Università di Roma Tor Vergata

Living Planet Symposium 2016
9-13 May 2016
Prague, Czech Republic

CESBIO

Analysis of SMOS Products Obtained by V620 L2 Algorithm over Forested Land

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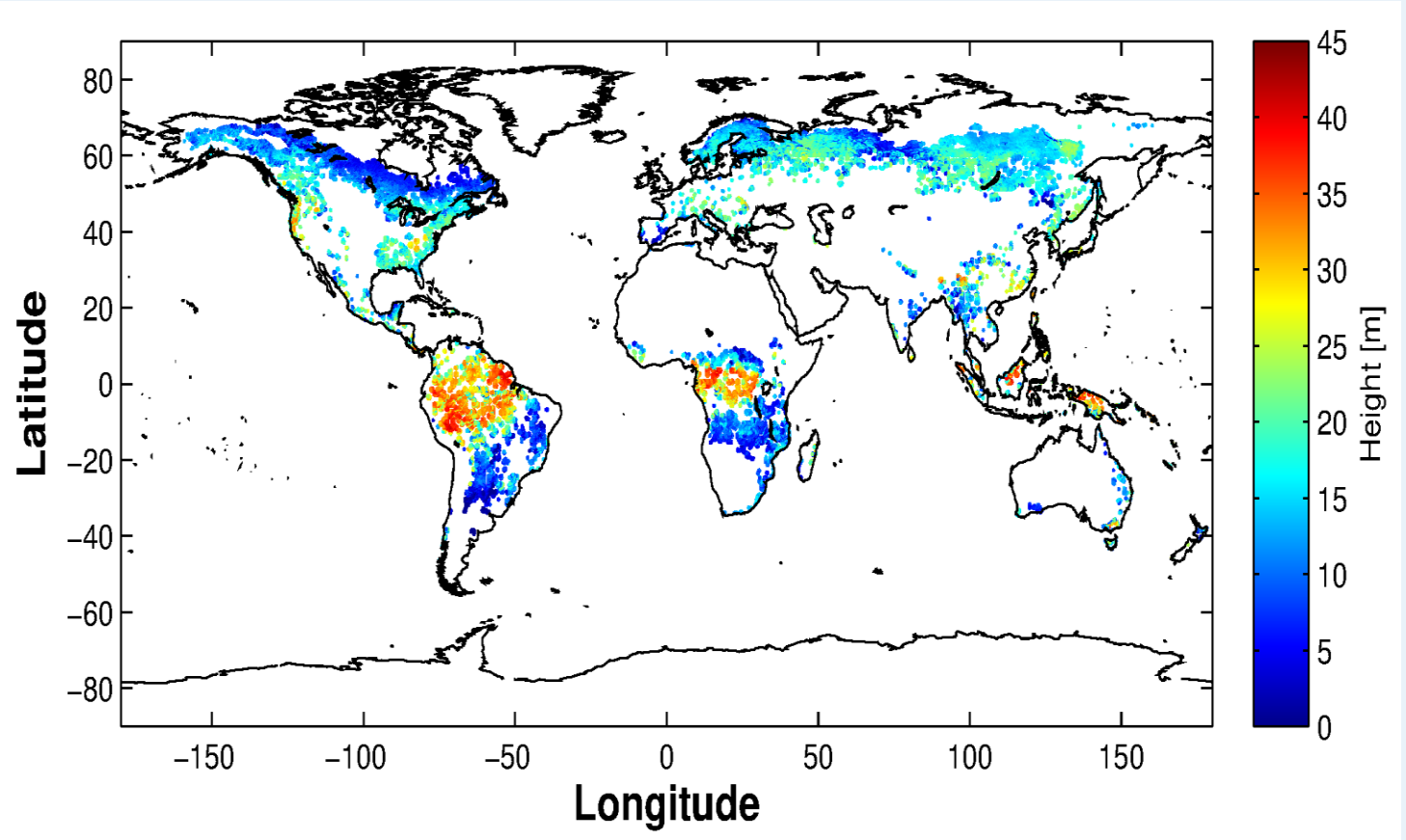
Poster ID: 1999 Land Application

QR Code:

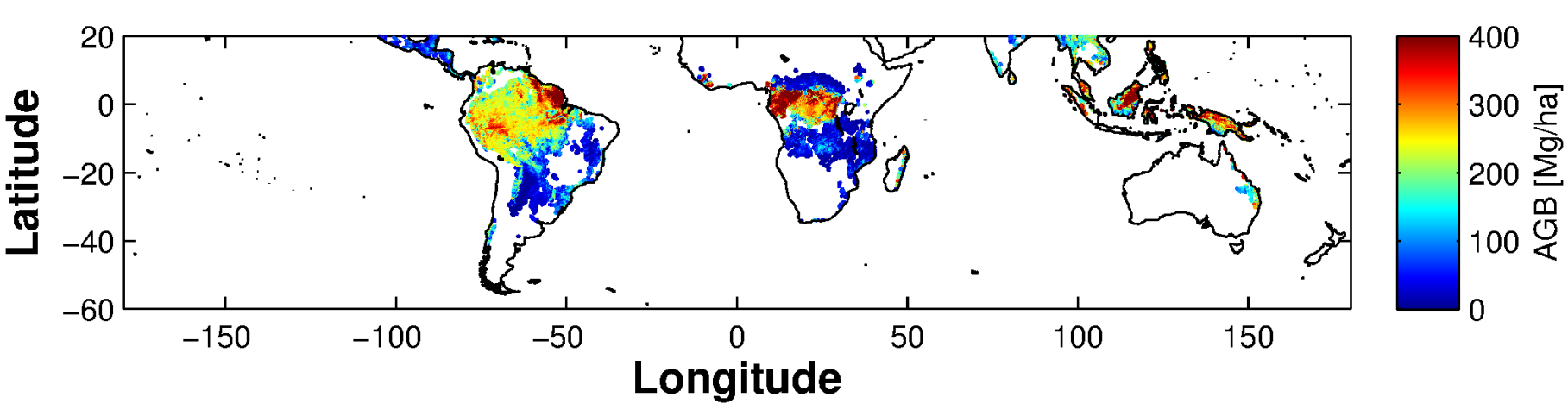
Comparison between optical thickness and Forest Height data base



Simard et al., (2009): Estimated by ICESat GLAS over lidar tracks, with MODIS ancillary data to fill cross track Lidar gaps. The extention is obtained using Random Forest Model.

The database also provides the RMSE computed comparing direct Lidar measurements and model predictions. We only selected data with RMSE < 5m.

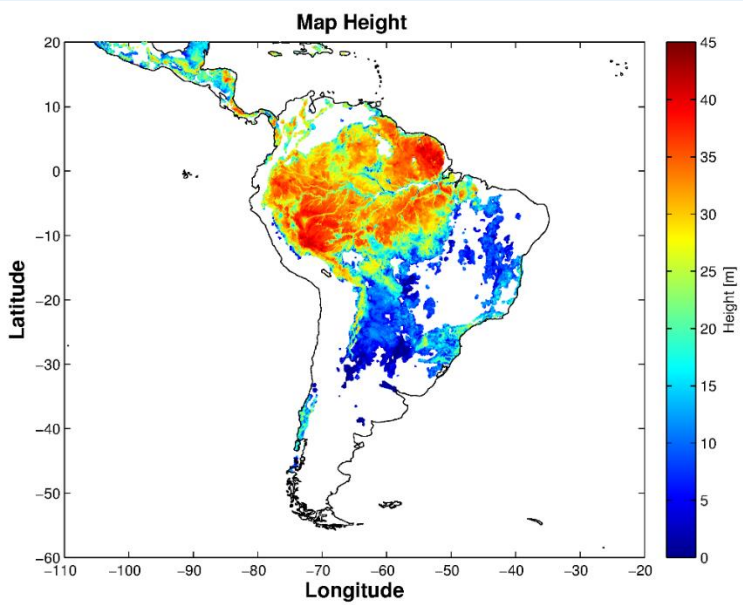
Comparison between optical thickness and a novel AGB database



