface temperature cci
- water vapour cci
- salinity cci
- permafrost cci
- snow cci
- open data portal cci
- toolbox cci

climate change initiative

BIOMASS

Overview of ESA's CCI Biomass and Purpose of the 1st CCI Biomass User Workshop

Professor Richard Lucas

Prifysgol Aberystwyth University

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The CCI Biomass Consortium

University of Leeds
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Fate of Anthropogenic Emissions (2005-2015)

Sources

E_{FF} = 34.1 ± 1.7 $GtCO_2$ yr^{-1} (91 %)

E_{LUC} = 3.5 ± 1.8 $GtCO_2$ yr^{-1} (9 %)

Partitioning

G_{ATM} = 16.4 ± 0.4 Gt CO_2 yr^{-1} (44 %)

S_{OCEAN} = 9.7 ± 1.8 Gt CO_2 yr^{-1} (26 %)

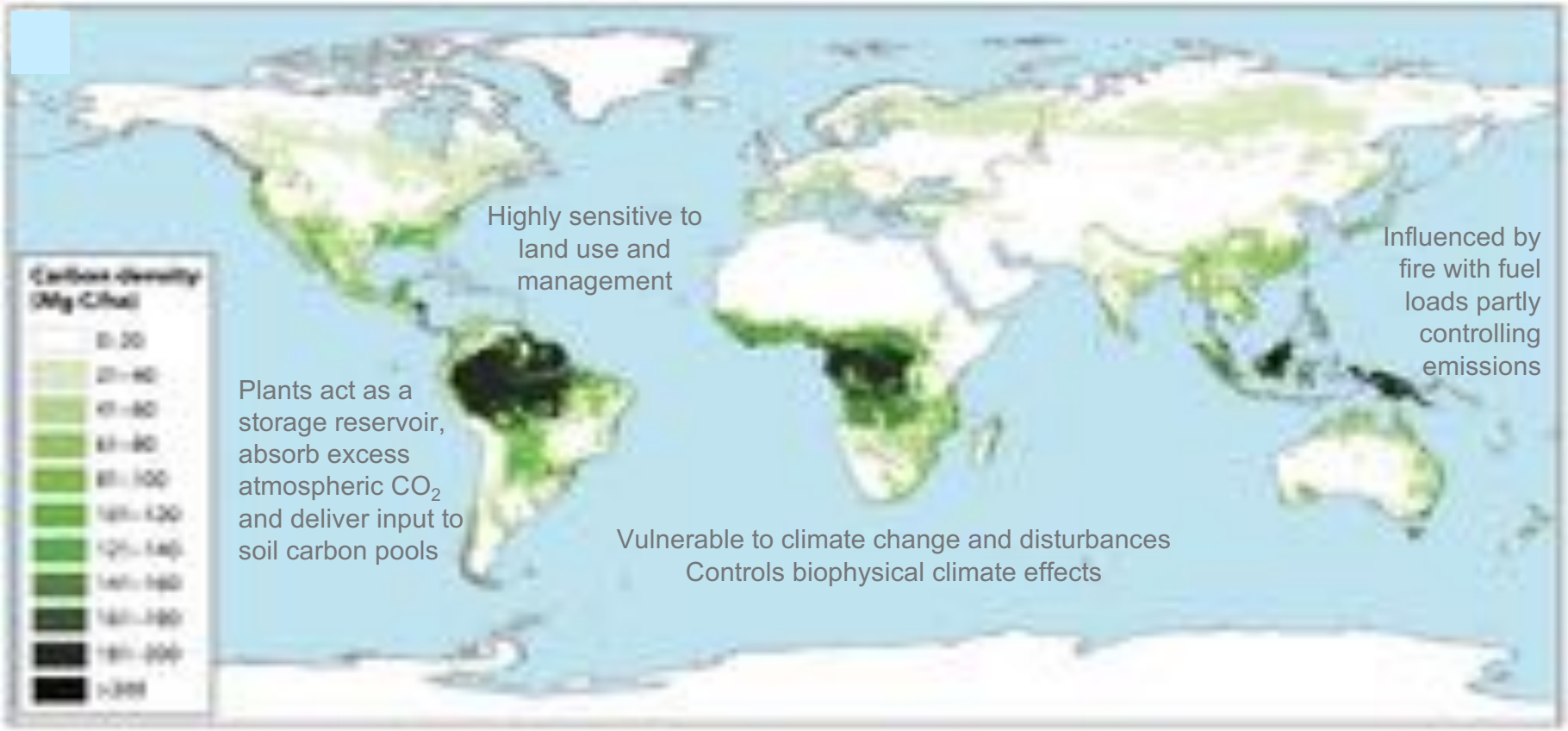
S_{LAND} = 11.5 ± 3.1 Gt CO_2 yr^{-1} (30 %)

$$E_{FF} + E_{LUC} = G_{ATM} + S_{OCEAN} + S_{LAND}$$

S_{LAND} - Not adequately measured

CO_2 sinks include response of land and ocean to elevated CO_2 & changes in climate and other environmental conditions

