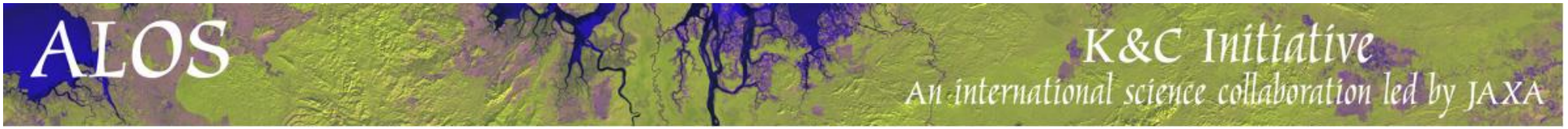

Post-K&C – First Report

Decadal forest biomass change
with ALOS-1 and ALOS-2 L-band SAR observations

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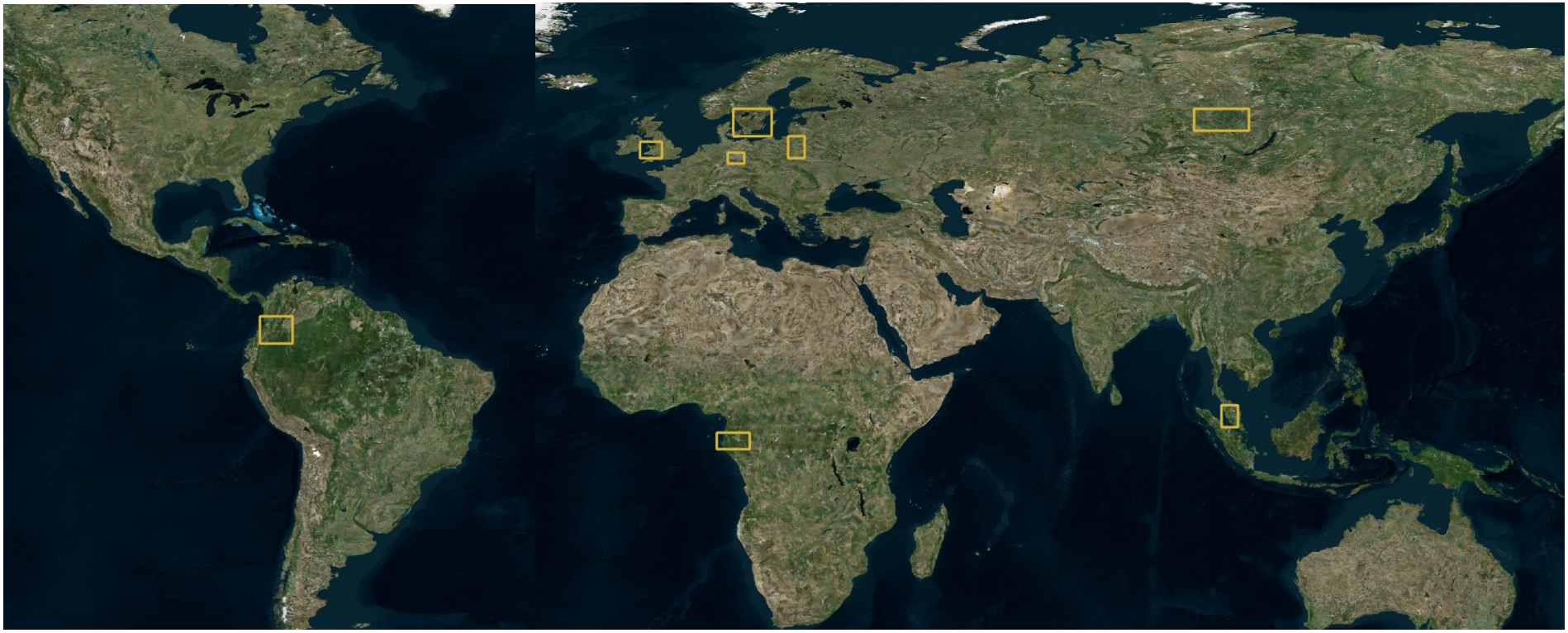
Post-KC Science Team meeting #1
Tokyo, Japan, January 20-24, 2020

