DUE GlobBiomass

Vol. 01

Minutes of the 2nd User Workshop

31.01. – 01.02.2017 VTT Espoo, Finland

Prepared for European Space Agency (ESA-ESRIN)

In response to ESRIN/Contract No. 4000113100/14/I_NB

Prepared by

Friedrich-Schiller-University Jena, Department for Earth Observation, Germany

Revision History

Milestone	Minutes of the 2nd User Workshop – 31.01.-01.02.2017, VTT Espoo, Finland
Authors	Evelin Matejka, Carsten Pathe
Distribution	ESA: Frank Martin Seifert; Nathalie Boisard
Release	1
Version	01

Minutes – 2nd User Workshop

Project Name	***GlobBiomass***			
Project Number	***ESRIN/Contract No. 4000113100/14/I-NB***			
Purpose	***2nd User Workshop***			
Date and time	***31.01.-01.02.2017***			
Location	***Espoo, Finland***			
Author	***Evelin Matejka, Carsten Parhe***			
Institution	***Participant Name***	***Acronym***	***Function***	***WP***
ESA	Frank Martin Seifert Stephen Plummer	FMS SP	ESA Project Coordinator ESA Project Coordinator	
FSU Jena	Christiane Schmullius Evelin Matejka Carsten Pathe	CS EM CP	Project Manager Administrative Project Management Technical Expert	9000 10000 2000, 8000
Uni Sheffield	Shau Quegan	SQ	Science Coordinator	3000
Uni Leicester	Heiko Balzter Pedro Rodriguez Veiga	HB PRV	Work Package Manager Technical Expert	5000
WUR	Martin Herold Danae Rozendaal	MH DR	Work Package Manager Technical Expert	1000, 7000
VTT	Tuomas Häme Yrö Rauste Oleg Antropov Anne Väänänen	TH YR OA AV	Technical Expert Technical Expert Technical Expert Technical Expert	3000
RSS GmbH	Sandra Lohberger	SL	Work Package Management, Technical Expert	5000
SLU	Henrik Persson	HP	Technical Expert	5000
IGIK IBLES/FRI	Agata Hoscilo Krzysztof Sterenczak	AH KST	Technical Expert Technical Expert	5000 5000
CESBIO	Thuy Le Toan Stéphane Mermoz Alexandre Bouvet	TLT SM AB	Technical Expert Technical Expert Technical Expert	 5000
GAMMA	Maurizio Santoro Oliver Cartus	MS OC	Technical Expert Technical Expert	2000, 3000, 4000, 6000
MPI	Nuno Carvalhais Adam Erickson	NC AE	Technical Expert Technical Expert	
IIASA	Dmitry Schepaschenko	DS	Technical Expert	

User:

Institution	*Participant Name*	*Acronym*	*Function*	*Country*
IKI	Sergej Bartalev Vasily Zharko	SB VZ	User User	Russia
Uni Leeds	Alain Grainger	AG	User	UK
UNSW	Richard Lucas	RL	User	Australia
Uo Stockholm	Martin Thurner	MT	User	Sweden
solo EO	Ake Rosenquist	AR	User	Japan
JRC	Valerio Avitabile	VA	User	Italy
Joanneum Research	Matthias Schardt	MSCH	User	Austria
FMI Finland	Terhikki Manninen	TM	User	Finland
SIZ	Charles Paradzayi	CHP	User	Zimbabwe
FGI Finland	Mika Karjalainen	MK	User	Finland
Uo Helsinki	Makku Larjavaara	ML	User	Finland

Agenda

Tuesday, 31 January	**2nd User Workshop Day 1: Overall Project Context, Regional Activities and User Presentations**
08:30 – 09:00	**Registration, Welcome Coffee**
09:00 – 9:45 (Chris Schmullius)	**Opening and Welcome**
Tuomas Häme	Welcome to VTT *(10 min talk)*
Frank Martin Seifert	Welcome from ESA *(10 min talk)*
Tuomas Häme	Forestry Thematic Exploitation Platform *(15 min talk)*
Chris Schmullius	Current Status of the DUE-project GlobBiomass *(10 min talk)*
9:45 - 10:00	Tour de Table
10:00 – 13:00 *(Heiko Balzter)*	**Task 1: WP 5000 Regional Biomass Estimations**
Heiko Balzter	Introduction to Task 5 and Deliverables Introduction to Round Robin "light" *(15 min talk)*
Pedro Rodriguez Veiga	MEXICO Case Study *(10 min talk, 5 min discussion)*
Stéphane Mermoz /Alexandre Bouvet	SOUTH AFRICA Case Study *(10 min talk, 5 min discussion)*
Sandra Lohberger	KALIMANTAN Case Study *(10 min talk, 5 min discussion)*
	11:00 – 11:15 15 min Coffee Break
Agata Hoscilo	POLAND Case Study *(10 min talk, 5 min discussion)*
Henrik Persson	SWEDEN Case Study *(10 min talk, 5 min discussion)*
Agata Hoscilo/Henrik Persson	Round Robin I - Poland/Sweden *(15 min talk, 10 min discussion)*
Pedro Rodriguez Veiga / Sandra Lohberger / Stèphane Mermoz / Alexàndre Bouvet	Round Robin II - Mexico / Kalimantan / South Africa *(2x 15 min talk, 10 min discussion after each talk)*
13:00 – 14:00	**Lunch Break at canteen**
14:00 – 15:10	**General Discussion on Regional Mapping and Feedback from All Participants**