Biomass: An Essential Variable in the Earth Climate System



CCI Biomass Aims

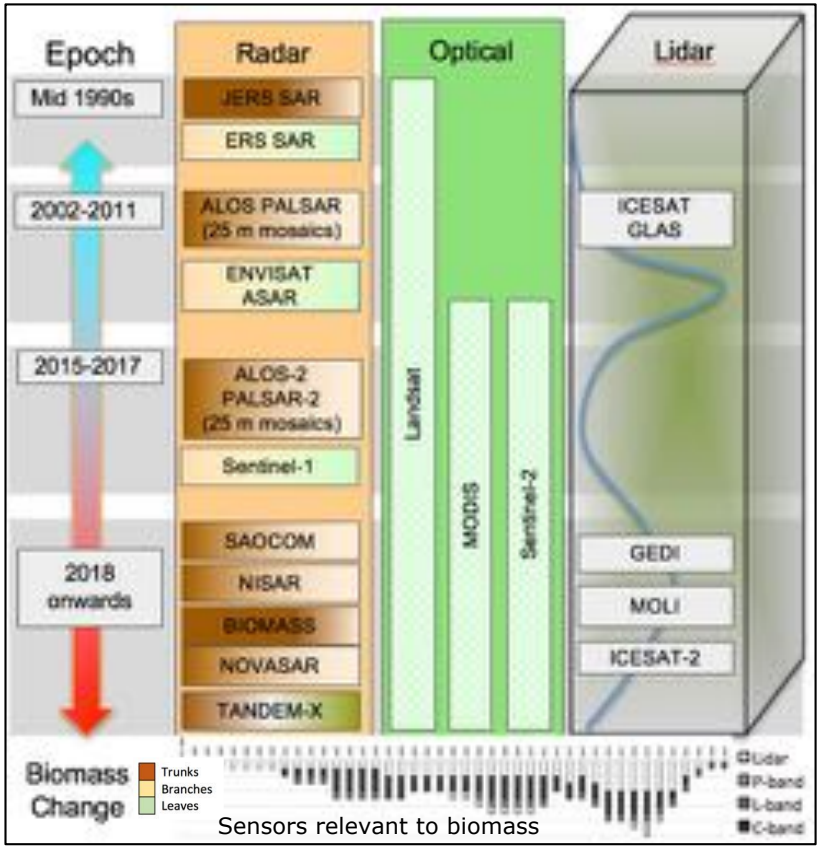
CCI Biomass is a three year project that aims to:

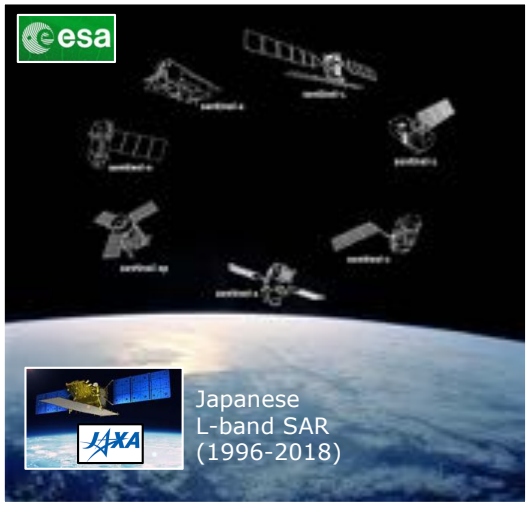
a) Generate global maps of above-ground biomass (Mg ha^{-1}) for four epochs (mid 1990s, 2007-2010, 2017/2018 and 2018/2019), with these being capable of supporting quantification of biomass change between epochs.

b) Provide information that is relevant for climate and has the potential to be exploited by global carbon cycle and climate models as they develop.

Fully supportive of global efforts and collaborative

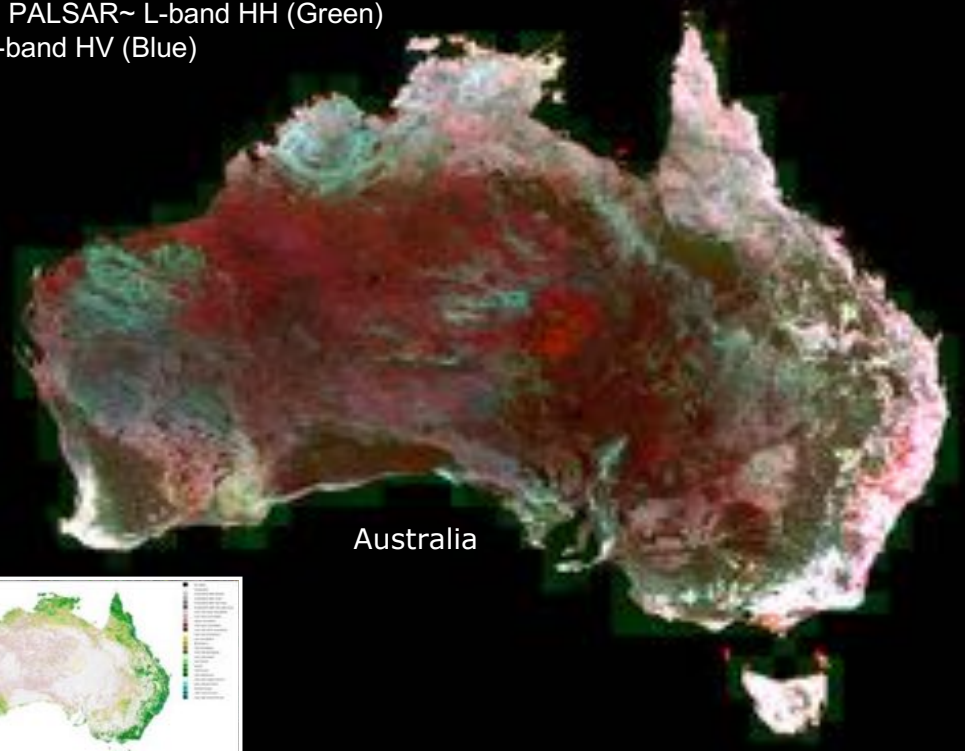
Earth Observation Data for Retrieving Global Forest Biomass and Understanding Climatic Contributions