- Project objectives
  - Assess changes in forest biomass over a decade using ALOS PALSAR (-1/-2) backscatter observations across several biomes
- Project rationale
  - L-band observations are currently the most suited dataset to estimate biomass and, thereof, try to quantify biomass changes
  - ALOS PALSAR (-1/-2) observations allow for a rather reliable estimation of biomass between epoch 2010 and epoch 2020.
  - Key factor: repeated observations to increase the accuracy of biomass estimates. In previous K&C projects, we demonstrated that quantifying biomass changes with the JAXA mosaics can be troublesome.
  - Approaches to be considered: differencing biomass maps and backscatter trajectories
  - This Post-KC project supports ESA's CCI BIOMASS project, which is currently ongoing (2018-2021).
- All 4 K&C thematic drivers are addressed

Project areas

- Boreal biome: Central Siberia, South Sweden
- Temperate biome: East Poland, Thuringia, Wales
- Tropical biome: Colombia, Matang mangroves, Gabon



Satellite and auxiliary data

- ALOS-1/-2: path data (“slant range strips”), best one-year coverage of each region

- Other data sources to be used
  - Reference data,
  - LiDAR data (ICESAT vs. GEDI and ICESAT-2)
  - Wall-to-wall EO datasets (e.g. from C-band, Sentinel-1 & ASAR)

Satellite data requested

- ALOS-2 requested (see table)

Area	Mode	Orbit	Year(s)	Number of paths
South Sweden	FBD	asc.	2018	23
Central Siberia	FBD	asc.	2017-2018	45
Thuringia, Germany	FBD	asc.	2018	15
East Poland	FBD	asc.	2018	15
Wales	FBD	asc.	2018	20
Gabon	FBD	asc.	2018	29
Colombia	FBD ScanSAR	asc. des.	2017-2018	25 58
Matang, Malaysia	FBD ScanSAR	asc. des.	2017-2018	21 27
TOTAL				**278**

Satellite data requested

- ALOS-1 data do not need an order because of public availability

- Question is however if the planned date of release of ALOS-1 data (end of 2020?) serves the purpose of this project. Probably not. Any comment?

Comparing two global datasets of AGB

GlobBiomass AGB:

year 2010, 100 m spatial resolution, based on ALOS PALSAR and Envisat ASAR

(Available at https://globbiomass.org/products/global-mapping)

CCI Biomass AGB:

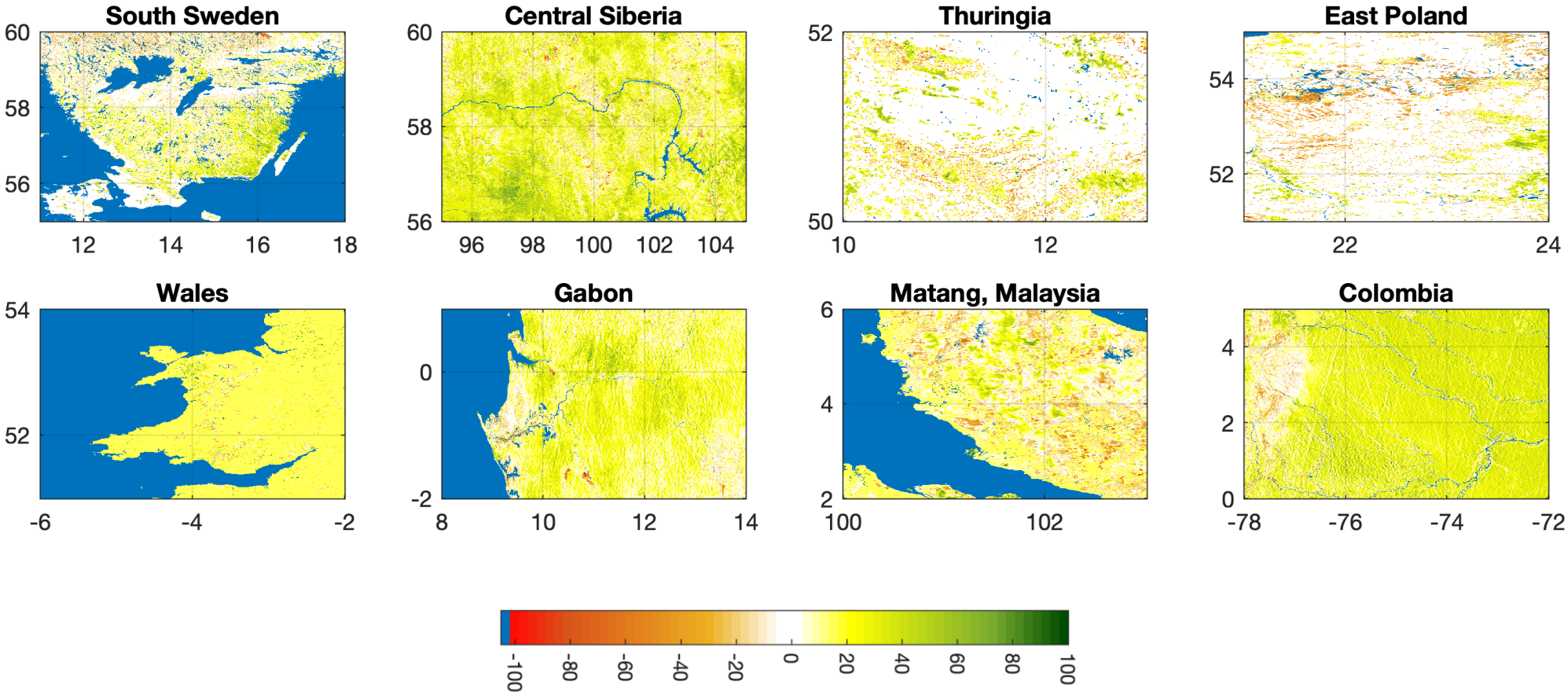
year 2017, 100 m spatial resolution, based on ALOS-2 PALSAR-2 and Sentinel-1