15:10 – 17:30 *(Nuno Carvalhais)*	**Task 2: Regional User Presentations** (6 x 15 min talk + 5 min discussion after each talk)
Valerio Avitabile	1) JRC Biomass project - Assessing forest biomass data in Europe: preliminary results
Richard Lucas	2) Australia's Biomass Library and Mapping
Anne Väänänen	3) ESA Innovators II project - AccuCarbon
	16:10 – 16:30 20 min Coffee Break
Mika Karjalainen	EU/FP7 Advanced SAR project
Charles Paradzayi	Proposed program to assess and monitor the impact of tobacco farming on savannah woodlands in post fast track land reform era in Zimbabwe
Sergey Bartalev	Forest mapping and monitoring activity in Russia using Earth observation: overview of resent R&D results
17:30 – 18:00	**Day 1 Wrap-up**
Chris Schmullius *(10 min)*	Conclusions and Action Items from Day 1, Outlook on Day 2
Frank Martin Seifert (10 min)	Conclusions and Action Items from Day 1
Evelin Matejka (5 min)	Organizational Issues
18:00 – 18:30	Bus Transfer from VTT (meeting venue) to Haltia
18:00 – 22:00	***Social Event – Nuuksio NP, Finnish Nature Centre, Haltia****
22:00	Transfer back to Espoo / Radisson Blue Hotel

* *Please take some warm clothes (jacket and shoes) with you. The Social Event is to large extent indoor, but some outdoor activities (coffee, drinks at the fire place) are planned. There will be not time between the meeting and the Social Event to coat at the hotel.*

Wednesday, 01 February	**2nd User Workshop Day 2: Global Activities, Validation and User Presentations**
8:30 – 9:00	**Welcome Coffee**
09:00 –10:00 *(Nuno Carvalhais)*	**Task 3: WP 3000 Product Specifications and Algorithm Design**
Shaun Quegan *(30 min)*	Algorithm Development Phase 2
Yrjö Rauste *(15 min)*	D6: ATBD - / including D7: DJF – Design Justification File
User Feedback	*Discussion (15 min)*
10:00 – 11:40 *(Martin Herold)*	**Task 4: WP 6000 Global Algorithm Development**
Maurizio Santoro *(20 min)*	Global Algorithm Development *Discussion (10 min)*
Oliver Cartus / Alexandre Bouvet/Stéphane Mermoz/ Thuy Le Toan	
Nuno Carvalhais *(20 min)*	Global Algorithm Development III *Discussion (10 min)*
	11:00 – 11:15 15 min Coffee Break
Thuy Le Toan *(15 min)* Alexandre Bouvet / Stéphane Mermoz as representative of Cecile Dardel, Philippe Peylin, Philippe Ciais, LSCE	Optimising the ORCHIDEE model using the biomass map of Africa derived from SAR data *Discussion (10 min)*
11:40 – 12:15	**General Discussion on Global Mapping and Feedback from All Participants**
12:15 – 13:00	**Task 5: WP 4000 System Development / Prototyping** **WP 7000 Validation**
Oliver Cartus and **Maurizio Santoro** *(15 min)*	System Requirements, System Specification and Qualification Review
Danae Rozendaal / Martin Herold *(15 min)*	GlobBiomass validation: updates and ecological applications
User Feedback	*Discussion (15 min)*
13:00 – 14:00	**Lunch Break at canteen**

14:00 – 15:20 *(Maurizio Santoro)*	**Task 6: User Presentations (Programs and Projects)** *(4 x 15 min talks, 5 min discussion after each talk)*
Martin Thurner	Large-scale investigations of forest carbon fluxes based on Remote Sensing biomass products – Recent advances and future requirements
Ake Rosenqvist	SAOCOM Companion Satellite Tomographic observation plan
Matthias Schardt	Mobile multi-sensor platform for efficient generation of validation data
Dmitry Schepaschenko	Validation with the focus on Geo-Wiki.org and Forest-Observation-System.net
15:20 – 16:00	**General Discussion and Feedback from All Participants**
16:00 – 16:30	**Coffee Break**
16:30 – 17:15	**Task 8: WP 8000 Data Dissemination** **Task 9: WP 9000 Promotional Activities**
Carsten Pathe	WebGIS for data dissemination (15 min)
Chris Schmullius	Report on Outreach Activities *(15 min)*
All	Feedback *(15 min)*
17:15 – 18:00	**Day 2 Review, Open Issues and Feedback from Advisory Board** *(2x 10 min talk, discussion)*
Chris Schmullius	Conclusions and Action Items from Day 2
Frank Martin Seifert	Conclusions and Action Items from Day 2
ALL	General Final Discussion
18:00	**Closure of public GlobBiomass 2nd User Workshop**
18:30	Transfer by public bus or shared taxi from meeting venue to the restaurant in the Helsinki City Centre
19:00	***Dinner at Restaurant "Manala" – for GB Team (interested users welcome on own costs)***
22:00	Transfer by public bus or shared taxi back to the hotel

Opening and Welcome

Issues & Discussion

1. ***Tua Homo – Welcome to VTT***

2. ***Frank Martin Seifert – Welcome from ESA – European Activities***

- Presentation of ESA`s current projects and programs
- Sentinel program – International Collaborative
- Copernicus Services
- EOEP-5 Science for Society
- Scientific Data Exploitation, EO Exploitation platforms, EO for Sustainable Development
- Open calls: 10% of the budget for small innovative activities!! Max 150k€, max. 1 year duration;
- Open for all field of EO applications
- Addressing national needs;
- Under discussion GCOS ECV T.9 (Above Ground Biomass)
- Worldcover conference ESRIN 14-16 March – high resolution land cover
- Collaboration of GlobBiomass (European Project) with NASA projects