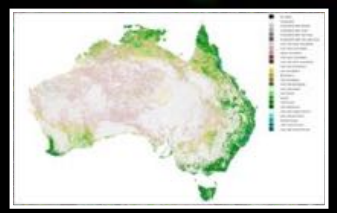




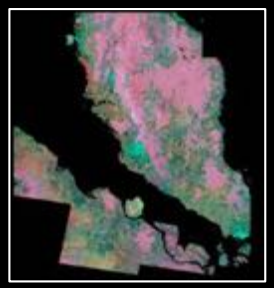
Integrating Sensors for Improved Biomass Retrieval

Landsat–derived Cover (Red)
ALOS PALSAR~ L-band HH (Green)
and L-band HV (Blue)





Structural classification



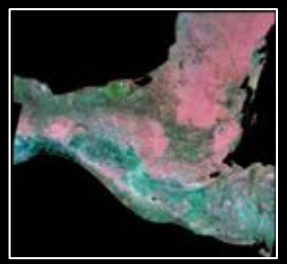
Peninsular Malaysia

Gabon

Wales, UK

ICESAT GLAS coloured by height, Injune, Queensland

Sweden



Central America

Supportive Data Layers for Refining Biomass Estimates

LIDAR profiles

Forest Structure

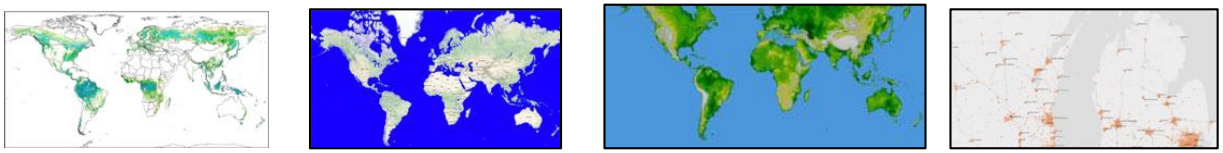
Water Inundation

Rocky Ground

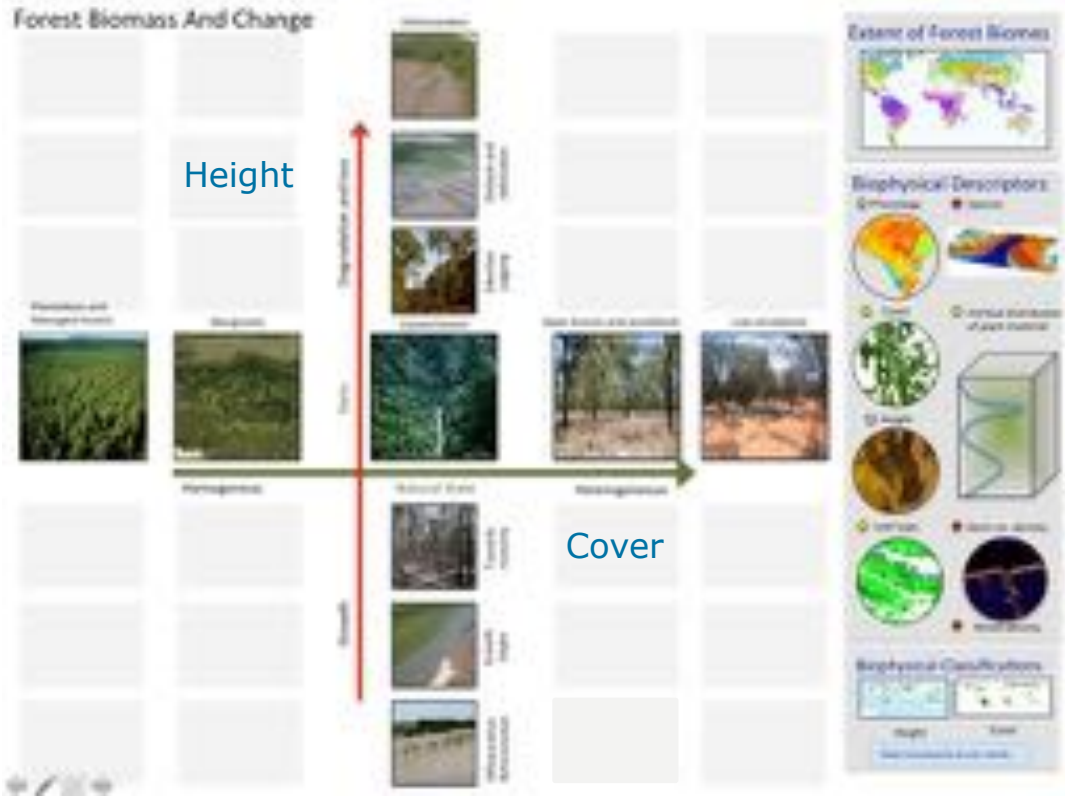
Urban Areas

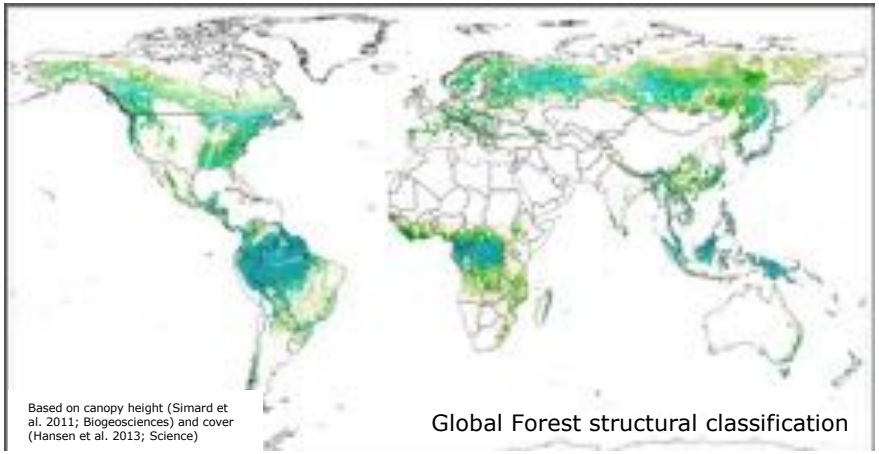
Mangroves