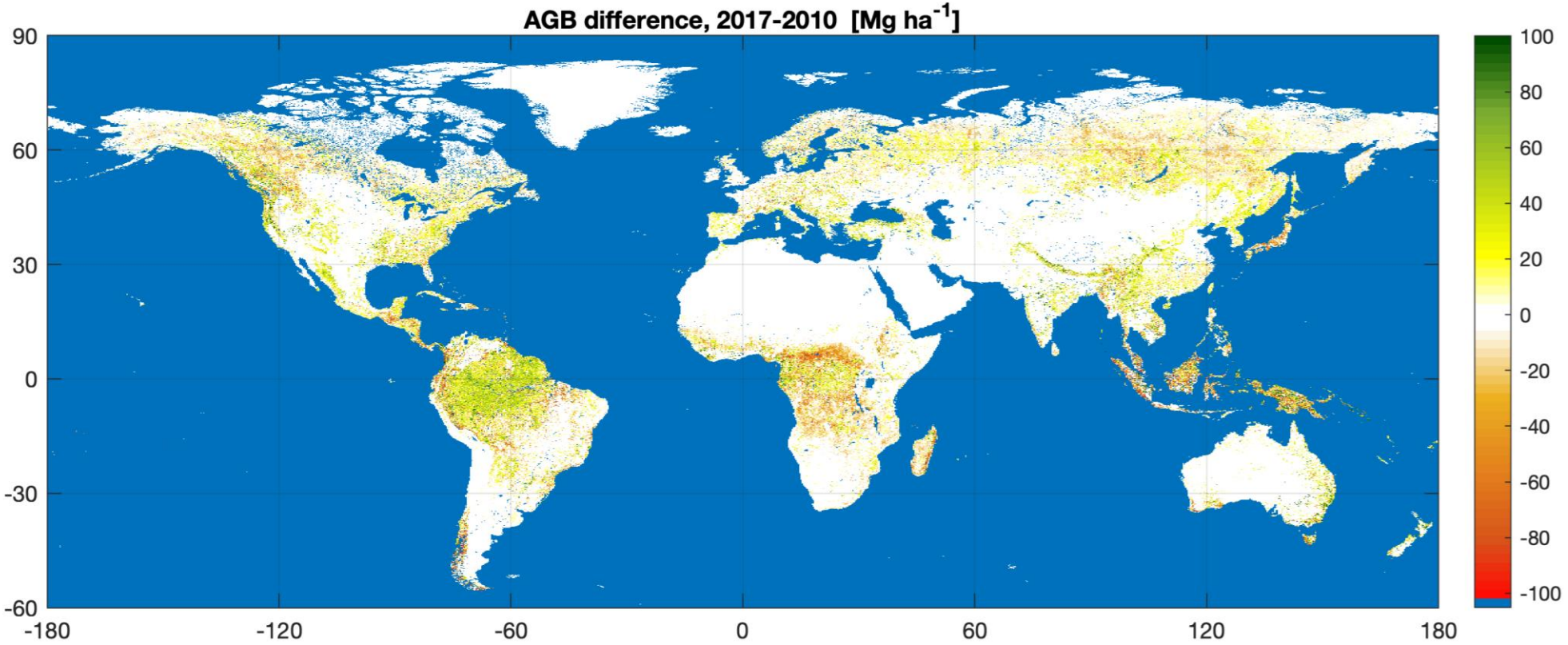
(Available at https://catalogue.ceda.ac.uk/uuid/bedc59f37c9545c981a839eb552e4084)

