NATURAL ENVIRONMENT RESEARCH COUNCIL

BIOMASS: first steps from selection to reality

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Structure of talk

What does BIOMASS do and why?

What is it?

Where are we?

What needs doing?

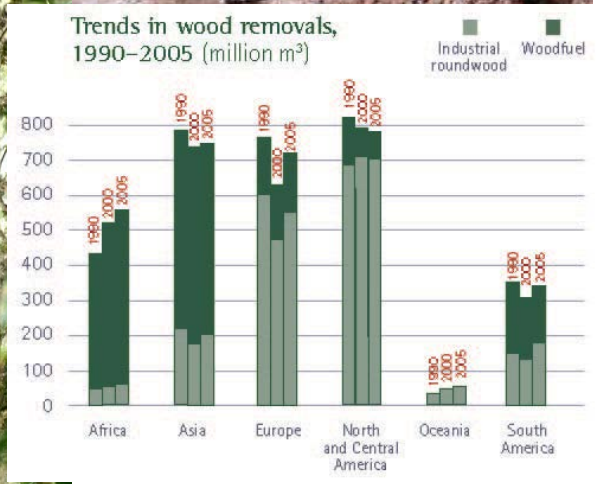
Biomass will map forest biomass, height and change with unprecedented accuracy

Forest biomass and forest height:
global, 200 m scale, every 6 months for 4 years, 20% accuracy in biomass, 20-30% accuracy in height