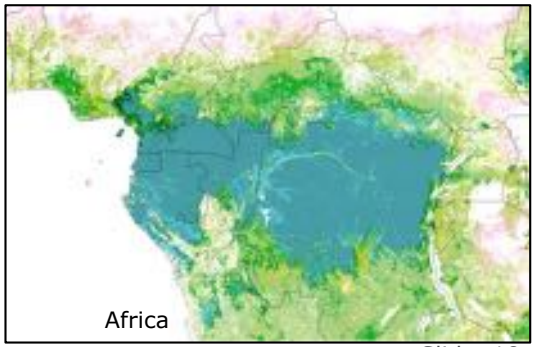
Global Layers



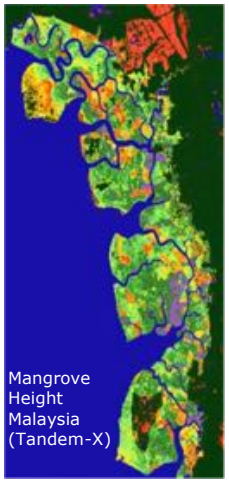
The Structural Development of Forests



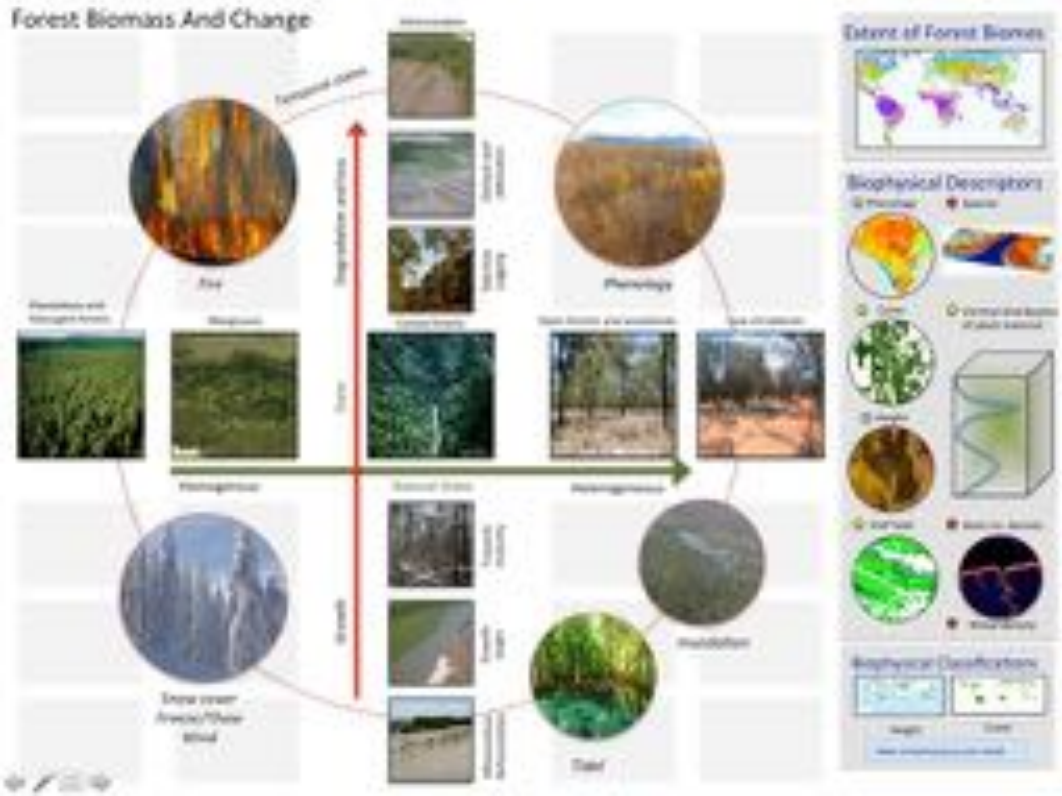


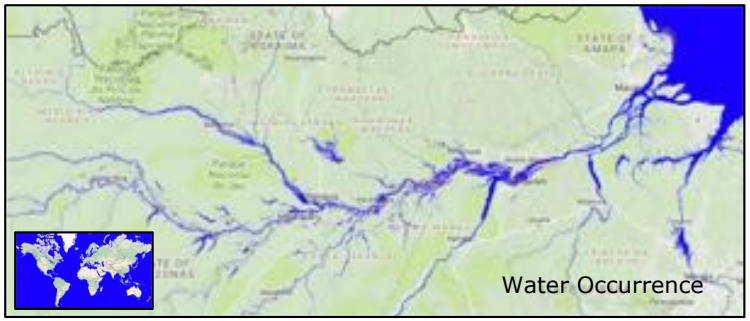


The Structural Development of Forests

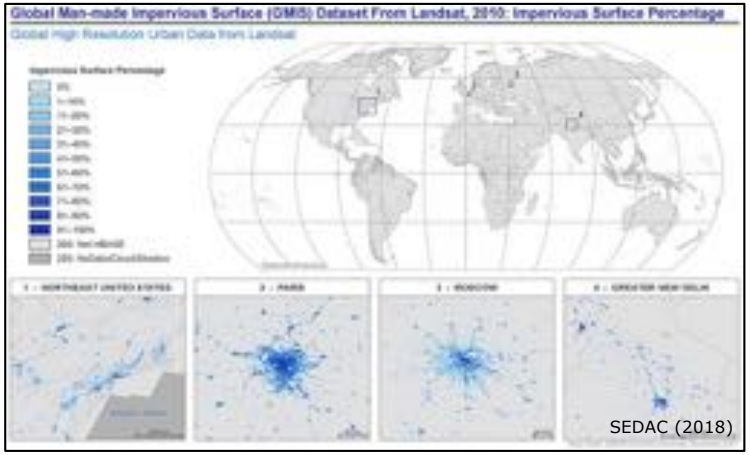


Factors Influencing Biomass Retrieval