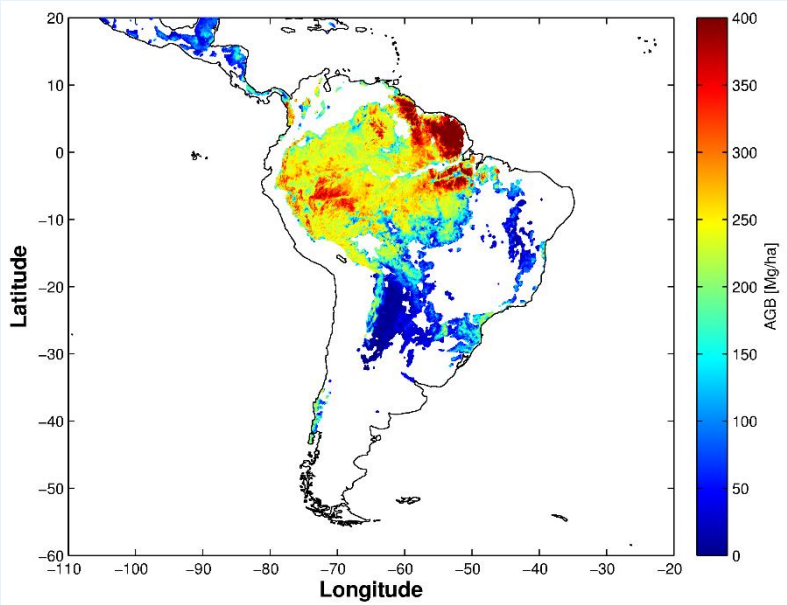
Pantropical AGB database by Avitabile et al. (2015): Fusion of previous AGB maps (Baccini et al., Saatchi et al.) reported an RMSE 15 - 21 % lower than that of the inputs maps and unbiased estimates.

Focus on South America (FFO > 70%):

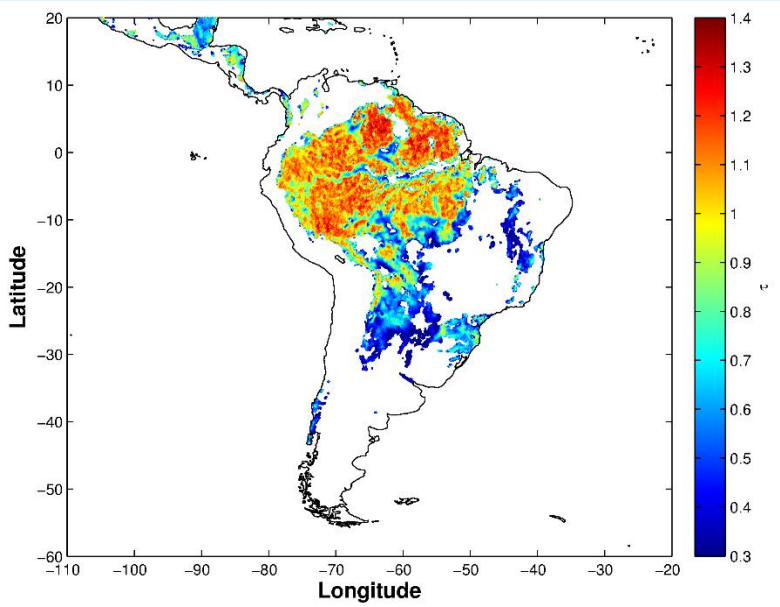
Height database (Simard)



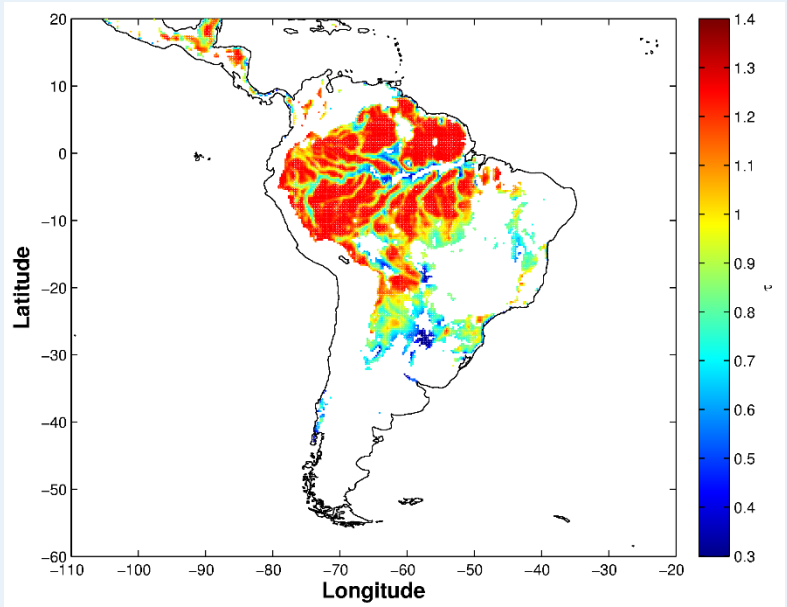
AGB database (Avitabile)



SMOS τ (July 2015)

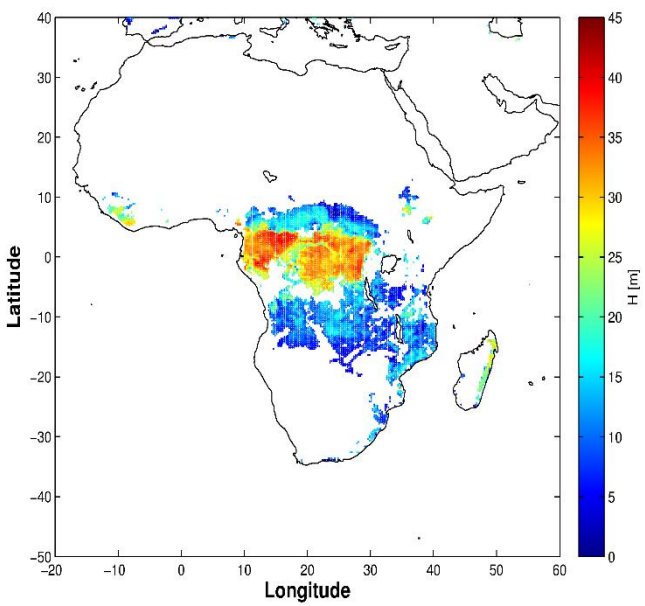


AMSR2 τ (July 2015)

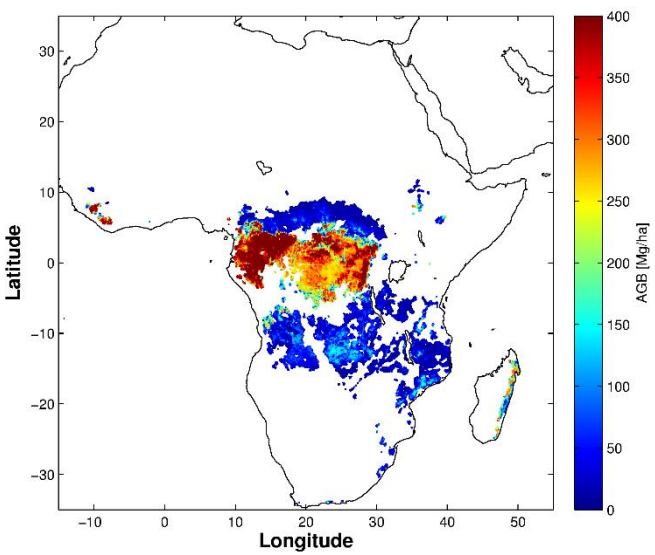


Focus on Africa (FFO > 70%):

Height database (Simard)



AGB database (Avitabile)