3. ***Tuomas Häme – Forestry Thematic Exploitation Platform***

- See presentation
- Forestry tep platform – live presentation
- If you have reference data – need to share – please contact us

4. ***Christiane Schmullius – Current Status of GlobBiomass***

- See presentation
- GlobBiomass – overview / project structure /
- ATBD – bible
- Future of GlobBiomass -

Action	*Responsibility*	*Deadline*	*Changes to Deliverables / Timeline*

Task 1: WP 5000 Regional Biomass Estimation

Issues & Discussion

5. *Heiko Balzter – Introduction to Task 5*

- See presentation
- Overview about the tasks in WP 5000
- Methods for AGB mapping
- 3 epochs – 2010, 2005, finished – 2015 current in working process;
- AGB 2015, change maps, uncertainty characterization and validation
- Round Robin comparisons
- Temperate / Boreal: Poland - Sweden
- Subtropical / Tropical: Mexico – Kalimantan – South Africa

6. *Pedro Rodriguez Veiga – Mexico Case Study*

- See presentation
- Area, datasets, methods, output, validation,
- Change methods in development stage
- Deliverables ready by 09/17
- Biomass maps 2015 in processing process
- More different data – ALOS, ALOS-2, Landsat 7/8, Sentinel 1 – Dual Mode
- PRV: Sentinel-1 / using median values
- CS: how much is the contribution of the optical data – presentation – page10?
- PRV: probably 90% of that
- PRV: you can put it out, if necessary
- AV: how did you filtered the in-situ-data?
- PRV – filtered out
- TH: was the unit?
- PRV – used 1ha

7. *Stéphane Mermoz – South Africa Case Study*

- See presentation
- Data, area, methodology
- 2015 biomass estimation - + Sentinel-1 / ALOS Palsar
- 2015&1016 56 1-ha plots (provided by CSIR)
- Use a simplified model with limited no. of unknown parameters (MIPERS) – using simplified SAR/AGB model
- Method can be extended at global scale / doing with GAMMA
- Published paper: in remote sensing / 03/2016 – area - Vietnam
- Tested the method in some other countries – e.g. Cambodia
- MS - 2005/2010 – biomass overestimation?
- SM – assumed a uniform biomass estimation – agree with MS
- SM – Bayesian inversion really increase the biomass
- CS – waiting for new data from Renaud Matthieu – measured into plantations;
- HB – LIDAR – vegetation around rivers – wondered about explaining the data

8. Sandra Lohberger – Kalimantan Case Study

- See presentation
- Data, area, methodology
- Plantation development
- Approach & accuracy from 2005 and 2010 similar
- Interaction with ESA fire_cci
- AG - How much is your work linked to the world forestry department?
- Exchanging our knowledge with a lot of different partners – really important to have this exchange
- CHP – would it possible to use a logarithmic regression?
- SL - yes , but we prefer a linear regression as we have several input variables
- SL – very diverse ecosystem - need a model who covers all this different types of forest – that's why the accuracy is not so high
- SL – limited in the higher biomass range
- AR - why not using species deistinctive allometric models
- SL - a more general allometric model is applicable, a recent study from CIFOR has tested several allometric models and found a general one including wood densities have good results

9. Agata Hoscilo – Poland Case Study

- See presentation
- Data, area, methodology
- Presentation of national Inventory of Forest Condition (16x16 km grid)
- Size of plots are small
- Selection of reference plots – only plots which are fully covered by forest;
- Model performance: 2005 – problems with slow biomass – maybe something to do with underground?
- Idea for change mapping: do it pixel based: classes - no change in low and medium biomass / gain and loss areas – preliminary work
- Or by stands – change within the stand not within the pixel
- 2015 mapping – Sentinel 1 -, and Sentinel 2 are usable + ALOS-2 Palsar
- Further work: BIOMASS 2015, uncertainty characterisation, validation, Change mapping, Round Robin comparison Sweden – Poland
- VA – working with stand level data is very interesting - stand is homogeneous, not only pixel
- VA- random forest need a lot of training – maybe more training on high biomass would be necessary;
- TH – RMSE – what about the bias – think the bias is more important to evaluate a systematic error;
- AH – did it – will show later –
- SQ – will present in detail tomorrow morning
- SQ – validation data set has the same properties than the training dataset

10. Henrik Persson – Sweden Case Study

- See presentation
- kNN (SPOT 4/5) + BIOMASAR (PALSAR/ASAR)
- RMSE = 59% for kNN
- RMSE> 70% for ENVISAT ASAR
- Combination ENVISAT ASAR + kNN = RMSE = 59%

- MSCH – results very much differing – whats the reason?
- AH – will show some example while Round Robin
- HP – have different forest
- HP – have stand level data for whole Sweden - only for some small areas;
- SQ – do you have mono-species stands in some cases?
- HP - yes, in plantations
- SQ – maybe something wrong – don`t know what it is?
- YR – Sweden do not have the homogeneous screening in ground plots
- AG – Sweden has high reputation for forest inventory – and you have so many problems?
- HP – to manage forest Sweden did not used satellite products – use laser scanning in regions;
- HP laser scanning products national-wide will be have much more accuracy
- KST – the selection of properly reference data is very important
- FMS – 2015 work – have several spots in Sweden from April to September - SPOT5 data are available – might look into it as potential smaller testsite;

