DUE GlobBiomass

Vol. 01

Minutes of the Internal Project Meeting PM4 / 02.02.2017 VTT Espoo, Finland

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Prepared by

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Minutes - Internal Project Meeting - PM4

Project Name	GlobBiomass
Project Number	ESRIN/Contract No. 4000113100/14/I-NB
Purpose	Internal Project Meeting – PM4
Date and time	02.02.2017
Location	VTT Espoo, Finland
Author	Evelin Matejka, Carsten Pathe

Institution	Participant Name	Acronym	Function	WP
ESA	Frank Martin Seifert	FMS	ESA Project Coordinator	
FSU Jena	Christiane Schmullius Evelin Matejka	CS EM	Project Manager Administrative Project Management	9000 10000
	Carsten Pathe	CP	Technical Expert	2000, 8000
Uni Leicester (UoL)	Heiko Balzter Pedro Rodriguez Veiga	HB PRV	Work Package Manager Technical Expert	5000
Uni Sheffield (UoS)	Shaun Quegan	SQ	Work Package Manager	3000
WUR	Martin Herold Danae Rozendaal	MH DR	Work Package Manager Technical Expert	1000, 7000
VTT	Yrö Rauste	YR	Technical Expert	3000
RSS GmbH	Sandra Lohberger	SL	Work Package Management, Technical Expert	5000
IGIK FRI	Agata Hoscilo Krzysztof Sterenczak	AH KST	Technical Expert Technical Expert	5000 5000
CESBIO	Thuy Le Toan Stèphane 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	6000, 7000
IIASA	Dmitry Schepaschenko	DS	Technical Expert	7000

Agenda Internal Project Meeting – PM4

Thursday, 02 Feb	PM4– <u>Internal Project Meeting</u>: Lessons learned from PHASE 2 for PHASE 3 performance
8:30 – 9:00	**Registration and Welcome Coffee**
9:00 – 9:15	**Task 1: WP 10000 – Project Management**
Chris Schmullius	Welcome to PM4
Evelin Matejka	Milestones, Deliverables, & Meetings, Phase 3
9:15 – 11:00 (*Chris Schmullius*)	**Task 2: Review of User Consultation Meeting, Lessons learned regarding Milestones and *Outlook to Phase 3 Milestones*** REMARK: times are only INDICATIVE! Expect long discussions!
All Partners	General Comments on User Meeting / Discussion and elaboration of significant points of interest for 3rd Project Phase
11:00 – 11:15	**15 min Coffee Break**
11:15 – 11:45	**Task 3: WP 3000 Product Specifications and Algorithm Design**
Shaun Quegan (*15 min talk, 15 min discussion*)	*M 9 a: Finalization of Products Specification and Algorithm Design* D 6/7 ATBD / DFJ – Final Version (content and deadlines in Phase 3)
11:45– 13:00 (*Heiko Balzter*)	**Task 4: WP 5000 Regional Biomass Estimation I**
	M13:Regional maps (2015) – finalization and dissemination *M15: Regional Change Maps – finalization and dissemination* *Round Robin "light" – next steps*
Henrik Persson	SWEDEN (*15 min talk, 10 min discussion*)
Agata Hoscilo	POLAND (*15 min talk, 10 min discussion*)
Sandra Lohberger	KALIMANTAN (*15 min talk, 10 min discussion*)
13:00 – 14:00	**Lunch Break at canteen**
14:00 – 15:00 (*Heiko Balzter*)	**Task5: WP 5000 Regional Biomass Estimation II**
	SOUTH AFRICA (*15 min talk, 10 min discussion*)

Stéphane Mermoz /Alexandre Bouvet **Pedro Rodriguez-Veiga** **Heiko Balzter**	MEXICO Case Study *(15 min talk, 10 min discussion)* Summary and outlook (10 min)
15:00 – 15:30	**1) Task 7: WP 7000 Validation**
Martin Herold / Danae Rozendaal	2) D17 Validation Report **3)** *(15 min talk, 15 min discussion)*
15:30 – 16:15	**Task 6: WP 6000 Global Biomass Estimation**
Maurizio Santoro/Oliver Cartus *15 min talk, 30 min discussion*	***M12: Demonstration of Global maps & Dissemination*** ***M14: Validation of Global Map*** D16 Reference Global Biomass Map 2010 & Validation
16:15 – 16:30	**15 min Coffee break**
16:30 –17:00	**PM4 Review and Open Issues**
Chris Schmullius	Conclusions and Action Items from PM4 Feedback Future Steps Closure of GlobBiomass Project Meeting
17:00	**Closure of PM4 meeting**