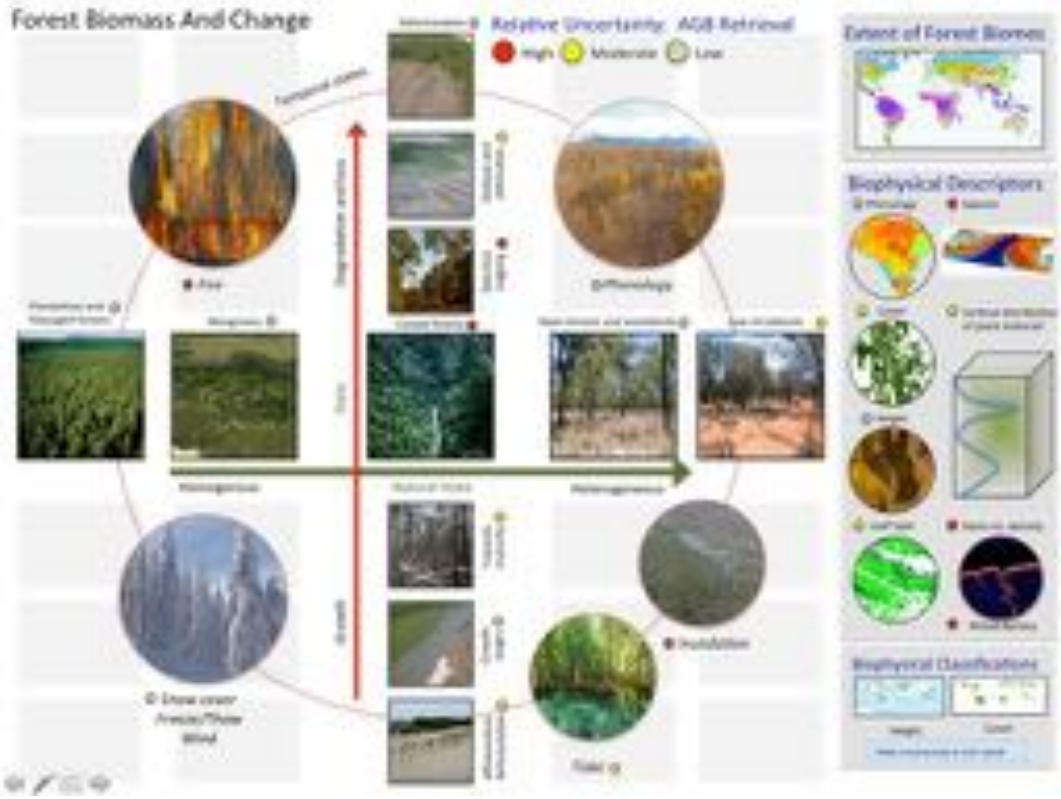


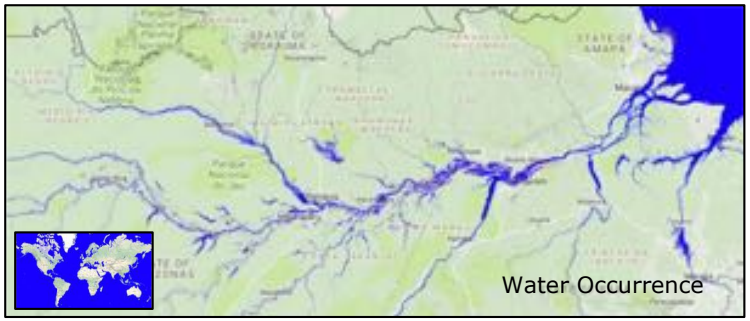


Pekel *et al.* (2016; Nature)



Uncertainty in Biomass Retrieval





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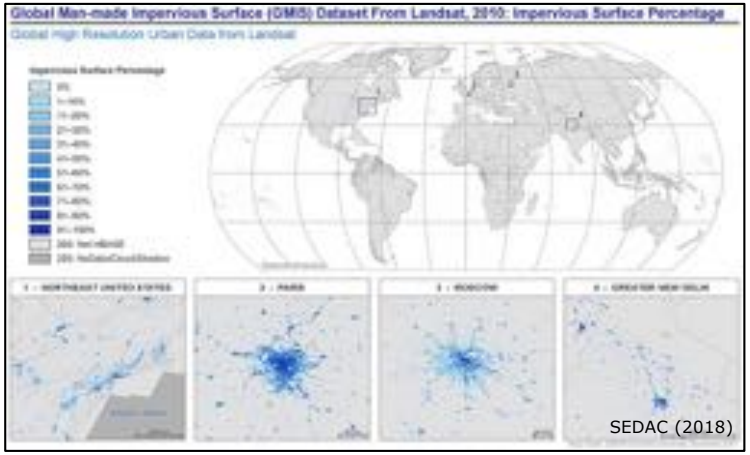
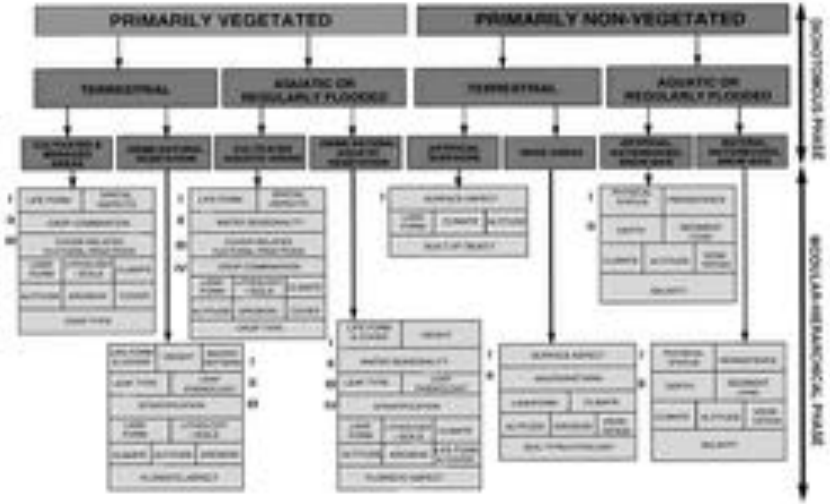
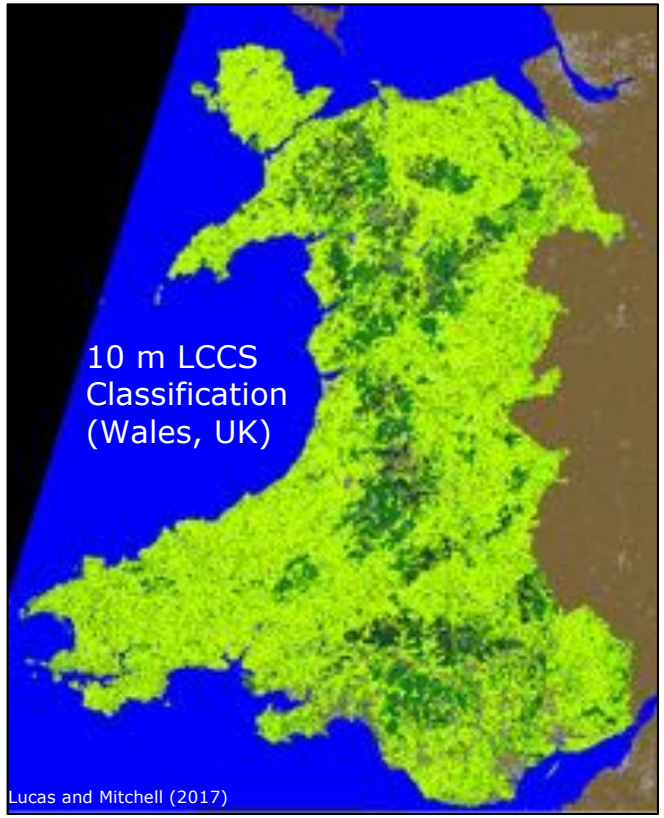