11. Agata Hoscilo / Henrik Persson – Round Robin Poland / Sweden

- See presentation
- Poland testsite - 1 Grid 1x1
- Sweden - Remningstop test site used
- AH: Forest in Poland / Forest in Sweden – Forest looks like similar: Polish forest is denser and have higher biomass
- AH: Data: used 228 inventory plots + ALOS Palsar images – selected 28 plots - did filtering with 3x3 window – surprised about result
- Swedish results with Polish method – better results than in Poland! –
- How Sweden managed to do with low biomass
- Random Forest only with ALOS Palsar
- Poland: Milicz test site: tested ALOS Palsar Mosaic + Landsat TM
- Poland: 165 plots to Sweden
- AH: has done Sweden: first results looks promising – need to separate forest type driven models
- HP: cannot use kNN for Poland
- HP relationsships between AGB and the Landsat band are quite poor
- AH: need more plots to use kNN
- AH: for Swedish case is not need to use an extra model for different forest types;
- AH: did it only with ALOS for Swedish case - nothing with optical data
- AH: five ALOS + optical data for Polish case in Sweden
- FMS: can look for additional optical data from ESA to do this exercise
- FMS: thanks a lot that you are doing this exercise
- AR – there is more PALSAR data available than the mosaics! – look into the archive
- SB – kNN Sweden – in Russia they tried to use the Swedish kNN approach - ist`s more statistical than a physical – seasons of Landsat makes a large difference in Poland – maybe your Polish regression is much worse;
- AH – images between March and October / based on median of 2 years / no winter scenes
- HP have to find out where are the missing in that equation
- Still in progress! Need to learn about the testsites

12. Pedro Rodriguez Veiga / Sandra Lohberger / Alexandre Bouvet – Round Robin II – Mexico – Kalimantan - South Africa

- See presentation
- Central Kalimantan/Indonesia - Calakmul/Mexico – Kruger NP Area/South Africa
- Different training data: Kalimantan and Krueger NP are Lidar-based, Calakmul = Plot-based
- Large differences in biomass ranges
- Different training data
- Additional datasets to be produced
- Seasonal SAR effects on stripes (Calakmul)
- South Africa – texture not usable for low biomass ranges
- Using MIPERS in Mexico - difference in high/low biomass ranges;
- Outlook – production of add. Datasets by 02-03/17
- 03/17 map productions
- 04/17 validation
- CS: has to be a rethinking now - about seasonality
- CS: has to be developed indeed in another project
- FMS – looking at Savannah - comparing with lower type of dry forest; look for high area biomass in Mexico – (Southern Yucatan) - to compare with Kalimantan
- Within the whole range a method will not be reasonable
- Exercise for a future project;

Conclusion	***Responsibility***

Action		***Deadline***	***Changes to Deliverables / Timeline***

General Discussion on Regional Mapping and Feedback from All Participants

Issues & Discussion

- HB -AGB maps usually overestimate low biomass and underestimate high biomass; training data often represent low biomass but models using the training data try to estimate low and high biomass as well
- CS - surface roughness and (soil) moisture need to be taken into account + there are also backscatter contributions from the ground (forest floor); correction for roughness and moisture required; possible source of error for RR: are NFI data identical in terms of measurement method? + radar does not see what NFI data represent
- HB - if different plot data are used for model training then the model results are hard to compare
- MSCH - refers to the Diabolo project which tries to harmonize different NFI measurement methods throughout Europe
- HB - selection of ground data sets and their pre-processing (if any) may be used to answer the questions: What can we learn the experiences gathered in GB project? + future ECV may benefit from that
- SP - What does uncertainty mean in the context of GB?
- SQ - refers to Wednesday's morning session where issues related to uncertainty and accuracy are treated
- SP - When talking about uncertainty one should always start from error propagation concept + bias and precision have to be taken into account
- SP - reliability of reference data sets from outside the project somehow questioned – if they accompanied by sufficient error characterization they should be used
- HB - we did not have a closer look at this issue due to lack of time (with reference to RR)
- AG - Underlines the importance of accuracy of the results with reference to uncertainty in data on global environmental phenomena, e.g. difference between biomass sequestration and emissions from burning biomass may be small but is important -> can GB give an insight into this issue.
- HB - fluxes between biomass stocks not subject of the GB project and the products
- HB - What will people do with GB products? Underlines Importance of error characterization
- HB - refers to IPCC good practice guide on uncertainty and accuracy
- AR - refers to GFOI documents (see also his mail to the team with a web link)
- TLT - existing methods have a problem when used for mapping low and high biomass ranges as well
- TLT - We should be aware about the limits of the existing EO sensors + question if we should wait for more appropriate sensors to measure also high biomass ranges with better quality