Task 1: WP 10000 – Project Management

Task 2: Review of User Consultation Meeting - Lessons learned regarding Milestones and Outlook to Phase 3 Milestones

Issues & Discussion	• SQ: Should the regional maps stay as they are or should they be reprocessed after validation? Some regional maps show lots of scatter and bias leading to very low R² values. Should we even produce a 2015 product if issues with epochs 1 and 2 remain unsolved?
	• FMS: Findings of Globbiomass are of great importance for an ECV Biomass project and the ESA Biomass mission! Globbiomass should follow a best effort approach: What are your findings after year 2 of the project? What has been learned so far? I am aware of the fact that there will be no single or unique solution, which would fit to all regions.
	• FMS: Reflect on the issues brought up in Shaun's presentation on the ATBD (underestimation in high biomass ranges and overestimation in low biomass ranges). How can we tackle the bias? I do not expect a final solution but at least a clear description of the possible error causes and an idea on how to do things better!
	• SQ: We clearly have a problem in the low biomass areas.
	• CS: We have to start producing epoch 3 products; otherwise, we may run into problems with the schedule. We do not have the sufficient resources (time, budget, and staff) to solve all the issues detected in the epoch 1 and 2 maps.
	• SQ: Maybe it is an algorithmic problem: All machine-learning techniques cause scatter and inaccuracies in the generated results. Therefore, the cause for (some) of our problems may not be found in the data (EO data, ground data) but in the algorithms.
	• SQ: I do not want to be involved in a project that ignores the issues brought up and just carries on. This is not good science!
	• HB: Biases are not the major issue for us for the remaining project time. We are constantly processing and developing (new data – Sentinel1/2, new methods). I would like to step back and have a look at the problems and how to solve them. Histograms of products should be similar to the histograms of the reference data. Increasing data amount and characteristics of Sentinel-1/2 may even introduce new and more errors/issues/inaccuracies.
	• CS: We need to know what ESA thinks about a possibility to use 3 more months for tackling the issues even if we run out of time with generating epoch 3 maps.

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| Minutes | Uni Jena – Dept. Earth Observation |
| PM4 02.02.2017 | Date 14-Feb-17 |

- FMS: I would like to split up the discussion in one on the global map and one on the regional maps.
- MS: We are doing lots of testing and developing, but we think that for us the remaining time in the project is sufficient.
- MH: First internal validation results will be available in September (global maps). Final validation in December.
- HB: Regional teams did the best they can but even three months more may not be enough.
- AH: ALOS mosaics not well suited, original data would be better.
- SQ: If data (e.g. original ALSO data) are not available then you still can state if we would have better data we could do better.
- FMS: Suggestion: Take a subset of your region and apply your methods to the whole data stack (original data) and show the potential. Globbiomass results will be used for set up of ECV Biomass project.
- SQ: If you produce a map that you are happy with, I'm happy.
- CS: 2015 global map?
- MS: Data coverage not sufficient. Some areas are missing or have very low temporal coverage.
- FMS: It is the nature of all science projects to identify issues for future projects.
- CS: What has been learned from working on epoch 1 and 2 has to be put into perspective. HB: How to go on?
- HB: Until Easter 2017: Try to reduce the bias. Methods are so different that individual discussions may be necessary. Face-to-Face meetings or Telecon?
- SQ: First check whether ground data or AGB maps are biased! Training data may "spoil" the results. I will send out some recommendations.
- SL: Would like to have a group discussion as we may all have similar problems and we may learn from each other. We have all done our best so far.
- DS: Bias may be due to character of the areas where the reference data have been gathered. We (IIASA) may help with some data.
- SQ: Low biomass areas: Soil return is strong!
- CS: We know this. But what is the implication?
- SQ: Difficult question
- CS: We have to describe what and how to do better. It is a problem of the training data.

- HB: Temporal variation (environmental conditions) may not be represented on the ground data. When (season/time of the year) have the training data been acquired? This has strong implications for using Sentinel-1 time series data.

- SQ: Soil return may vary a lot and cause a strong bias! Zero biomass areas may give up to 25t/ha AGB in biomass map. Cause: Soil return (soil moisture?). Solution? We have to develop a method to tackle this issue.

- TLT: Africa: Treat dry season and wet season separately.