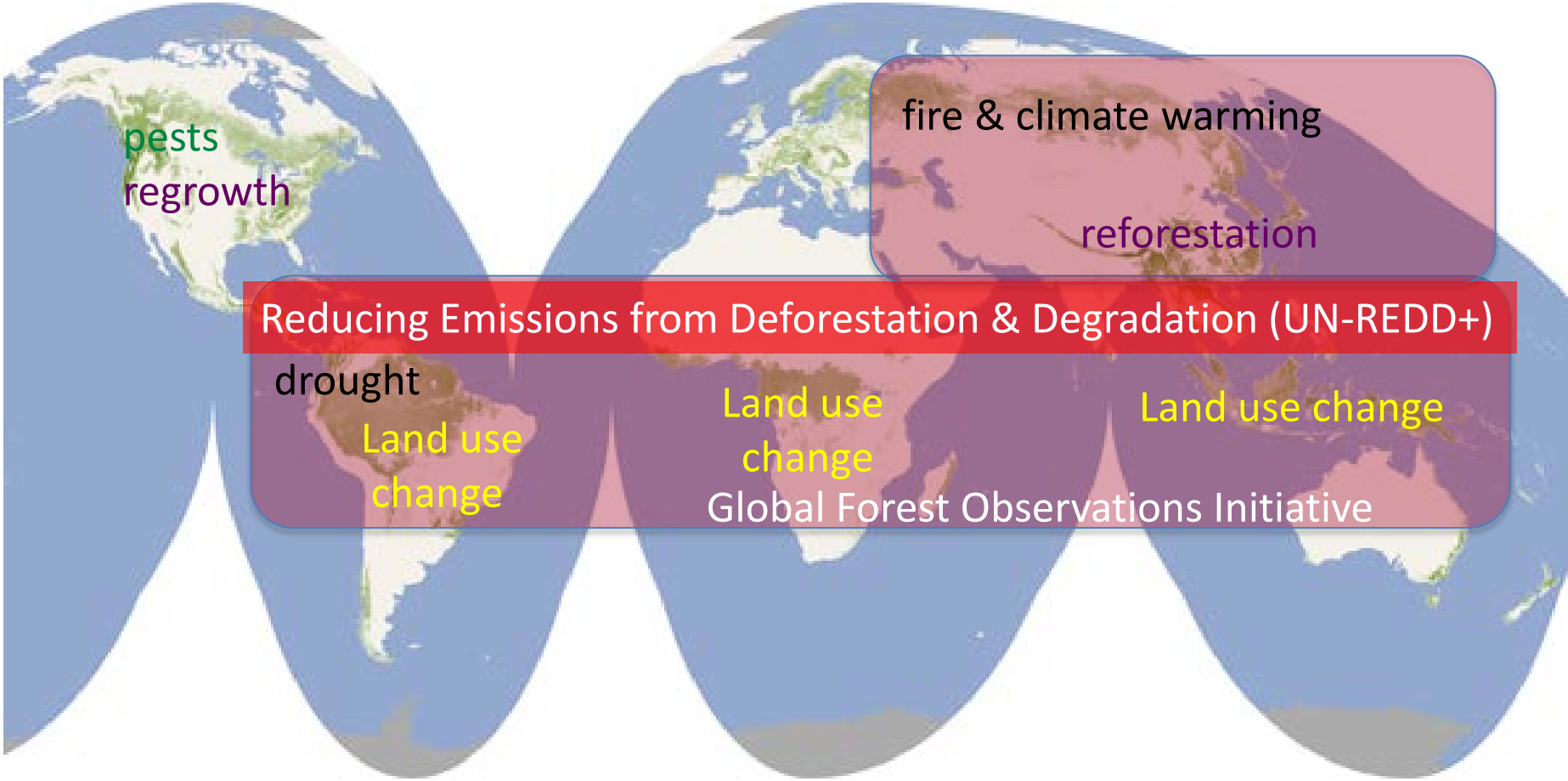
Disturbances: global, at 50 m scale

Biomass is strongly linked to societal benefits

Forest biomass is basic to the energy, material, environmental protection, biodiversity & cultural benefits offered by forests

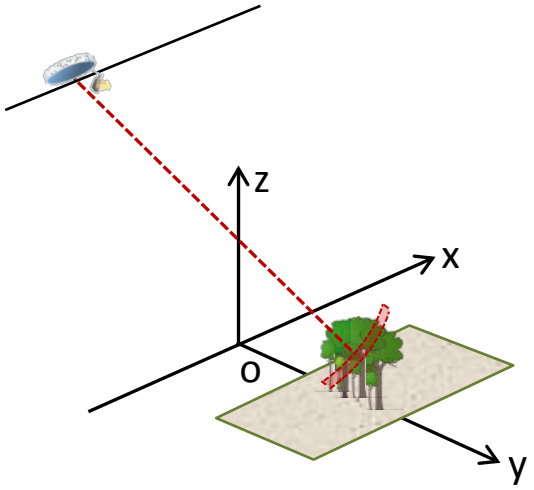


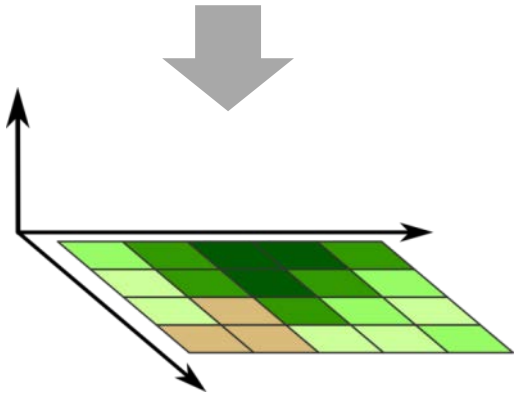
Biomass is needed to calculate carbon fluxes, so crucial for climate and treaties



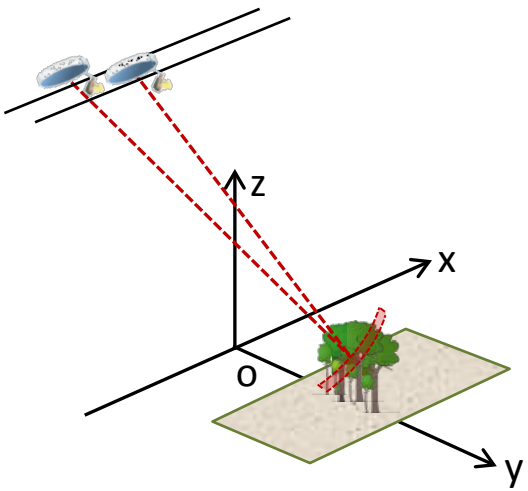
The Biomass mission will make 3 types of measurement relevant to biomass