- CS - one way forward could be the use of a global biomass map + some Landcover CCI products for stratifying forest and apply model to stratified data
- TLT - Underlines the importance of assessing the role of moisture for biomass mapping
- CS - what moisture is meant?
- TLT - overall moisture conditions before and during data take (was there a precipitation event before SAR data acquisition?), use meteorological data
- CS - Question on percentage tree cover product from optical data: Are errors in the product known?
- PRV - Yes, product comes with uncertainty layer
- SQ - more general statement that we are not able to map global biomass in the high biomass ranges
- CS - Answers – if we cannot get above 100 t/ha we go only to 100 t/ha -> this is better than no information at all
- SQ - not only C-band but also L-band is limited (around 200 t/ha saturation), high data coverage may help to apply BIOMASAR-like model, but data are not available (mostly ALOS PALSAR mosaics have been used)
- SQ - At least we should concentrate our efforts to a precise estimation of biomass in the low biomass ranges, which would mean to exploit the power of existing sensors as far as possible
- KST - Information for high biomass ranges important for forest managing!
- VA - is the implication of the limitation of methods/products when looking at biomass changes? Can change be detected at all with sufficient accuracy?
- HB - Change maps are important!
- HB - We should do the change mapping and not the users as we know the limitations of our methods and products
- KST - What about clear cuts?
- HB - This refers to forest cover change which can be mapped with much more accuracy than biomass change.
- AG - comments on low biomass uncertainty 1) look at what forest you want to measure for (degraded forest, cleared forest, low tree density) 2) be careful when combining different layers of data, e.g. mixing of optical and SAR data may introduce additional errors
- HB - Look at different forest types! Stratify forest before biomass mapping! Can we use existing land cover data for stratification? We may should start to do the forest type characterization on our own
- MS- limited data coverage for global mapping -> what does it mean for biomass mapping, may be a new research question
- HB - Do accuracy assessment separately for different biomass ranges, e.g. 0-50, 50-100, … t/ha
- MS - Agrees with Heiko but states that this not give an answer for the reasons for inaccuracies/errors
- TLT – States, that products, that are useful for one user group may be irrelevant for other users. We should bear question in mind, what the user actually wants but we are already heading towards operational processing

	• CP - We need above ground woody biomass • TH - Agrees with Thuy. For precise results the estimats have to be accurate (no bias)! • TH - Forest managers may accept some bias as long as results are precise • FMS - Question about the user's needs where subject of a meeting (in Jena @MPI) before the GB project and are written down in the GB statement of work • FMS - Stand-wise information cannot be expected from global/continental/regional biomass products • FMS - understand regional mapping as a kind of laboratory experiment, What can we learn from the project and what/how things could be done better • FMS - Also agrees with Heiko's demand to do the change maps within the GB project • FMS - Comments on change maps and their quality – we are talking about science, nobody expects perfection • FMS - We should treat problems from an scientific point of view • MT - Underlines mismatch between scales if plot data and EO biomass products and asks if there can be a method for upscaling plot data to make them comparable (spatially) to EO derive biomass products • HB - LiDAR data may help + If upscaling of ground measurement data would work we would not need remote sensing for large scale biomass mapping • AR - ALOS PALSAR data from 2007 used for mapping biomass status of 2005: this must be taken into account and clearly communicated • AH - States that a proper uncertainty characterization of biomass data is also important if these data are used for climate modelling
Conclusion	

Action	***Responsibility***	***Deadline***	***Changes to Deliverables / Timeline***

Task 2: Regional User Presentations

S

13. *Valerio Avitabile – JRC Biomass project – Assessing forest biomass data in Europe: preliminary results*

- See presentation
- Group is working on forest biomass assessment
- Modelling of forest growth and management
- Removals and wood products
- 1014.16 – contracts on Biomass harmonization with 26 countries
- Harmonized Biomass definition
- National scale – by species group
- Maps covering Europe: Thurner 2014, Barredo 2012, Gallaun 2010, Kindermann 2008,
- Large differences in high biomass
- Comparison with the Poland Biomass map 2010
- Total biomass was very good / closest
- Request to producers: include areas with low forest cover to allow users to apply different forest masks;
- JRC need biomass map which is consisting with statistics
- MSCH – there is a project for Forest Economy – what can be done with the Energy –
- VA - biomass is not enough – information about what kind of biomass would be needed;
- SP – you got to define Biomass in Europe – what about the rest of the world
- VA – difference in definitions are not very bit
- SP – what kind of data you did used –
- VA - inventory data from last 10 years
- FMS – what is lesson learned for next one?
- VA – work is ongoing for harmonization

14. *Richard Lucas – Australia`s Biomass Library and Mapping*

- See presentation
- Structural classification of Australia´s Woody Areas: IceSat + Landsat used
- TERN Biomass Library
- Maps of canopy cover and height are available for Australia – keen link with GlobBiomass
- PRV – using segmentation for ALOS-PALSAR? – Yes
- AR – layer of mangrove / non mangrove globally would really useful for GlobBiomass project

15. Anne Väänänen + Makku Larjavaara – ESA Innovators II project – Accu Carbon

- See presentation
- Idea – combine growth model and multi-date satellite imagery inventory for improved carbon prediction of tropical forest
- Users: Chiapas, Mexico – Ricardo Hernandez Sanchez
- Change detection & carbon calculating
- Assumed that Carbon density approaches the new equilibrium a fixed proportion of the remaining difference per unit time
- Density / land use change
- > 100t/ha AGB no difference for carbon is seen
- Using a change tracking system for modelling
- Input: land cover map, time series of binary change maps or change layer, parameters of the carbon (forest growth) model
- Result – Production of carbon maps
- Current working also on Sentinel data / Sentinel-1 time-series / change detection
- Using also ALOS PALSAR mosaics for change detection
- User workshop preparations continue
- SQ – is the forest model with growth rates?
- ML – yes
- SQ – what about degradation?
- AV – working with deforestation, not with degradation
- TH - Mapping of clear cuts will be done
- TH – have a baseline map of GSV for biomass