- SQ: Soil moisture effects may be even worse for L-band data.

- SL: Which data to use? We only have the mosaics. For multi-temporal data we have to apply as PI. This costs time.

- TLT: Use rainfall data/meteorological data to handle soil return (soil moisture) effect.

- HB: We are restricted to the data we have. Question to the team: Do you think we can improve without having new/additional data?

- FMS: One reason (for problems?) may be the mosaics. Get a stack of ALOS and try to identify the time (season?) when errors occur. If you cannot do it for the whole region/country, select a subset! Demonstrate the potential of a better data coverage.

- MS: We are talking about structural issues! What about the influence of scale? I'm missing an answer to the question, why we are wrong.

- SQ: SM was right: Biases may be due to training data especially when using linear regression models.

- MS: Why do we face problems that have not been brought up in the literature in the last 20 years?

- SQ: Because nobody conducted such a detailed and systematic study in different test regions. We have 5 different methods and 5 different regions and we all have the same problems. This implies that there is a general problem either in the reference data or in the methods.

- TLT: EO data (SAR, L-band) show high sensitivity at low biomass ranges and low sensitivity in high biomass ranges together with high spatial resolution may be a cause. Maybe select restrictions for different biomass ranges (stratification).

- HB: Look at results at resolutions 150 – 500m. I f we can show that working at 100m spatial resolution reduces the bias than this is a major result!

- FMS: Yes. Agree.

- MS: Maybe a too generalized model applied to a whole area may cause a problem?
- All: yes, possible
- TLT: What about an adaptive method?
- CS: Adaptive method was used in SIBERIA-I and II. Are the regions to large? Regions may be stratified. But what is the criterion for stratification?
- MS: Use model for sub-regions.
- FMS: Try to focus on answering the questions: Where are the problems? Why do we have the bias? How to solve it?
- EM: Change deadline of WP5000 (Regional Maps) to September?
- FMS: First I need an agreement on how to scientifically solve/address the issue and then talk about management issue!
- HB: Look at the quality of ALOS mosaics.
- CS: We still have to work on the regional maps (epoch 1 and 2). We do not touch deadlines now. Lessons learned from epochs 1 and 2 may make it easier to work on epoch 3.
- HB: There are statistical methods for improvement of RandomForest. The same applies to MaxEnt.
- CS: Use the time until Easter and let us decide then.
- SQ: It is madness just carrying on!
- CS: I do not want to put a date on epoch 3.
- FMS: Use the time until Easter to look at the issues and give a potential solution.
- SQ: Our discussion now is positive as we learned a lot and have the problems at the table. Identifying errors/issues is not a bad thing. It is good sciene!
- SQ: What about learning from the validation of the global product?
- MS: We are using 3 different methods.
- SL: Our resources are very limited. I am not sure if we can do it.
- FMS: The real value if Globbiomass is the analysis of the issues we brought up. Let us have a telecom after Easter and talk about implications on the project management plan. Please provide 1st version of a global map (merged version based on 3 different methods).
- HB: I will organize how to go on.
- SQ: When comparisons with global products start?

	• MS: We can send intermediate results to regional partners.
	• SQ: L-band is the band that matters!
	• FMS: Send subsets of global map based on L-band to regional partners. Share merged global map directly with regional partners!
	• MS: L-band based and Cubist based global map should be sufficient.
	• FMS: Yes. Agree.
	• CS: Please involve me in any telecom/meeting with regional partners.
	• HB: O.K.
	• SQ: Do the exercise where the training data have been acquired.
	• HB: Do this in the next 2 weeks and then let us talk and decide how to go on.
	• SQ: CESBIO should do much finer AGB scaling (smaller bins).
	• CS: Document issues you have with ground data/in-situ data. Question to DS: May you please talk to the regional partners and show them what is available for them from the GEO-WIKI?
	• DS: I will have a look and come back to you.
	• AH: We did stratification by forest type. Don't know if it makes sense to do it by land cover.
	• SQ: What does this mean for the ATBD?
	• CS: Next couple of weeks may bring valuable information.
	• SQ: ATBD – I can tell a story how things evolved or just report the final algorithms.
	• FMS: Report and reflect findings in the final version of the ATBD. Make it like a cook-book telling how to do it the correct way.
	• SQ: Work on ATBD V2 and improve?
	• FMS: O.K.
Conclusion	• 23.5./24.5. Toulouse/France – PM5 meeting
	• 11.09. – 13.09.17 – 3rd User Workshop FAO, Rom
	• WP 3000 – ATBD update / final version until end of project
	• WP 5000 – until Easter: look into Bias problem, address the problem, improve the methods, find a possible solution for each regional site
	• WP 5000 – comparison with global map (L-band map + Cubist map)
	• WP 5000 – regional mappers meeting before Easter

Action	Responsibility	Deadline	Changes to Deliverables / Timeline
1-2 pages to ESA for the necessary developments until End of April 2017 (WP 5000)	Regional Partners, Uni Jena (check and delivery)	End of February 17	

Task 3: WP 3000 Product Specifications and Algorithm Design (skiped)

WP 4000 System Development / Prototyping

Issues & Discussion	1. *Oliver Cartus – System Requirements, System Specification and Qualification Review* • See presentation • Presented the SRD / SSD / QR • WP 4000 – with acceptance of the QRR will be closed		
Conclusion	QRR accepted – WP 4000 closed		
Action	*Responsibility*	*Deadline*	*Changes to Deliverables / Timeline*
no further action - finalized			

Task 4: WP 5000 Regional Biomass Estimation I

Task5: WP 5000 Regional Biomass Estimation II

Issues & Discussion	
	2. *<u>Henrik Persson – Sweden</u>* • See presentation • Change mapping: pixel change vs. NFI change at national level • Radar change detection / 3 different models • Round Robin "light" – Poland (from SLU) • BIOMASAR radar algorithm requires stack of data • Landsat shared with Poland • Prel. Evaluated without success using kNN • Correlation to AGB seems to be low • RR-Sweden – (from IGIK) **3.** *<u>Agatha Hoscilo – Poland</u>* • See presentation • Epoch 2, 2015 • ALOS-2, multi-temporal Sentinel data, Forest Inventory data • Change mapping: • **FMS: look into the improvement to the 2010/2005 produced maps and afterwards to the 2015 epoch** **4.** *<u>Krystof Sterenzak: using Airborne Laser data to detect the forest structure</u>* • See presentation • Using species map to find out species/height • Which characteristics are important, thresholds, minimum area, variables, stand characteristics – for discussions • TLT: would like to have – tree no. density

5. *Sandra Lohberger – Kalimantan*

- See presentation
- PALSAR mosaic for 2015 – mixture between dry seasonal and wet seasonal data – using or trying to get a 2016 mosaic
- Sentinel-1 – good source – full coverage
- Change approach: pixel based inappropriate (noisy)
- Calculation of RMSE for each interval
- Possible minimum and maximum AGB estimate for each epoch
- Calculation of change / no change
- Should RSS add the probability?
- Change map – has a lot of single pixels – minimum mapping unit would be preferable (e.g. 200m x 200m)
- FMS – RR would be good to have one approach together with Mexico, South Africa, Poland and Sweden (e.g.)

6. *Alexandre Bouvet – South Africa*

- See presentation
- Method: preprocessing – inversion – uncertainty assessment
- For 2015: Sentinel-1 – yet not many results
- Not a lot of differences between the 3 ALOS datasets
- In-situ 2015/16: 56 1-ha plots in savanna, plantations, dense forests
- Uncertainties: precision is linked to data – errors in measurements
- Accuracy: linked to the methods
- 95% highest Posterior Density Interval / dB=0.95
- CS: need to clarify!
- Change – 3 approaches: difference between AGB – large errors
- Detect change (disturbance or regrowth?)

7. *Pedro Rodriguez-Veiga – Mexico*

- See presentation
- Data for 2015 – Sentinel-1 – statistical analysis, same for Sentinel-2
- Change methods:
- Uncertainty characterization
- Independent validation
- Based on threshold
- Percentage of change between both periods
- Little change between both
- How to validate this? Have high uncertainties
- Round Robin: Run MaxEnt using different sets of data – only using ALOS PALSAR or + Landsat + SRTM

Conclusion

Action	Responsibility	Deadline	Changes to Deliverables / Timeline
FMS: improvement of the 2010/2005 produced maps, afterwards developing the 2015 epoch	Regional Partners	Eastern 2017	

Task 6: WP 7000 Validation

Issues & Discussion	**8. _Danae Rozendaal – Validation of Global Biomass Map and ecological applications_**
	• See presentation
	• 25% of reference database for independent assessment of bias and accuracy, per biomass class, per region
	• Use 50% of available GLAS height biomass, cover more areas (tropics)
	• Validation of 2<u>nd</u> version – working plan
	• Using remaining 25% of reference database for independent validation
	• Analysis of representativeness of reference data for accuracy assessment
	• Comparison with other maps
	• Providing accuracy information for biomass estimates depending on users and applications
	• Ground Database (01/17) - >115.000 forest plots, ~ 14 reference biomass maps;
	• FMS – what about Canada?
	• DR – will be filled with data from MPI (AE will provide)
	• CS – what about GeoWIKI?
	• MH – GeoWIKI does not give Biomass
Conclusion	

Action	Responsibility	Deadline	Changes to Deliverables / Timeline
MPI will provide ground data Canada to WUR	AE	asap	

Task 7: WP 6000 Global Biomass Estimation

Issues & Discussion	**9.** ***Maurizio Santoro – Global Mapping*** • See presentation • Towards merging: <u>detrending</u> • CUBIST: Remove the bias and apply the function to the retrieved GSV (trend correction) • BIOMASAR-L: detrending again regional statistics • <u>Weighting</u>: generate a global dataset, detrend if necessary, compute residuals for each sample • **10.** ***Nuno Carvalhais – From GSV to Biomass*** • See presentation Thursday (part of presentation from Wednesday) • Different GSV products with various information – how do they compare? • Implementation of GSV-AGB conversion into the ATBD
Conclusion	

Action	*Responsibility*	*Deadline*	*Changes to Deliverables / Timeline*
• Implementation of GSV-AGB conversion into the ATBD final version	NC / SQ	09/2017	

PM4 Review and Open Issues

Issues & Discussion	**11. _Frank Martin Seifert – Conclusions –_** • Very exciting period of project • 2nd layer of regional mapping • Closed to global approach • Validation • Link to user: Richard Lucas (Australia) – mangroves – low biomass • Ake Rosenqvist – good link to JAXA – related to data provision – • VTT activities on Mexico • Charles Paradzayi – good contact to Zimbabwe • Sergey Bartalev – well experiences from Russia • US-colleagues – missed / should send a form to come closer with the US colleagues • Round Robin light: a good learning exercise to try to understand with work in other areas • Have the opportunities to do this 1x1 tests • Want to see – Mexico – check, what is more suitable for you? • Learning curve – regional results – what has to be done now • Next 3 months – intensive months – looking, how the bias in the regional maps can be removed? • **Would like to have – short plan for the next 3 months what we are doing there** • Change detection – no doubt about that – several approaches – good to discuss and to produce - what can be done – discuss end of May at the PM5 • Global approach – more discussion about that end of May (PM5) • BIOMASS – ECV – from member states - when approaches approved, after financing approval – ITT (call) will come up (autumn 2017) • Round Robin: supersites / super-plot: longer term plots – 20-40 km radius – characteristic from ecosystem, boreal zone, temperate zone … • Come up with some ideas for supersites – Krzysztof Sterenczak will coordinate the ideas with the plot (volunteer coordinator)

PM4 Review and Open Issues

	• ECV Project: start now with thinking to have already some ground to work
	• ECV International groups, best algorithm of US and Japan + Europe, Round 1 time, Round 2nd time will come,
	• Will put much more budget (5 Mio for the next 4 years)
	• Potential ESV biomass: clear reference with GlobBiomass
	• If something not working perfectly - but inputs for further activities;
	• IIASA/Dmitry - will use it in the validation – need to start collecting in-situ data relating forest parameters
	• We have to move as well in this direction
	• Global approach – highlight –
	• we are in a good shape related in the project itself
	• milestones closed
	• invoicing – possible
	• ATBD – remember, it is the 2nd version, not a final
	• ATBD – final version needs to show: need to move from GSV to Biomass (MPI) – should be a part of new version – respect the time frame!
	• ATBD - applicable document with respect to the ECV project
Conclusion	

Action	Responsibility	Deadline	Changes to Deliverables / Timeline
• Implementation of GSV-AGB conversion into the ATBD final version (WP 3000)	NC / AE/SQ	09/2017	
• 1-2 pages working plan to ESA for the necessary developments until End of April 2017 (WP 5000)	Regional Partners, Uni Jena (check and delivery)	02/2017	
• Development of ideas for a Round Robin supersite – coordination Krzysztof Sterenczak	All Partners, Regional Partners, FRI	asap	

Evelin Maleyka

(GlobBiomass Project Management)