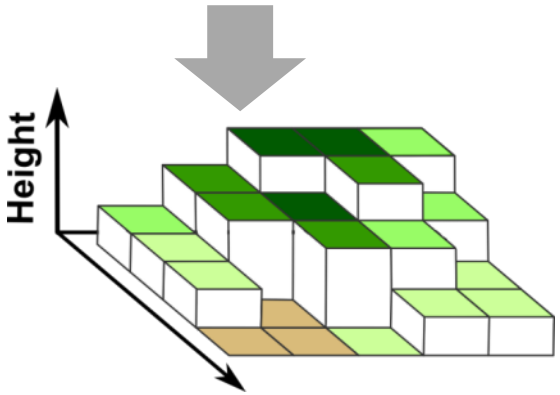
PolSAR
(SAR Polarimetry)



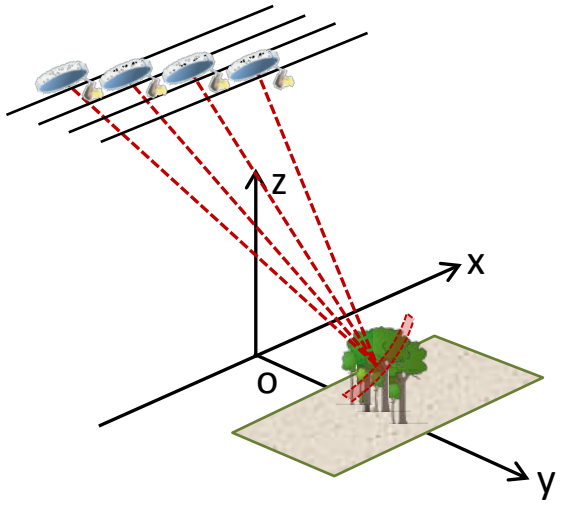


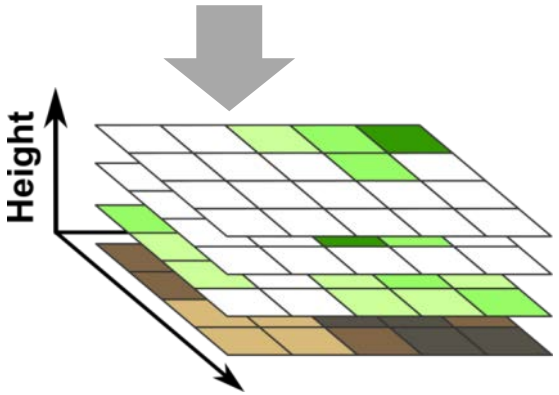
PolInSAR
(Polarimetric SAR Interferometry)





TomoSAR
(SAR Tomography)





Timeline

May 2013: BIOMASS selected

November 2013: 1st meeting of the new Mission Advisory Group;
Phase B1 industrial BIOMASS design studies placed.

June 2014: 2nd MAG meeting

Activities around African airborne and in situ campaign.

KO of initial science studies (Level 2 studies; in situ networks)