16. Mika Karjalainen – EU/Fp7 Advanced SAR project

- See presentation
- SLU, TU Wien, Treemetrics Ltd, Chalmers, FGI coordinator
- Derivation of 3D canopy height, biomass and biomass change
- Using ALS, SAR, Optical satellites, TomoRadar, MLS, Field Inventory, TLS
- Focussed on field inventory – test side in Sweden & finnish testsite – EVO test site
- Field survey with TLS and MLS – leading the EuroSDR comparison for forest inventory
- Airborne technology – really dense
- www.fgi.fi/advandedsar

- CS: this is type of data that we need for our validation
- CS: would ESA could plan more money for this type of in-situ ground measurement?
- FMS – there is already planned in this direction with Smithonian – data are freely available
- DS: data free from 2017 (is planned)
- SP: do you have a long term plan for this data?
- MK: data is open from 09/17 – it is open science

17. *Charles Paradzayi – Proposed program to assess and monitor the impact of tobacco farming on savannah woodlands in post fast track land reform era in Zimbabwe*

- See presentation
- Land tenure systems (freehold tenure, leasehold tenure resettlement permit tenure, common hold tenure, state land, easement)
- Fast track and land reform program
- Tobacco is the golden leaf of the economy of Zimbabwe (25% of GDP)
- From 2005 until now – no figures what with woodland loss
- Estimated forested area losses have not been verified
- Need to develop human capacity to handle data from optical and radar sensors
- savanna woodland dynamics: science and technology, social sciences, natural, resources management
- need international collaboration
- will try to improve staff and technologies
- increase interdisciplinary publications at Midlands State University; contributing to threating of MSU
- FMS: GFOI could be cooperation to install a data cube in your centre in Zimbabwe

18. *Sergey Bartalev – Forest mapping and monitoring activity in Russia using Earth observation: overview of resent R&D results*

- See presentation

Action	*Responsibility*	*Deadline*	*Changes to Deliverables / Timeline*

Day 1 Wrap-up

Issues & Discussion	**Frank Martin Seifert: final words** • FMS: thanks a lot for reporting about the regional mapping in the morning • FMS: thanks a lot for Round Robin light • FMS: will stimulate the discussion – was very pleased with that • FMS: user presentation – a lot of potential – for validation – to promote open science approaches to share data • FMS: relating Charles Paradzayi / Zimbabwe – will use the support and recommend cooperation with GlobBiomass project – will bring that within GFOI – ESA not funding for large capacity building – hope, that somebody will pick up that.
Conclusion	

Action	***Responsibility***	***Deadline***	***Changes to Deliverables / Timeline***

Task 3: WP 3000 Product Specifications and Algorithm Design

Issues & Discussion

19. Shaun Quegan – ATBD

- See presentation
- ATBD v1 produced for 1st User Meeting
- ATBD v2 takes account of ESA, UoS and VTT
- Update of global mapping

Regional Mapping

- Analyses properties of the AGB estimates by biomass range
- Includes modifications of methods and data for 2005/2015 epochs
- Properties of AGB estimates – regional maps (Accuracy, improved methods, changes)

From regional partners delivered:

- table about validation of 2005/2010 epoch (RMSE, bias) by biomass range/class
- Histogram of errors by biomass range for 2005/2010
- Overall scatterplot

Why RMSE is useless?

- No balance between BIAS and Scatter
- For Poland: need to fix the BIAS
- Bias is the dominant error except for the middle range (150-200t/ha) of AGB
- Random error is an absolute error – not relevant
- For Sweden / Mexico: the same than in Poland
- For Kalimantan: data have a very special structure, (train the lidar data with the forest inventory) – there are many points in the small range and in the high range – less in the middle range;
- All regions overestimate AGB for AGB<150t/ha
- Improvement of bias? Are the training data and reference data representative?
- Where does the random error come from and can we reduce it? Are there environmental changes in reference datasets?
- FMS – is L-Band – overestimating?
- YR – techniques that reduce bias at high and low end tend to increase the overall RMSE – improvement of bias statistics usually comes at the expense of RMSE statistics
- MH – purpose is to learn and improve
- Why Random Forest is failing?

Biomass Change Maps

- 5 types of change: random variation, environmental changes, sudden high-intensity change due to deforestation and fire; lower intensity, Biomass changes from forest growth
- 2 methods: produce 2 biomass maps and subtract
- Detect change and interpret in terms of biomass
- If bias is dominant, the RMSE of the difference may be smaller than the RMSE of the individual products
- Otherwise the RMS will be larger (if variances are similar)

	• The reporting of accuracy still needs to be clarified • Challenge for GlobBiomass is to demonstrate that its products are better than the pantropical maps from Saatchi et al. 2011, Baccini et al. 2012 Hu et al. 2016 and Avitabile et al. 2015 • Relation between accuracy and the scale is an unresolved issue • TM – what is the Biomass definition for GlobBiomass • CS – Stem Volume • CS – need supersites which a lot of measurement equipment, in situ data, - have such a supersite in Jena, need it in different ecosystems
Conclusion	

Action	*Responsibility*	*Deadline*	*Changes to Deliverables / Timeline*

Task 4: WP 6000 Global Algorithm Development

Issues & Discussion

20. Maurizio Santoro – Global Algorithm Development I

- see presentation
- Presentation of different approaches for the Global Map
- GlobBiomass Global retrieval algorithm
- CESBIO, BIOMASAR-C, Cubist, BIOMASAR-L
- Ongoing: visual assessment, quantitative assessment
- Using CCI-Landcover Forest mask
- BIOMASAR-C present best agreement up to 200m3/ha
- BIOMASAR-L averages somewhat overestimated – most reasonable in high biomass forests
- BIOMASAR-C in countries with high average biomass
- CUBIST does not seem to keep the information from the 1 km dataset when increasing the spatial resolution /
- CESBIO – precise estimation of model parameters at training samples
- Retrieval algorithms present some systematic differences but also local discrepancies
- Deficiencies/uncertainty: regional under-, overestimations related to model, parameter… / mangroves are not estimated well
- Need to understand what the different algorithms estimates before decision how to combine…
- AR – could do multi-temporal filtering
- MS – multi-temporal aspect is implemented
- MS – want to come out with a data product – which not show undesirable effects;

21. Nuno Carvalhais – Global Algorithm Development II – from GSV to Biomass

- See presentation
- Thurner-approach: GSV + Global Wood Density Database = Stem Biomass
- Stem Biomass + Biomass Compartment Database = Biomass
- Problems:
- Replicates between databases
- Spatial representatiness of measurements
- Lack of geographical information
- AG - would look in books and papers for wood density
- NC – would density comes from work of Chave et al 2006 – all sources come from publications
- TLT – look at wood density by specious, but what kind of resolution you are looking at?
- NC – we consider this variability locally
- NC – the databases are not complete

22. Thuy Le Toan – Optimising the ORCHIDEE model using the biomass map of Africa, derived from SAR data

- See presentation
- Can we use biomass maps from satellites to improve Carbon models
- Used: CESBIO biomass map for Africa + Orchidee model
- Combine both to predict the future of forest carbon stocks
- How to improve the model?
- Orchidee DGVM AGB simulation from 1850-2200
- Overestimation of AGB by Orchidee – problems in the DGVM module
- Use of CCI landcover products in coupled model
- Will use the GlobBiomass global maps as indicators
- TLT - Orchidee did not includes model for savannah – need to look at this

Conclusion

Action	*Responsibility*	*Deadline*	*Changes to Deliverables / Timeline*

Task 5: WP 7000 Validation

Issues & Discussion	***23. Danae Rozendaal – GlobBiomass: updates and ecological applications*** • See presentation • Thinking about new approaches • Validation of biomass change – what is the best to validate biomass? • Ecological applications: carbon sequestration in regrowing in the neotropics • Age is based on the biomass + climate at plot level •
Conclusion	

Action	*Responsibility*	*Deadline*	*Changes to Deliverables / Timeline*

Task 6: User Presentations (Programs and Projects)

Issues & Discussion

24. Martin Thurner – Large-scale investigations of forest carbon fluxes based on Remote Sensing biomass products

- See presentation
- Carbon cycle in forest ecosystem – large
- Forest C fluxes constrained by C stocks
- Vegetation carbon turnover to atmosphere and soils (incl. fire)
- Spatial variation in carbon turnover rate in boreal forests is explained by frost; Spatial variation is related to drought stress effects on mortality
- Simulation by 2 global vegetation models
- CCI data for assessing soil moisture controls in fire emissions;
- Remote Sensing Biomass can constrain the estimation of carbon fluxes
- Global consistency mapping approach needed
- Covering of forest heterogeneity
- Uncertainty estimates: assimilation into models
- Direct inference of C turnover flux
- AR - Carbon model – is it mainly C02 fluxes

25. Ake Rosenqvist – SAOCOM Companion Satellite Tomographic observation plan

- See presentation
- Potential ESA mission in collaboration with CONAE and ASI
- 2018/19 with SAOCOM-1B
- L-band passive receiver
- Mission:
- Tomographic (Boreal, Temperate and Tropical forests)
- It`s interferometry – collect data with different baseline;
- HH-HV used
- Forest products: Forest height , AGB, TomoSAR (Radiometric); Sub-canopy Digital Elevation Model
- 8 day recurrence with 2 satellites
- Global Background Mission
- Data policy: should beopen and free
- ASI has exclusive data rights over Europe
- “Automatic” gap filling
- Biomass related: InSAR coherence / DSM

	26. Matthias Schardt – Mobile multi-sensor platform for efficient generation of validation data • See presentation • Presentation of ADAM system • Doing LiDAR Processing ***27. Dmitry Schepaschenko – Validation with the focus on Geo-Wiki.org and Forest Observation-System.net*** • See presentation • Estimation of forest cover using Geo-Wiki.org • Mobile app: Geo-Wiki Pictures • Game: Picture Pile • GlobBiomass Validation with Geo-Wiki (land cover types, forest/non forest/density/) • Forest-Observation-System.net: • GEDI Biomass Calibration Database •
Conclusion	

Action	*Responsibility*	*Deadline*	*Changes to Deliverables / Timeline*

General Discussion and Feedback from All Participants

Issues & Discussion

Richard Lucas: final words

Ake Rosenqvist: final words

Valerio Avitabile: final words

- Global map – important that is can match with existing statistics
- Map by doing the process – needed to double check in the communities
- Wood density map – some different patterns could
- For Europe – could work with statistics -
- Will use the global map – interested in
- A regional products about whole Europe would be interesting for JRC
- Can JRC be partner for an upcoming project?
- ESA – in kind contribution is possible, for smaller roles – FMS not sure now.