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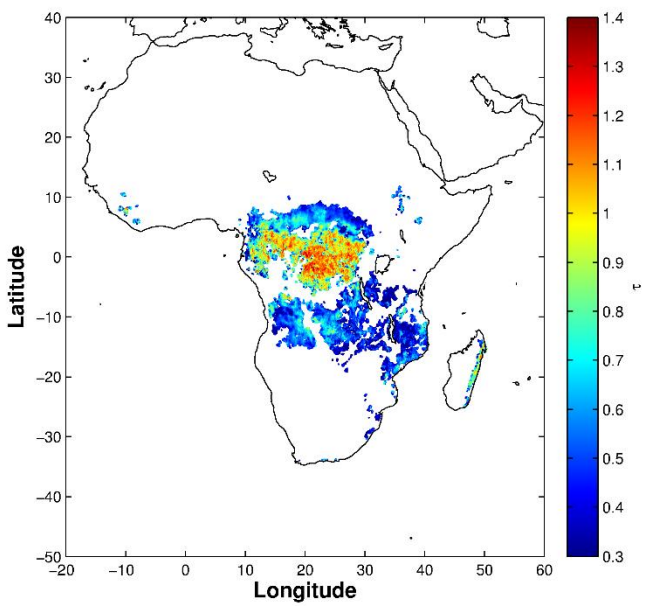

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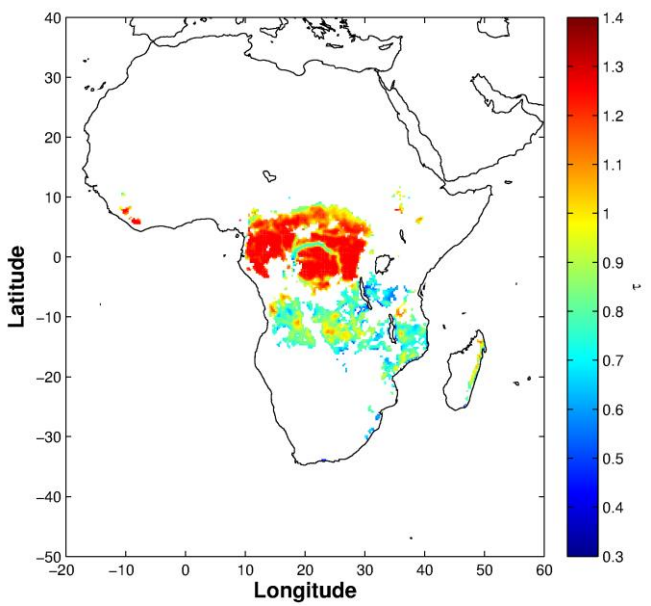


Comparison VOD (SMOS and AMSR2) - forest parameters (par.)

Test:

τ vs. par. correlation (R^2)

$\tau = b1\ par. + b2$

par. → Forest height by Simard et al. (2011)

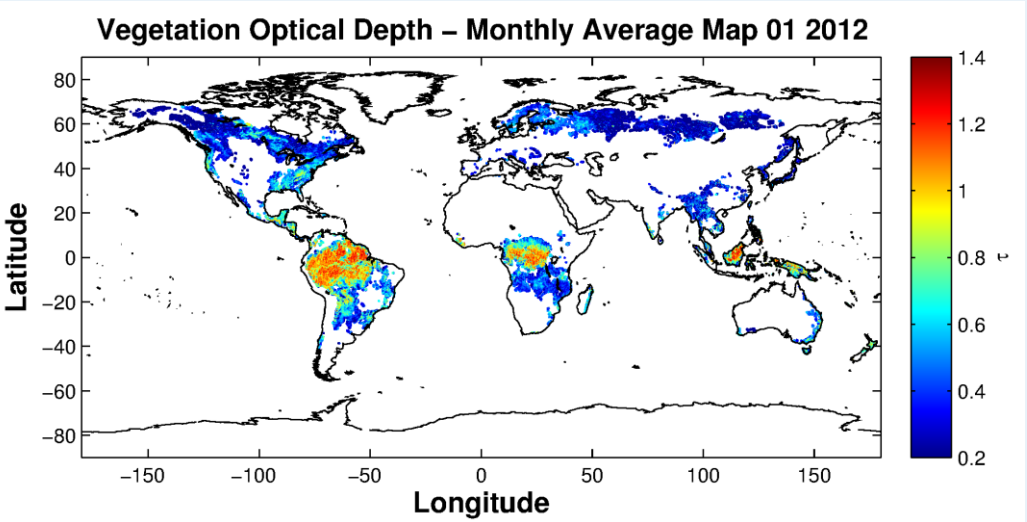
par. → AGB by Avitabile et al. (2015)

	R^2 SMOS	b1 SMOS	b2 SMOS	R^2 AMSR2	b1 AMSR2	b2 AMSR
Forest Height South America	0.72	0.022	0.31	0.55	0.016	0.63
Forest Height Africa	0.67	0.020	0.29	0.64	0.017	0.64
AGB ≤ 400 [Mg/ha] South America	0.79	0.002	0.42	0.58	0.001	0.77
AGB ≤ 400 [Mg/ha] Africa	0.78	0.002	0.45	0.67	0.001	0.83

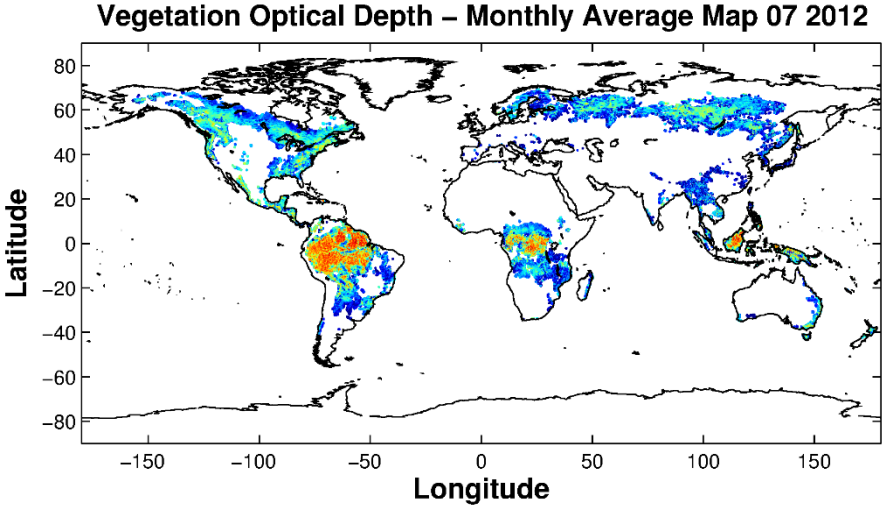
SMOS & AMSR2 Vegetation Optical Thickness time series (2012 – 2016)