October 2014: B1 studies completed

November 2014: review by PBEO and approval for phase B2

March 2015: ITT for Phase B2

June 2015: Phase B2/C/D begins

2020: Planned launch date

Mission budget

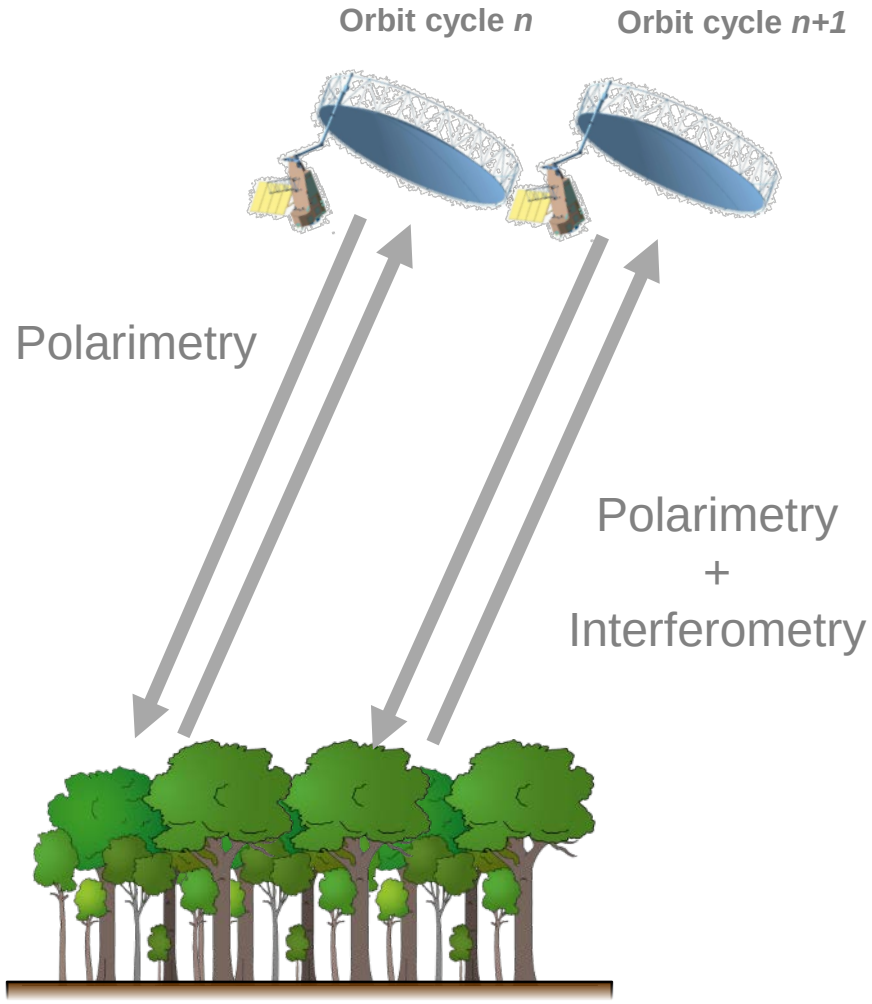
Total budget = €470M

Industrial return = €220M; this must satisfy geo-return

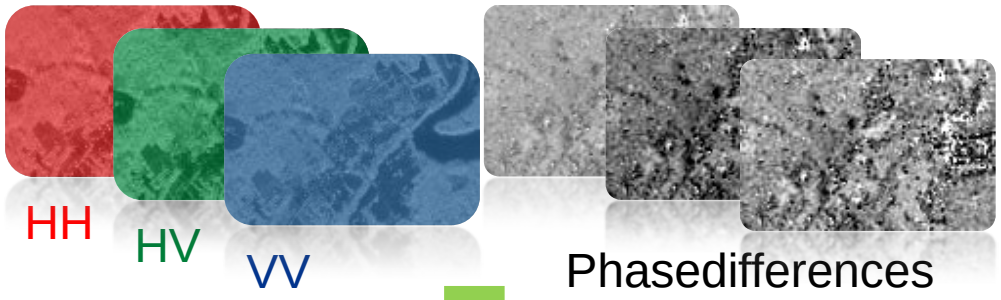
Science budget = €10M.

Implication: national funding is crucial to develop the science programme underpinning BIOMASS

Calibration is crucial, and teaches us about the ionosphere



Calibration, Ionospheric correction



Retrieval algorithm

1. Forest biomass
2. Forest height
3. Forest disturbance

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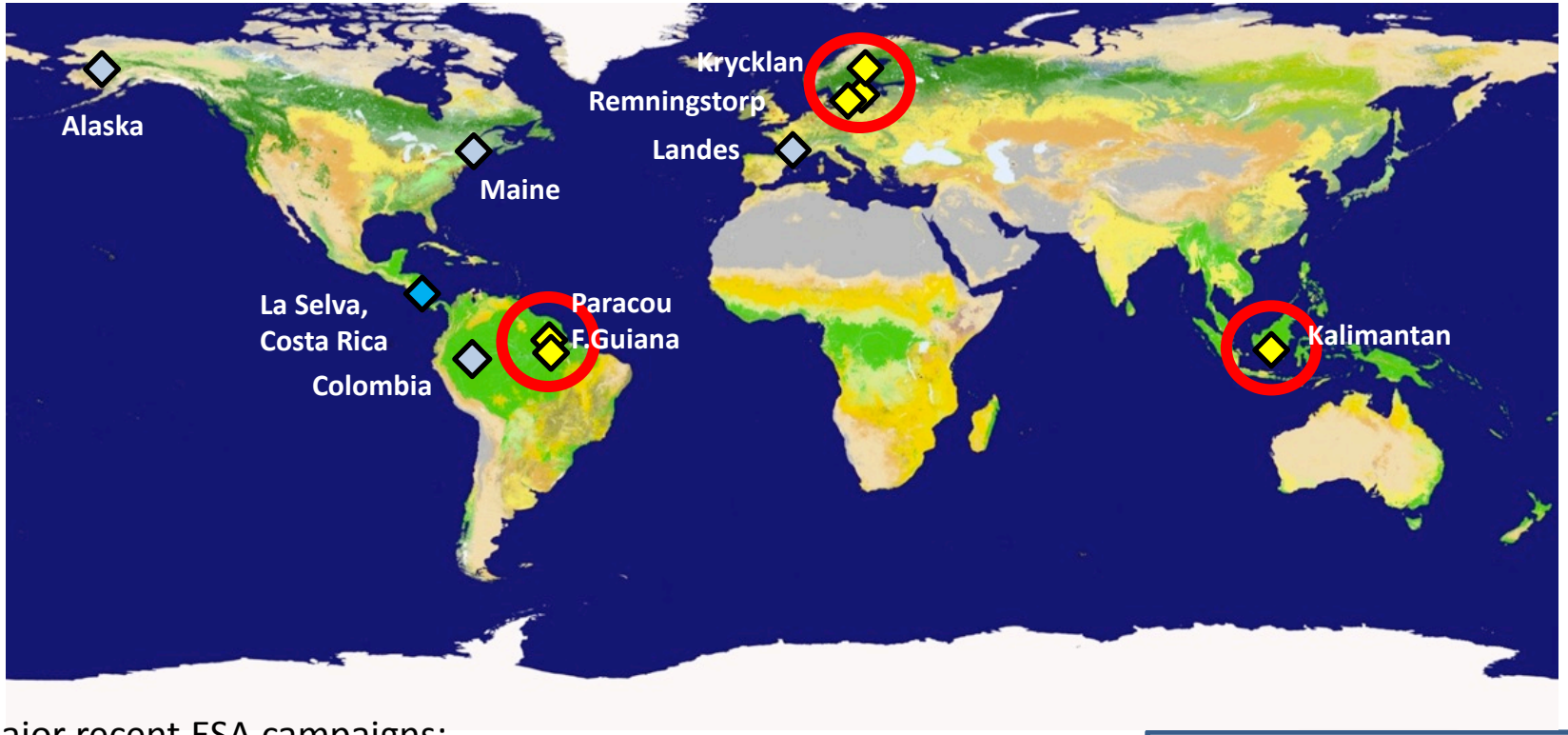
Campaign data for testing retrieval methods and assessing performance



Major recent ESA campaigns:

1. Kalimantan 2004 (Indrex)
2. Remningstorp 2007 (BioSAR 1), 2010 (BioSAR 3)
3. Krycklan 2008 (BioSAR 2)
4. F. Guiana 2009 (TropiSAR), 2011-13 (TropiScat)

ESA campaigns
non-ESA campaigns

Working with key worldwide in situ networks

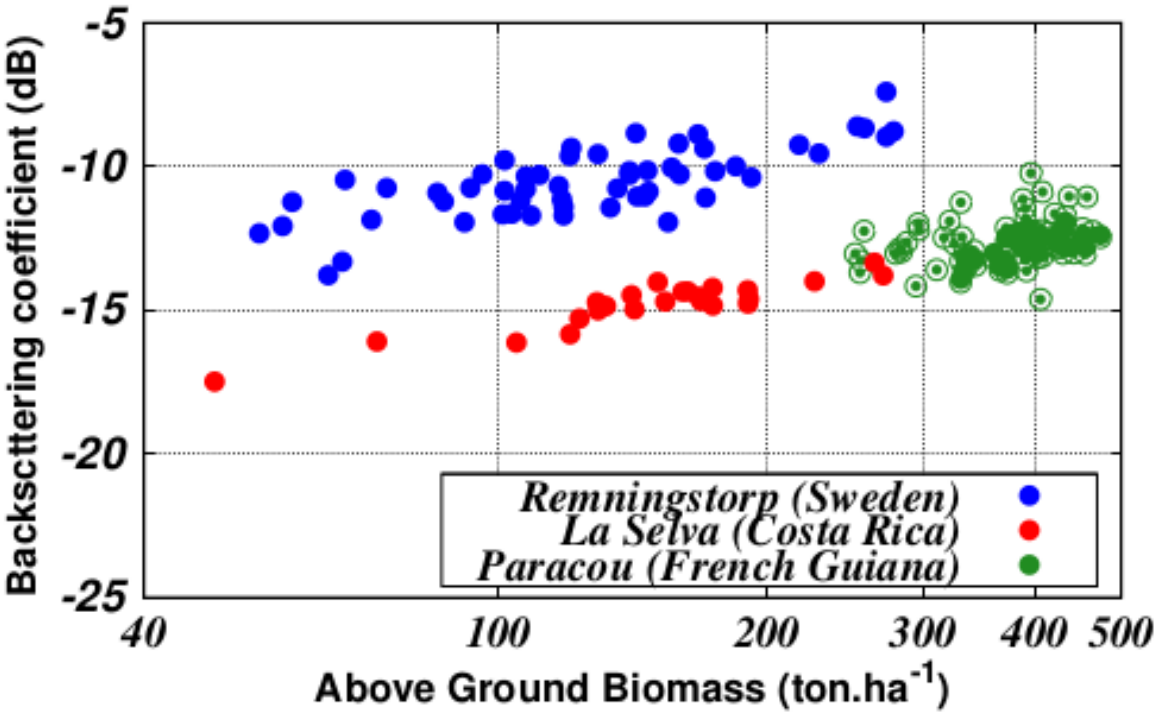
In situ network led by Smithsonian, including Centre for Tropical Forest Science

entre for
servation

Global consistency in the biomass – P-band backscatter relationship: why?

Similar power-law relationships between backscatter and biomass are found for all forests where we have data: $B = A\sigma_{hv}^{p}$

Inversion techniques need to deal with data dispersion and differences between different types of forest



Exploiting biomass data to learn about forest mortality

If rate of loss of biomass is proportional to biomass, with rate coefficient α, residence time τ then

$$B = \overline{P} / \alpha = \overline{P}\,\tau$$

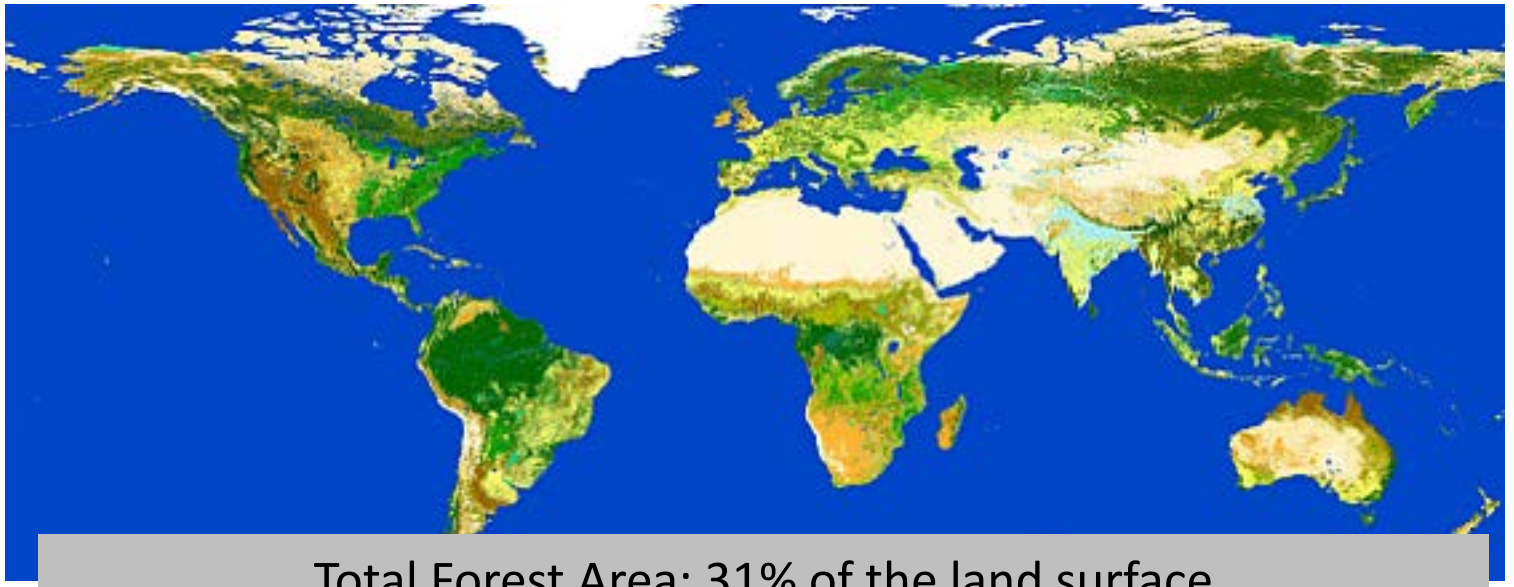
where $\overline{P}_B$ is mean production of biomass.

What can we infer about forest mortality from current sub-optimal estimates of biomass and Net Production?

Final Remarks

- Six years is not long, and a lot needs to be done.
- BIOMASS relies on supporting science activities and can provide a framework around which science activities can cluster, to mutual benefit
- There is a need to grow the community of scientists interacting with the BIOMASS mission, especially younger scientists
- Six years is a long time for some of us!

Global forest cover & biomass distribution is concentrated within the tropics



Total Forest Area: 31% of the land surface

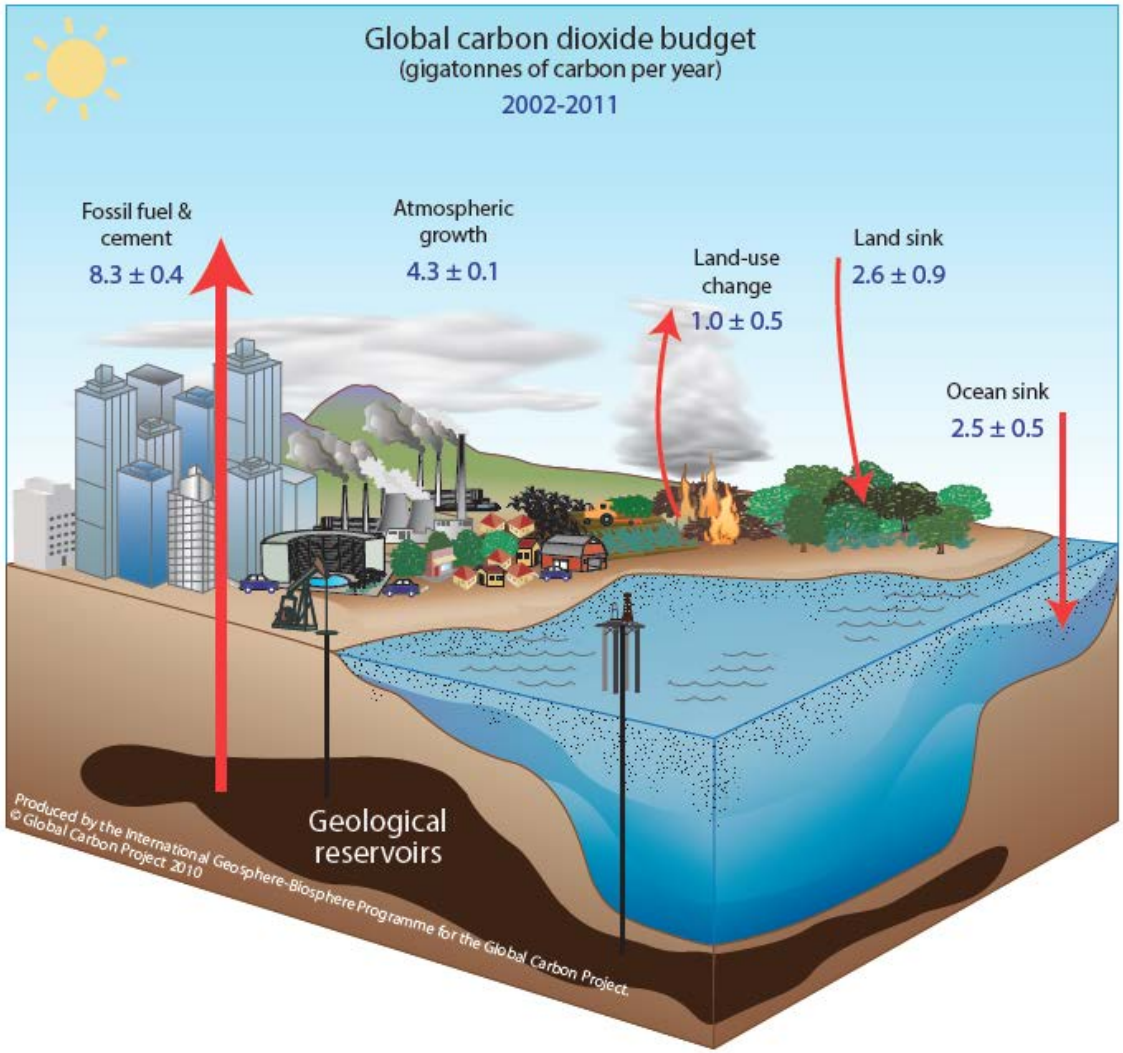
Forest Biome	Area (Millions of hectares)	Biomass (tons/hectare)	Total Biomass (gigatons)
Boreal	1372	83-128	110-176
Temperate	1038	114-270	118-280
Tropical	1755	190-390	350-680
TOTAL	4165	mean 129-262	718-1300

Pan et al., 2011; Houghton et al., 2009

Forest biomass plays a key role in the carbon cycle and hence in climate change

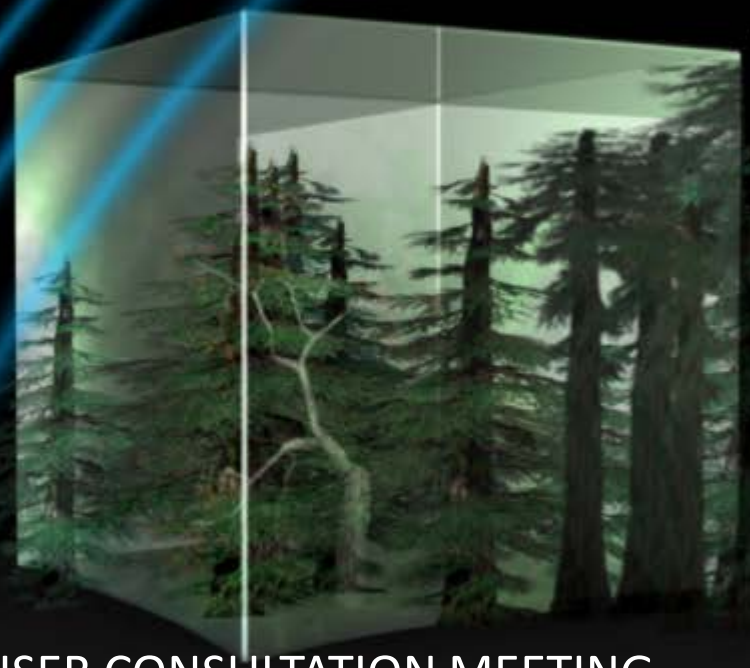
Biomass is ~50% carbon.

Changes in forest biomass represent carbon sources (deforestation and forest degradation) and carbon sinks (forest growth).



biomass

ESA's 7th Earth Explorer mission



EARTH EXPLORER 7 USER CONSULTATION MEETING

An Earth Explorer to observe forest biomass

European Space Agency