Sergey Bartalev: final words

- GSV very important for Russia
- Very much looking forward to this Global Product
- Important would be fast evaluation
- Would be good to have some tools to parameterize, would be good to change the map in case of better knowledge about a region
- Will do dome tests with Sentinel-2 and Landsat
- Will try to improve the methods;
- CS – how we can find funding / German-Russian Science foundation
- CS – how about the inventory data?
- SB – data also not available for us!
- SB – Forest Inventory is a huge;

Stephen Plummer: final words

- Biomass-CCI – can start
- Very nice progress within the project – kind of things we will push in CCI; tracabillity of method and the validation are important
- Not trying to produce a product for everybody!
- What you might want to do in a future potential product – tink about it
- Money is being committed

Alain Graingee: final words

- results on changes in GlobBiomass stopped
- Focus has being on carbon fluxes - limited relations to biomass stocks
- AG – needed indications how to manage forest degradation
- Could have also make a major contribution – could be an important scientific output
- AG – allometric equations, what about it?
- AG – don`t forget the drylands
- AG - any contributions on forest degradation

Frank Martin Seifert: final words

- Thanks Ake for coming for advisory board –
- Will continue to inform JAXA by the really important use of the L-Band data
- Related Valerio Avitabile: should compare the statistical result with our results (Sweden and Poland) – and the European part of the Global Map
- All users – look into Sentinel-Data
- For the global product will see how the final product will be aggregated – could be much more useful to aggregate to 100 or 150m
- Bring information from the global tools more to the regionals
- Users: to do some comparison with the regional products
- Looking at the exercises what we need to develop in the 2nd half year
- AR – GFOI have closer links within GlobBiomass
- Need to coordinate within GFOI
- MH – GFOI meeting in November was included in the Biomass session with a lot of key personnel
- CS – there is a GFOI meeting in ESRIN in 1st week in September
- CS – 3rd GlobBiomass User Meeting 11.-13.09.17 (at FAO?)

Conclusion

Action	*Responsibility*	*Deadline*	*Changes to Deliverables / Timeline*

Task 8: WP 8000 Data Dissemination

Issues & Discussion

28. Carsten Pathe: WebGIS for data dissemination

- WebGIS live presentation
- At the moment password protected
- Next weeks will be open for the GB – team
- MS will send 1st test-version of global maps to test the global map at the WebGIS
- Current status: biomass maps 2010 from regional partners are included
- CP show different functionalities of the WebGIS
- Show of legend, transparency, different layers are possible
- Outgoing from the world-view
- Need to apply for a subdomain to reach and integrate the GlobBiomass website
- CP will add the 2005 data next week
- At the end of the project all data (which are validated) should go out to the public
- MS: is there a way for readme or class specification
- CP: it is possible to implement
- CP: tell me, what would you like to see – can implement
- NC: when you download – you download the whole layer?
- CP: yes
- CP: resolution cannot be changed, download via subset should be implemented if you want to have it
- AE: at the moment it is running at a local server
- TLT: if the user have additional data – possible to upload?
- CP: upload function will checked and if possible implemented
- CP: it is GeoTiff
- MS: is it possible to implement a resampling tool
- CP: was not the objective of the project – if we have time we can think about it;
- CP: need to check how flexible we can develop the system
- SL: maybe it would be good, if people could upload a shape file for subset
- HB: maybe you can link the system to other global products
- NC: philosophy is click and download – if you could implement different projections / doing re-projection – would increase the amount of users
- MS: if you provide the data about an aggregation tool – would be useful (e.g. CCI LandCover)

	• FMS: CCI LandCover has a link to climate modellers • FMS: checking which tool could be made available • FMS: within CCI – something of visualization tool are in planning – can check what is available there to transfer, as needed by the climate community • AG: should go in dialog with the users • CP: it is underestimated what is needed (money and time) to develop a really good tool • CS – respect to GEO-Wiki and Forestry-TEP – would be nice to have this functionalities included in the system • CS – why do we develop something else, if we have Forestry-TEP • TH – is one part of Forestry-TEP to distribute data to interested parties • TH – will be developed until the end of the year – operational service is planned, but not sure • CS – until this year we try to find a solution how we can operate the data without funding; • FMS: will check related to CCI LandCover the visualization tools – and for the distribution of data (GlobCover) – what possibility is there; • FMS: as well the Forestry-TEP could be also one distribution channel • TH – is also interested to link with GeoWiki • CP – general information for presenting of results after finish of project • FMS - website should be open 2 years after the project was ending • FMS - need to look for an approach for offer the results for users much longer • CS: will start on 11.09. – noon for 2,5 days public meeting (the GFOI meeting is before)
Conclusion	

Action	***Responsibility***	***Deadline***	***Changes to Deliverables / Timeline***
3rd user workshop – 11.-13.09.17	CS/EM	09/17	

Task 9: WP 9000 Promotional Activities

Issues & Discussion	***29. Christiane Schmullius – Outreach and Promotional Activities*** • What you can see - there are not enough publications at the website • CS: Pedro is working on the regional paper • For 2016 – 40 contributions to Meetings and Symposia are listed • MS: please remove the column listing the partners' names • CS: promotional activities – postcards • CS: what to do in 2017? • FMS: no more papers – only electronic material – could be the future • CS: if you have papers - maybe one page can distributed • CS: buttons in the shape of the regions (research) – • CS: user requirements document / products specification document / • FMS: related to guidance documents - use distribution channel (electronic) – GFOI, GOFC-GOLD; • MS: publishing documents on research gate • MS: created an entry on research gate – updates possible by any team member registered on ResearchGate • FMS: would be use advisable scientific bodies
Conclusion	

Action	***Responsibility***	***Deadline***	***Changes to Deliverables / Timeline***
More publications Regional paper Buttons in the shape of the regions	GB-team UoL + Regional Partners TM	3rd phase Asap 3rd User Workhop	

Evelin Malejka

(GlobBiomass Project Management)