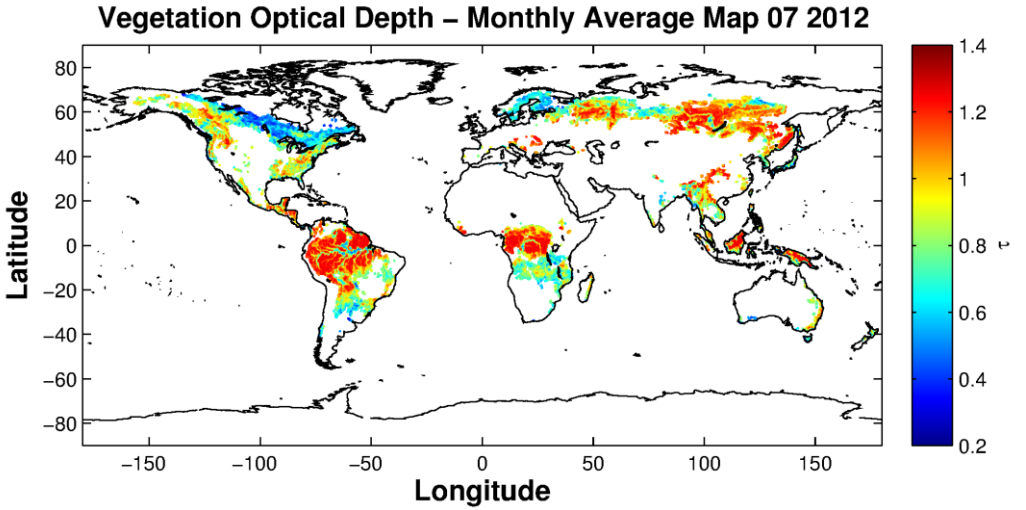
SMOS τ

AMSR2 τ



Date not available





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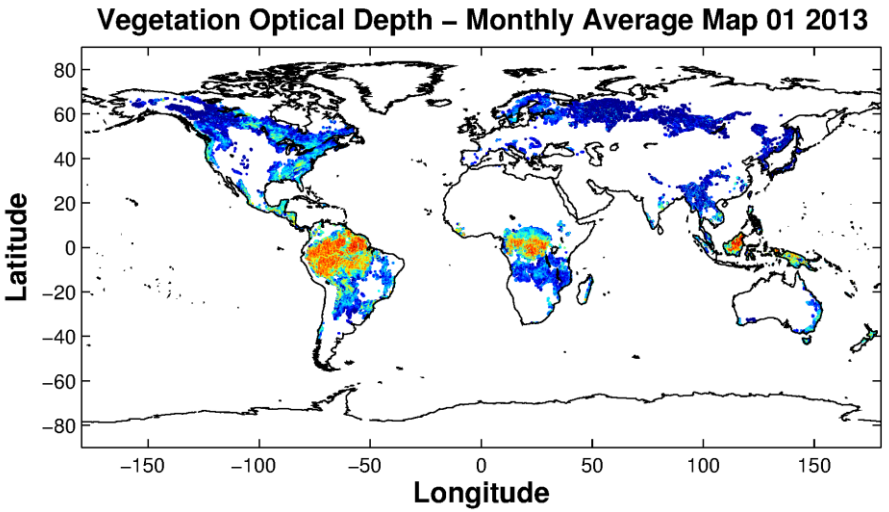
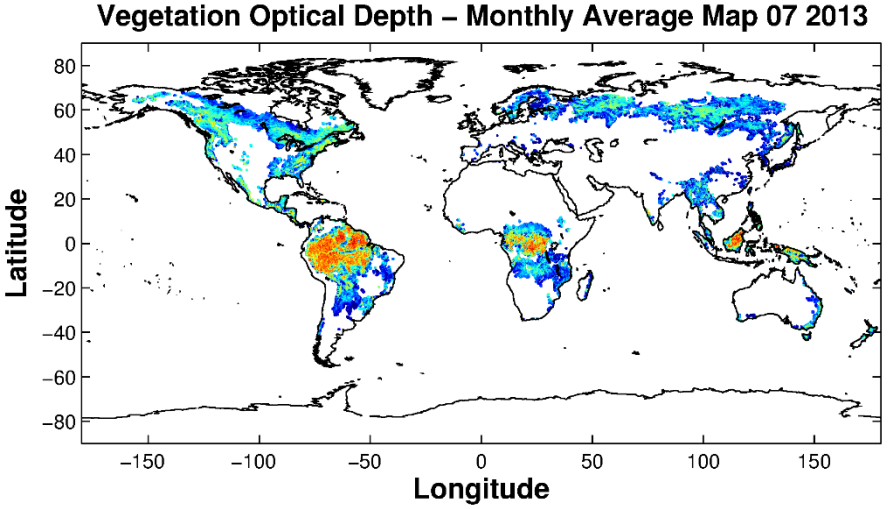
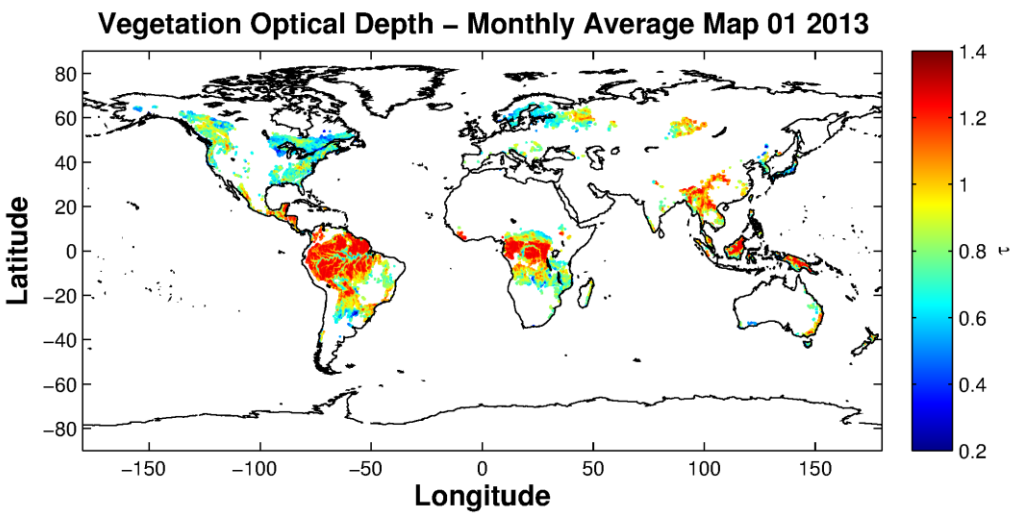
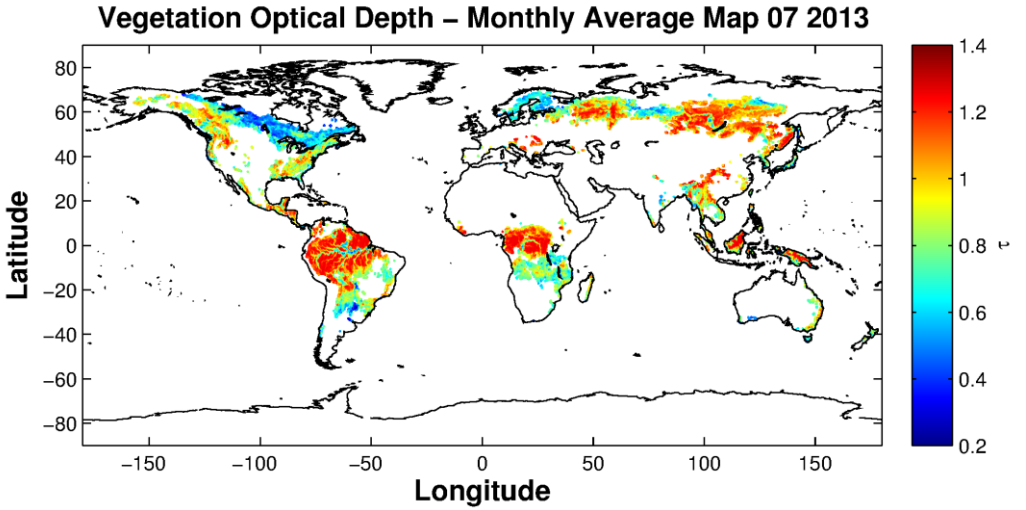