The datasets are very similar in terms of AGB retrieval and predictors, thus in theory being comparable.

Note that the discussion will not take into account the uncertainty of each product (on average 40%-50% of the pixel AGB)

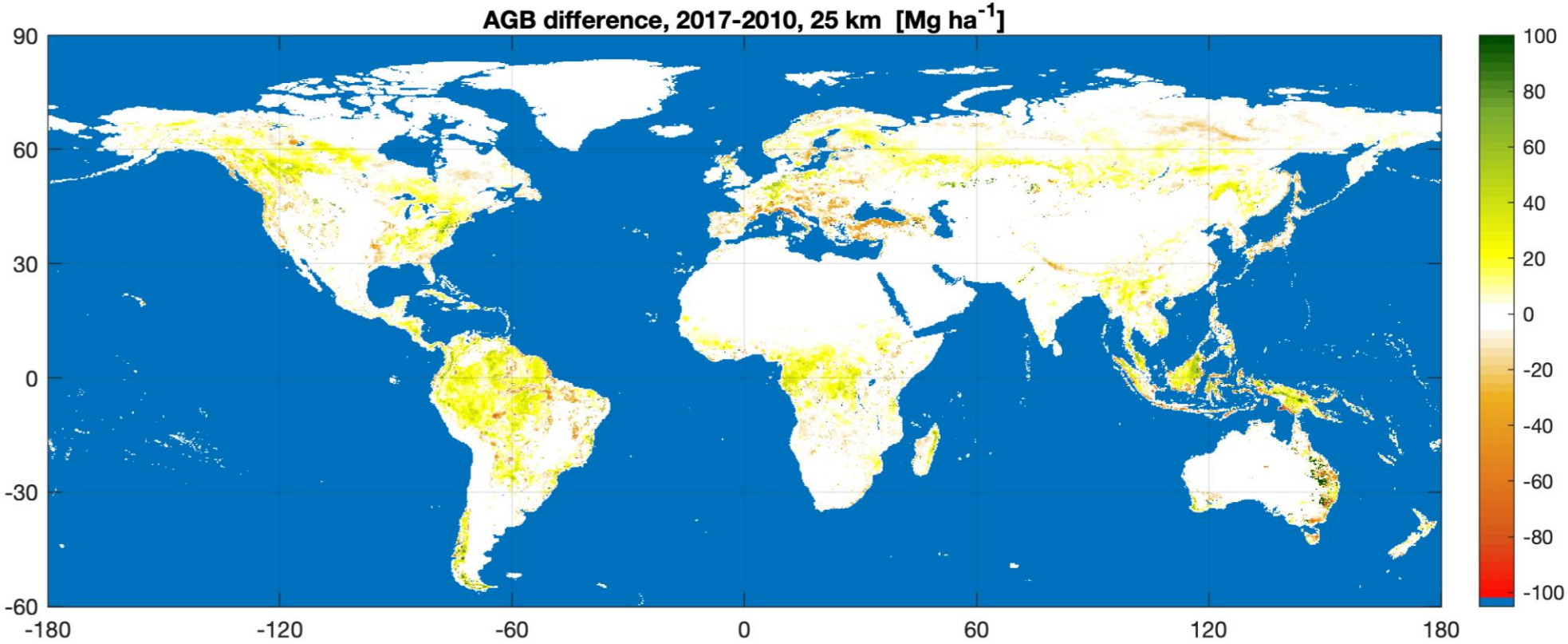
Differencing AGB maps





Plain difference between CCI AGB 2017 and GlobBiomass AGB 2010

Similar input datasets (ALOS + ASAR vs. ALOS-2 and Sentinel-1),
different EO spatial resolutions (25 - 1000 m, vs 20 - 50 m),
different time density and same algorithm



Plain difference between BIOMASCAT AGB 2017 and 2010

Same input datasets (ASCAT),
same spatial resolution (25 km), same time density and same algorithm

Theoretical basis of this KC project

Differencing is ill-posed because the two maps were obtained with different datasets, without previous consideration of an inter-annual comparison. For this reason any pattern appearing in this difference maps are possibly caused by differences in the EO datasets rather than growth/mortality/degradation.

One way to reduce the impact of the EO data diversity is to harmonize EO datasets by using in both studies similar inputs, e.g., ALOS FBD and ALOS-2 FBD. This justifies the data request (see this presentation).

Comparing two global datasets of AGB

Differencing maps is not entirely correct, however, it is seen as the only viable method to assess decadal changes since the sets of EO predictors differs even if slightly between epochs. Any comment or suggestion?

For this, retrieval algorithms should be advanced to guarantee temporal consistency of the estimates.

Novel concepts developed in the “BIOMASCAT” activity, aiming at building up a consistent time series of annual AGB maps from C-band scatterometer data (25 km), may be applied to our work. Here, individual retrievals reinforced by the use of backscatter trajectories are applied.

Research schedule

JFY	2019				2020				2021			
Month	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3	4-6	7-9	10-12	1-3
Milestones				MS1	MS2	MS3		MS4	MS5	MS6		FR
Activities				(1)	(2)	(3)		(1)	(4)	(5)		

(1) Completion of ALOS-1 and ALOS-2 data selection (for JPY i)

(2) Reporting on first biomass change algorithms based on ALOS mosaics and path data

(3) Biomass change maps based on algorithms obtained at (2)

(4) Completion of biomass change algorithms based on ALOS mosaics and path data

(5) Biomass change maps based on algorithms obtained at (4)

FR: Final Report and publication of maps

Deliverables and other output

Project deliverables

- Biomass maps for the 2010 and 2020 epochs
- Biomass change maps, 2020 vs. 2010
- Biomass retrieval and biomass change estimation algorithms

Publications:

- This Post-KC project supports CCI BIOMASS currently ongoing (2018-2021). Publications will follow in the next coming years.

PALSAR/PALSAR-2 data access

Please list the PALSAR/PALSAR-2 data you have

(1) 278 PALSAR-2 requested on 20-Nov-2019

(2) All to be obtained

(3) PALSAR: awaiting for public release

Have you had sufficient data to complete your research
(according to your K&C agreement)?

Post-KC project has started in 2019; research is getting started with mosaic data.

If not, which key data sets are missing?

The PALSAR-1 and PALSAR-2 multi-temporal "path" images