Integrating Environmental Variables into Land Cover and Change Classifications

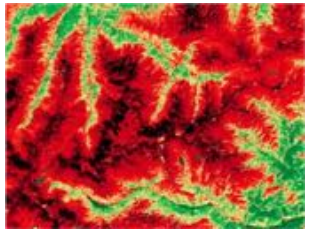
Land Cover Classifications Generated from Environmental Variables according to the Food and Agriculture Organization (FAO) Land Cover Classification System (LCCS) and derived from **Environmental Variables** with unit quantities (e.g., m, %, days)



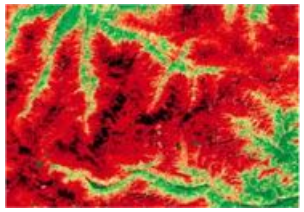
Trees closed canopy (>70-60 %) tall (14-30 m) continuous broadleaved evergreen with 2nd layer supporting open canopy 7-3 m in height; Above Ground Biomass of 210 Mg ha^{-1}; dominated by *Pinus sylvestris*)



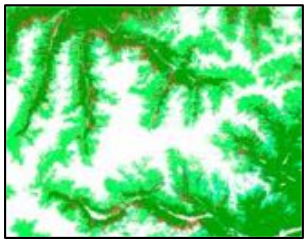
Tree cover density (2000)



Tree cover density (2010)



Cover change (2000-10)



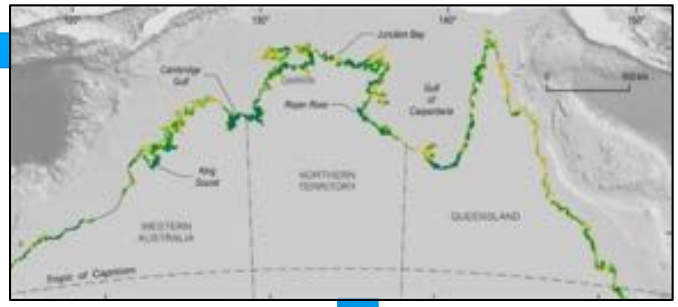
Linking with other ESA CCIs

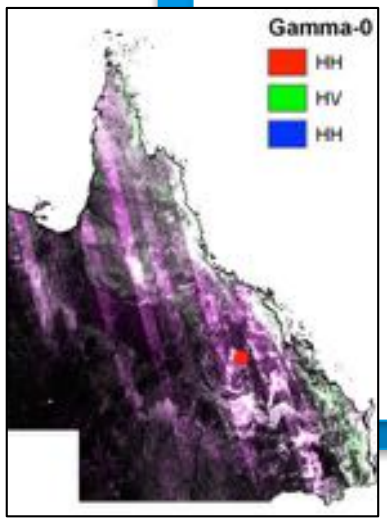
land cover cci

Inputs to land cover descriptions

sea level cci

Sea level impacts on mangrove biomass





snow cover cci

soil moisture cci

Impact on biomass retrieval algorithms

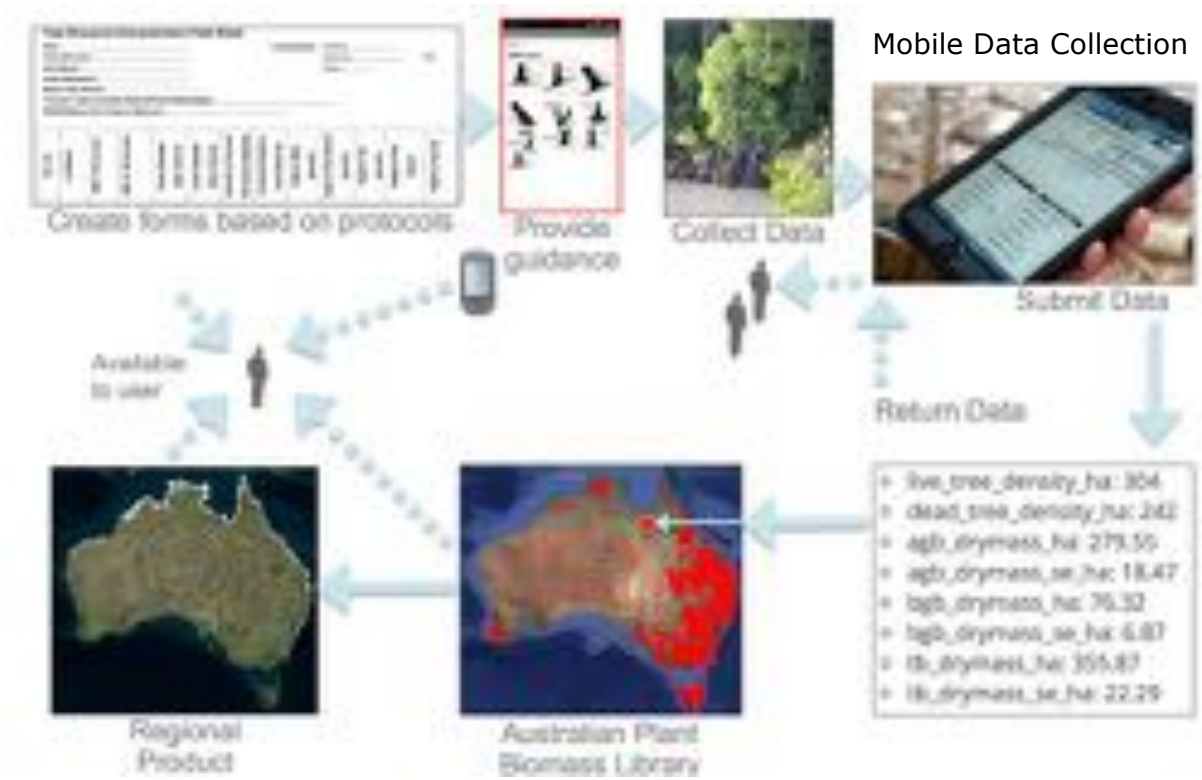
fire cci

Fire impacts on biomass

ghg cci

Contributions to GHG emissions

CCI Biomass: Global Plant Biomass Facility

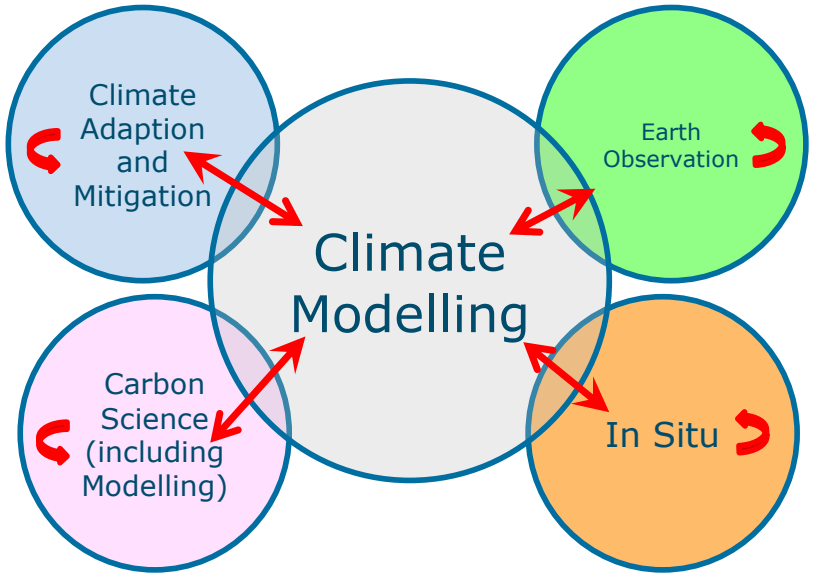


Mobile Data Collection

Land cover and environmental variables (including tree to stand level biomass) consistently captured in near real time

Existing Biomass Databases (e.g., FOS)

ESA's Climate Change Initiative: User Requirements – Climate Modelling



https://trello.com/b/XLEQIEJV/cci-biomass-workshop-public

Climate Modeller Viewpoints

How do you see earth observation (biomass) data being used by the climate modelling community?

Data Users (Climate, Carbon, Mitigation)

List your requirements for spatial resolution

Climate modellers and science community

Tuesday 25th September - Session 1. Agenda

8:45	Introduction and Welcome	F. M. Seifert (ESA)
9.15	Overview of ESA's CCI Biomass and Purpose of the 1st CCI Biomass User Workshop	R. Lucas (AU)/P.Caias (LCSE)
9.30	ESA's GlobBiomass Project and Datasets	M. Santoro (GAMMA)
9.45	Review of Experiences and User Requirements for Biomass Mapping	M. Herold (WUR)
10:00	NASA GEDI Update and potential collaboration	J.Armston (UMD)
10:10	Biomass estimation GEDI and OBI-WAN	S. Healey (NSFS)
10:20	The NISAR mission and Forest Characterization NASA's Arctic Boreal Vulnerability Experiment (ABoVE).	P. Siqueira (UMASS)
10:30	The ESA NASA Joint Platform	F. Seifert (ESA)
10:45	Break	