AMSR2 τ

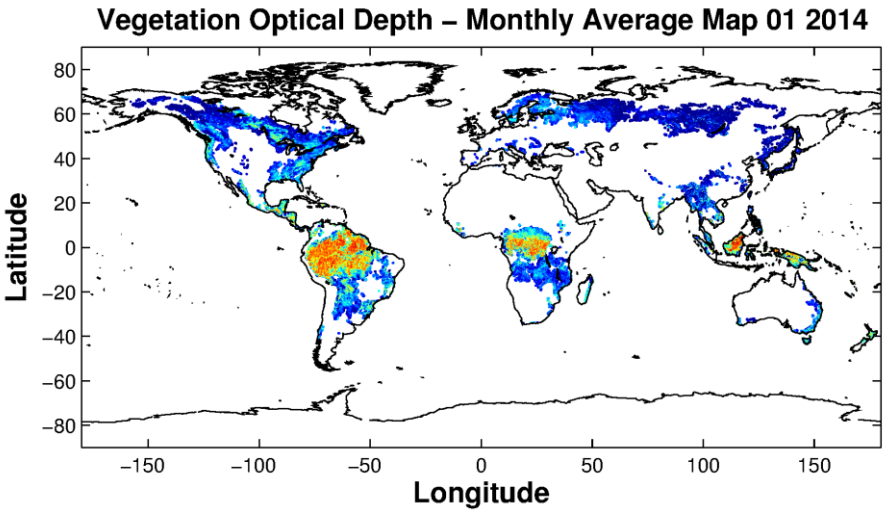


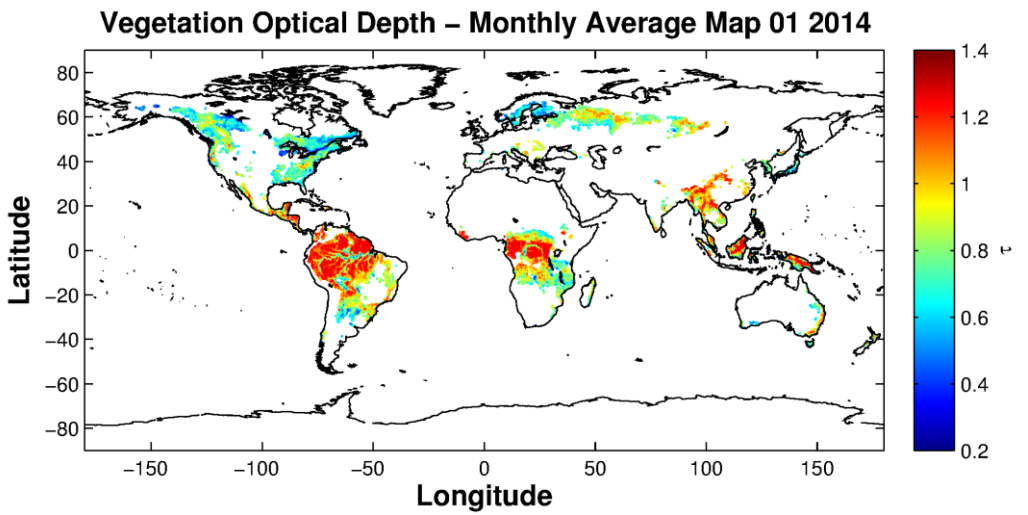


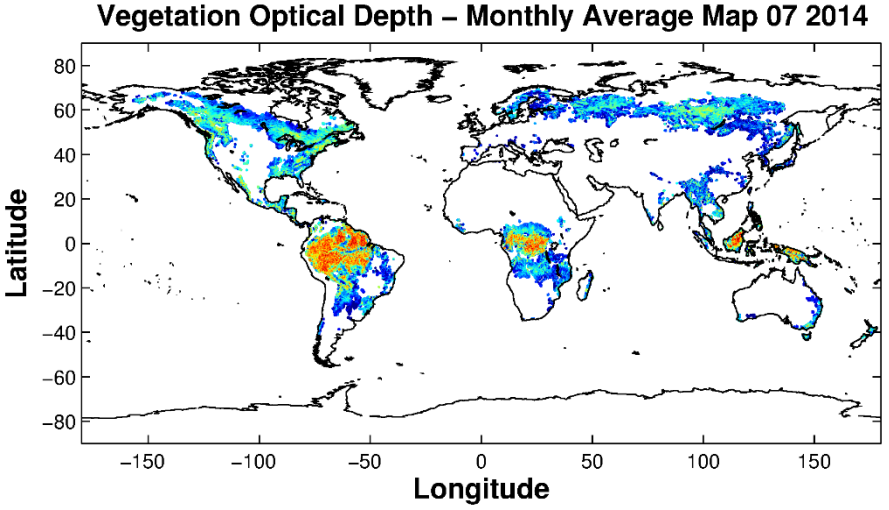
SMOS & AMSR2 Vegetation Optical Thickness time series (2012 – 2016)

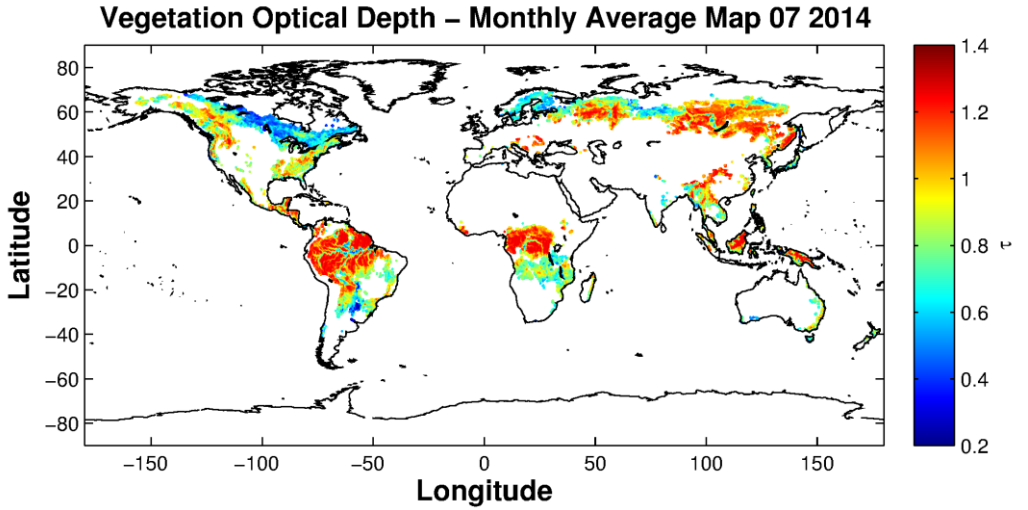
SMOS τ

AMSR2 τ





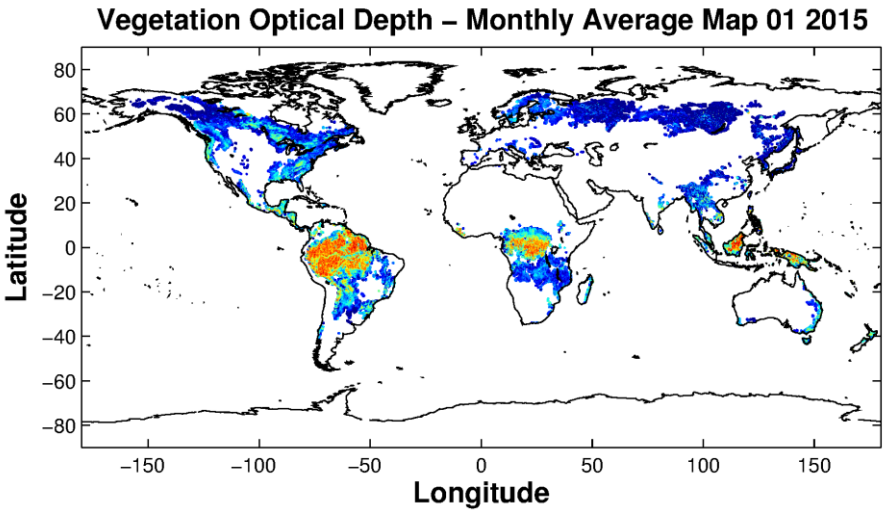


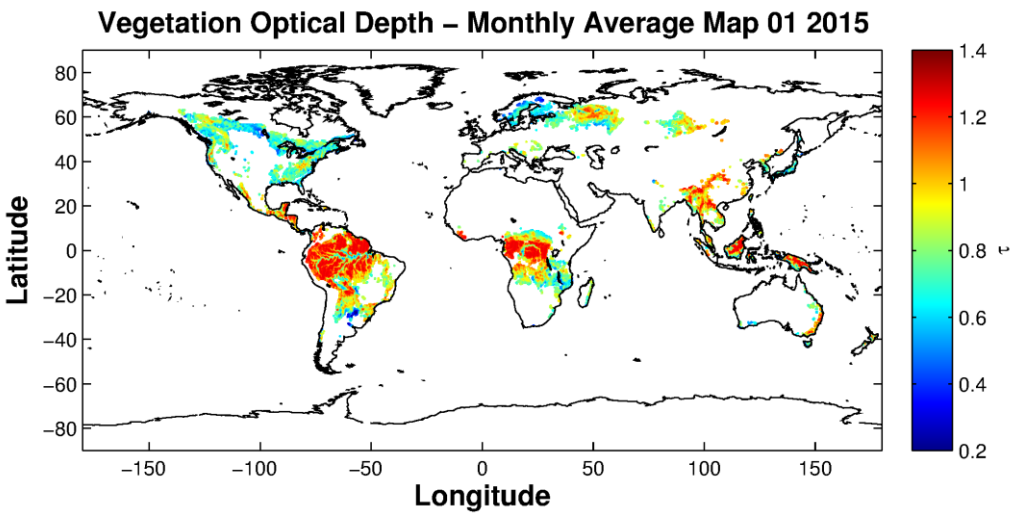


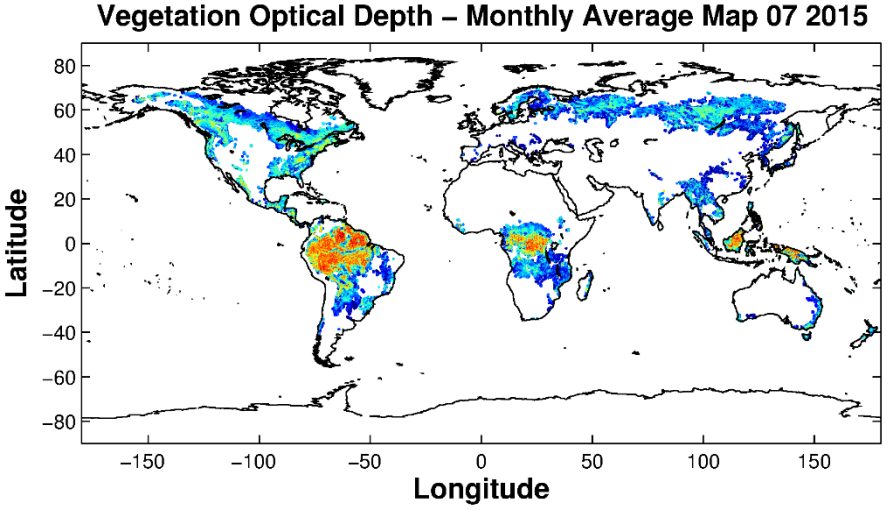
SMOS & AMSR2 Vegetation Optical Thickness time series (2012 – 2016)

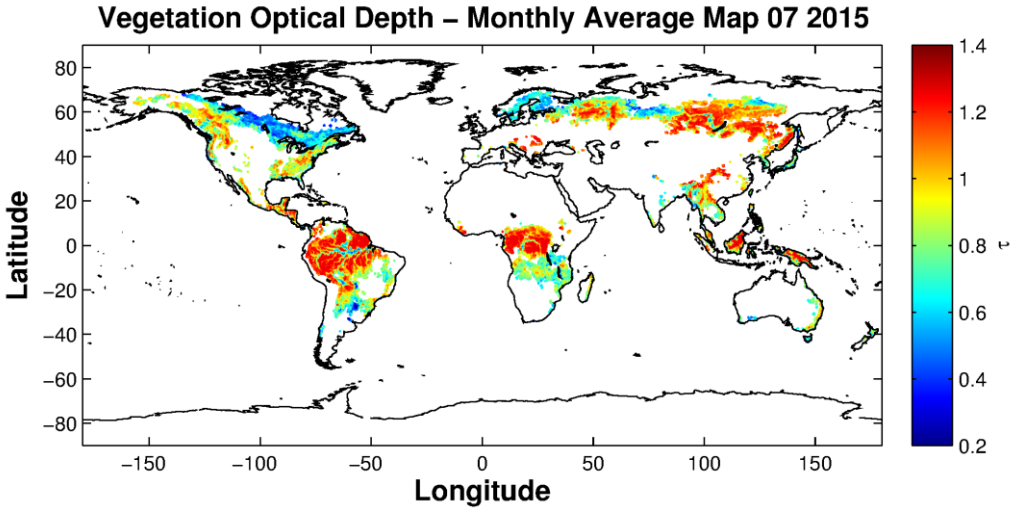
SMOS τ

AMSR2 τ



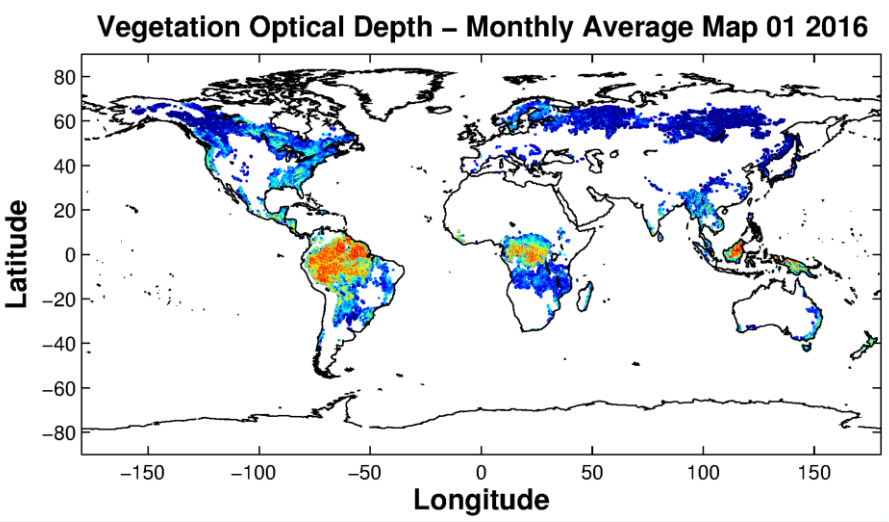




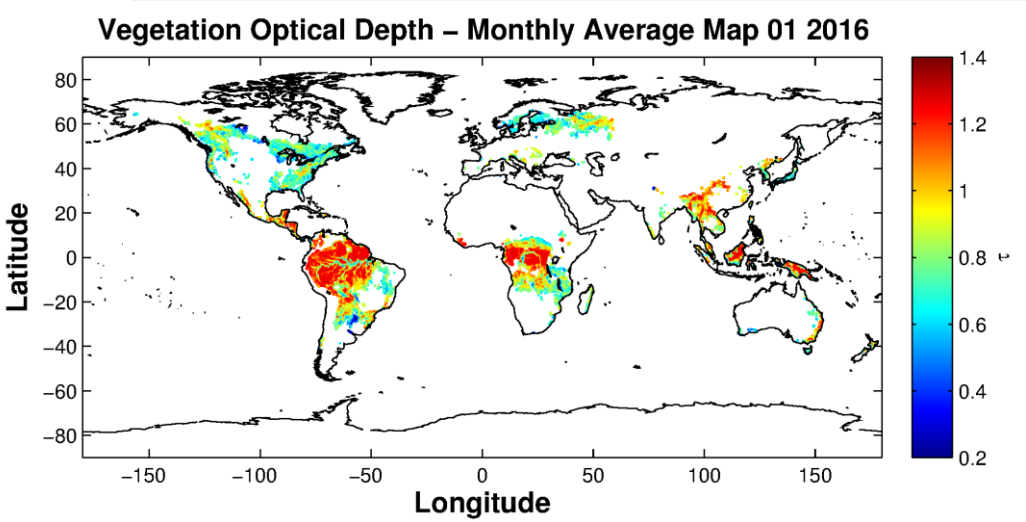


SMOS & AMSR2 Vegetation Optical Thickness time series (2012 – 2016)

SMOS τ



AMSR2 τ



Conclusions VOD Investigations

- ✓ Comparison between VOD and two databases including the novel AGB dataset
- ✓ linear regression analysis with different forest parameter registers an overall better performance of L band
- ✓ b2 coefficient represents the intercept of linear regression due to contribution of understory and short trees. C band shows higher b2 as expected
- ✓ SMOS VOD shows good temporal stability, particularly in tropical forests

Overall, SMOS optical depth can be a possible new contributor data source for estimating forest biomass (or wood volume) and its changes at global scale.

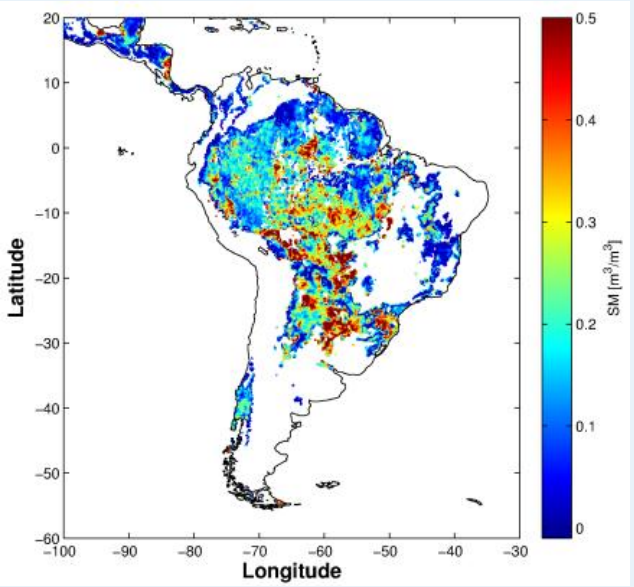
SM investigations

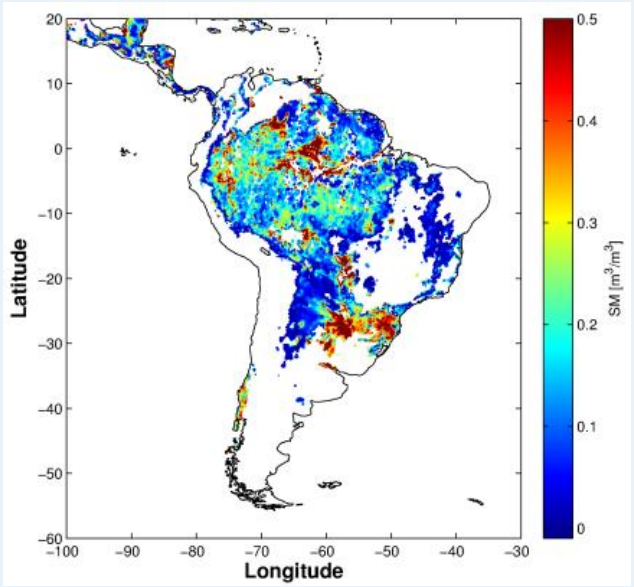
SM variation over forest VOD 2011 (FFO≥50%)

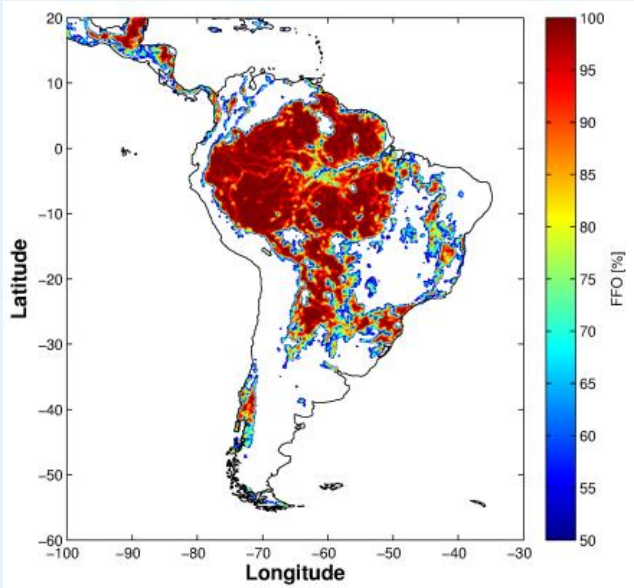
Feb. 2011

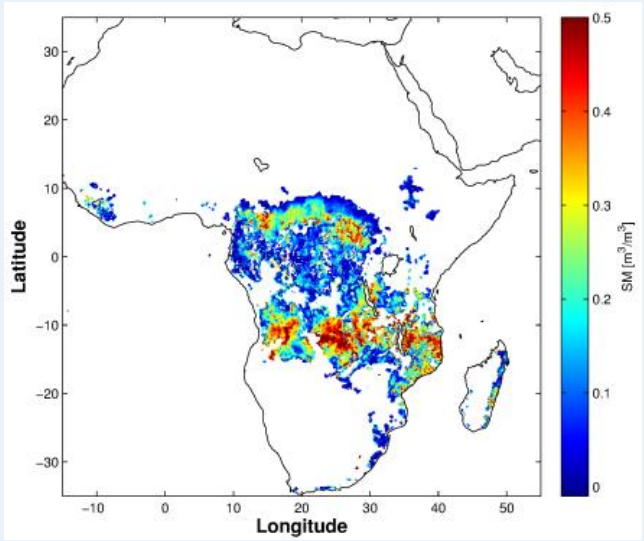
Jul. 2011

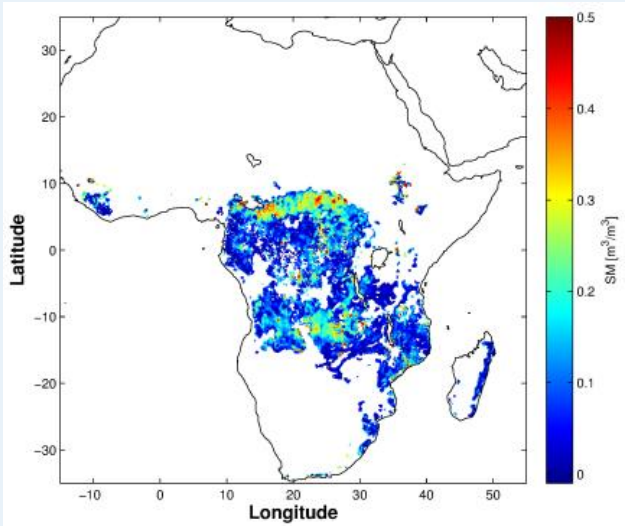
FFO

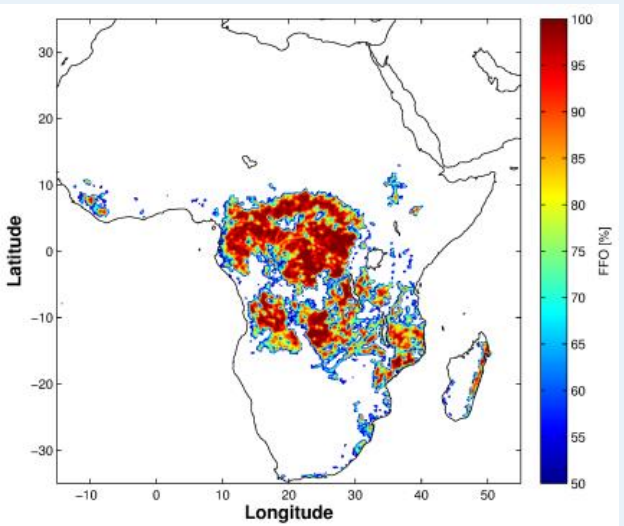












Comparison V620 SMOS SM – SCAN Network

May 1st, 2015, to October 7th, 2015

Site Name	Site ID	RMSE	R	Bias	N1	N2	FFO %
Cullman-NAHRC	2113	0.211755	0.281765	0.195482	148	102	70 - 80
Hytop	2054	0.166967	0.403432	0.159699	34	30	90-100
Sudduth Farms	2179	0.078949	0.575739	-0.03693	136	131	90-100
Wedowee	2175	0.166372	-0.03453	0.157998	75	43	80-90
Hubbard Brook	2069	0.103207	0.241573	0.073914	172	167	90-100
Mahantango Ck	2028	0.082144	0.297995	0.03707	164	125	70-80
Rock Springs Pa	2036	0.108139	0.563745	0.088511	165	157	80-90
Reynolds Homestead	2089	0.088506	0.597578	0.05583	154	140	90-100
Wabeno #1	2003	0.102579	0.047324	0.077505	176	174	90-100

N1: number of available samples with ground measurements

N2: number of valid retrievals after filtering

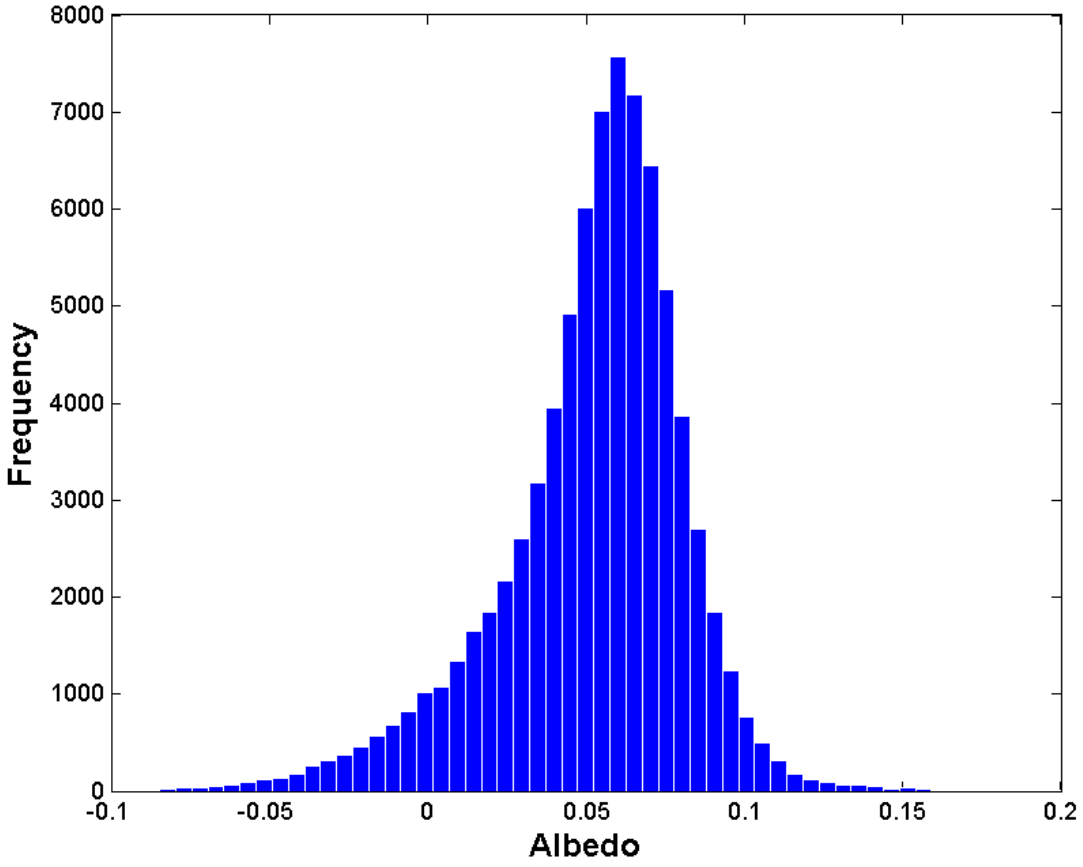
Conclusions SM Investigations

- SM maps show spatial and temporal variations. Some features agree with climatic considerations (but this cannot be a validation).

- Multitemporal comparisons with SCAN/SNOTEL network produce RMSE > ~ 0.10 m3/m3, but results were obtained with older prototype and spatial sampling of ground measurements was poor. (not shown in this presentation)

3 Parameter investigations Soil Moisture, Vegetation Optical Depth and Albedo

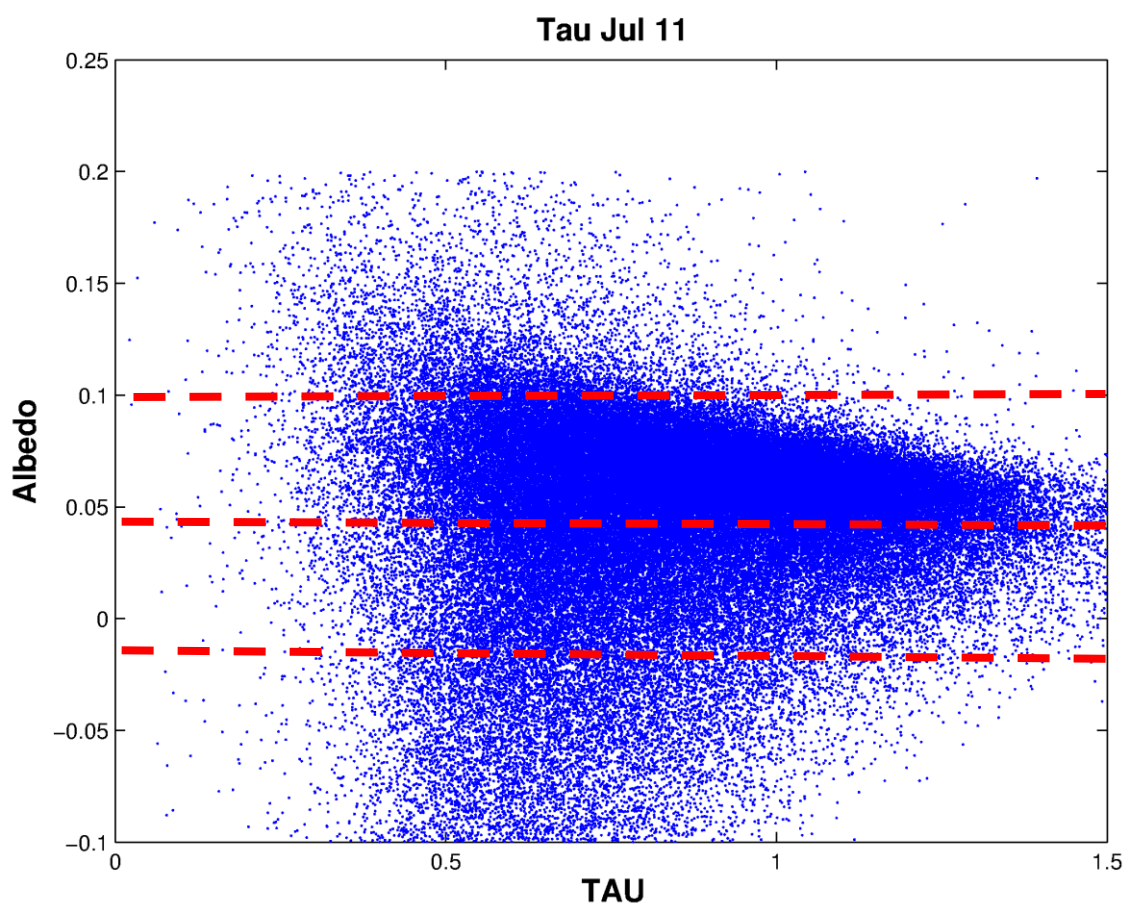
Global 3 Parameter: Albedo Retrieval Results



- ✓ Clear peak for ω slightly higher than 0.05
- ✓ Long tail towards lower values, due to previously mentioned problems (Boreal Emisphere)

Histogram of retrieved albedo with new 3P prototype for all forests. July 2011, ECOCLIMAP as data source. FFO>80%.

Global 3 Parameter: Albedo Retrieval Results



- ✓ scatterplot is triangle shaped
- ✓ For lower τ, lower influence of ω on TB: the retrieval is more difficult
- ✓ For τ values close to 0.5 wide dispersion of ω from negative values to about 0.15
- ✓ For higher τ values ω is in the range 0.05-0.06 (histogram peak).
- ✓ ω values retrieved with higher τ are more reliable.

Scatterplot of retrieved albedo vs. retrieved optical depth with new 3P prototype for all forests. July 2011, ECOCLIMAP as data source. FFO>80%.

Conclusions 3 Pararameters Retrieval

Simultaneous retrieval of SM, VOD, Albedo
using 8 day temporal intervals shows:

- ✓ Albedo shows high dispersion over low vegetation areas
- ✓ Albedo shows convergent behaviour over dense forest close to 0.06

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Thanks for the attention

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QR Code: