ALOS

K&C Initiative
An international science collaboration led by JAXA

K&C Phase 4 – Status Report: Forest Biomass in Papua New Guinea

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UNSW AUSTRALIA

Science Team meeting #24
Tokyo, Japan, January 29-31, 2018

Project outline and objectives

Project was intended as a follow-on from two previous studies in PNG which used a combination of airborne SAR and PALSAR to estimate land cover, biomass and GHG emissions.

The previous projects were conducted with and supported by various partners:

The Kokoda Track and Owen Stanley Ranges Remote Sensing Project

Dr M L Williams, Prof. A K Milne, Dr A L Mitchell, Dr I Tapley, Dr J Fox, Dr Cossey K Yosi, Mr James Sabi, Mr Malcolm Keako, Mr Joe Pokana, Mr Frederick Ohmana, DEWHA

The Milne Bay Remote Sensing Project

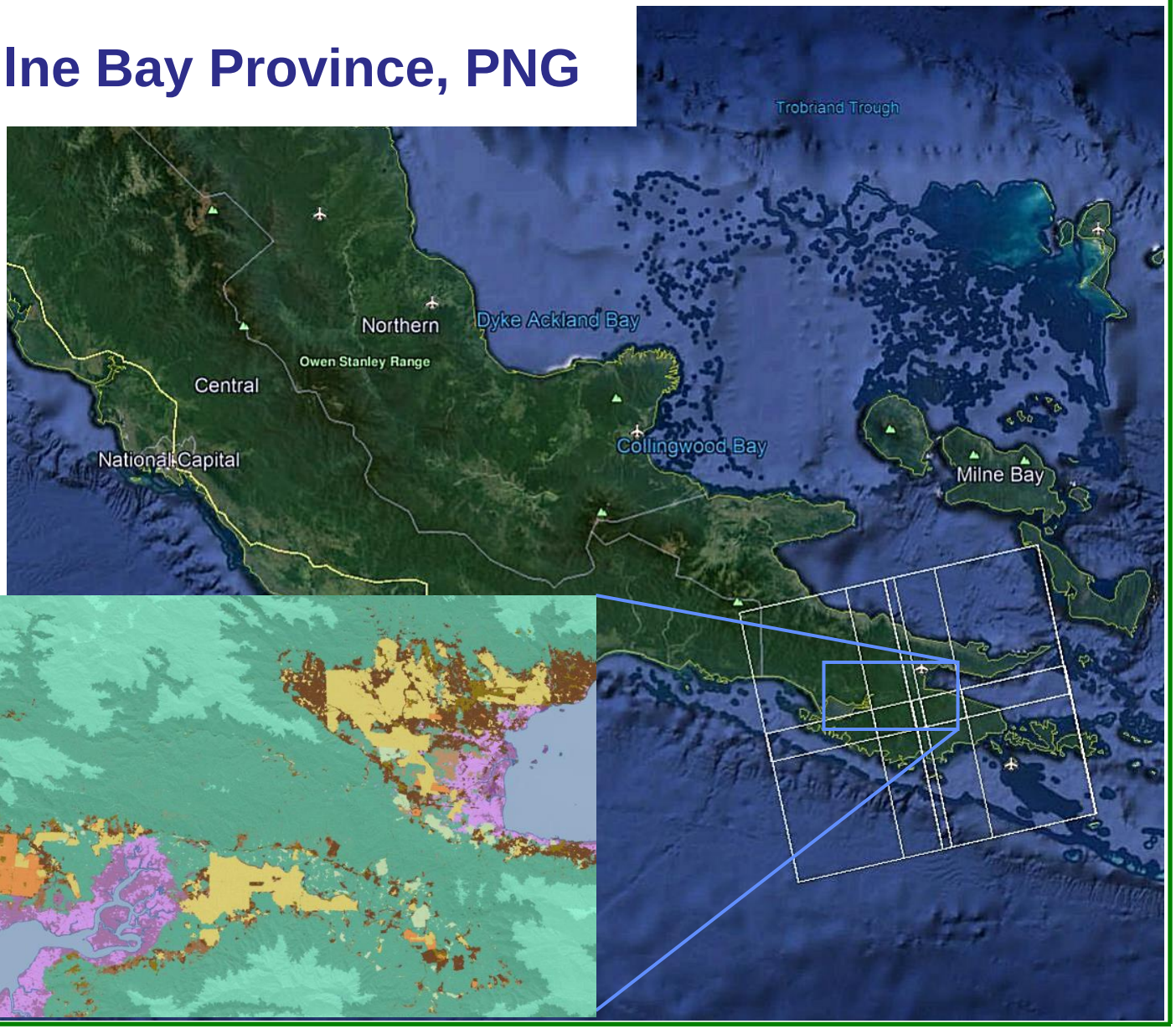
Dr Masamichi Haraguchi , Dr M L Williams, Prof. A K Milne, Dr A L Mitchell, Dr I Tapley, Mr James Sabi, PNG FA, KKC, JICA

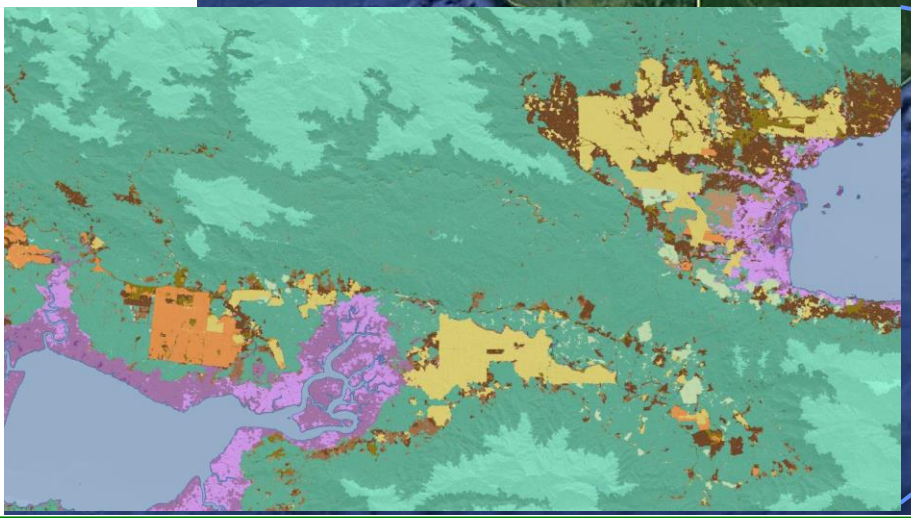
Kokoda
Australian Government
Papua New Guinea
DEPARTMENT OF ENVIRONMENT & CONSERVATION
THE UNIVERSITY OF MELBOURNE
THE UNIVERSITY OF NEW SOUTH WALES
HGC Horizon Geoscience Consulting
crc•si
JAXA
FUGRO
NASA
JICA ジャイカ

Area of Interest: Milne Bay Province, PNG

Milne Bay:

GeoSAR 2012 X- and P-band airborne InSAR
(5m imagery, 5m DEMs)
PALSAR 2011
(12.5m FBD)
LiDAR 2012
PALSAR 2 2014+



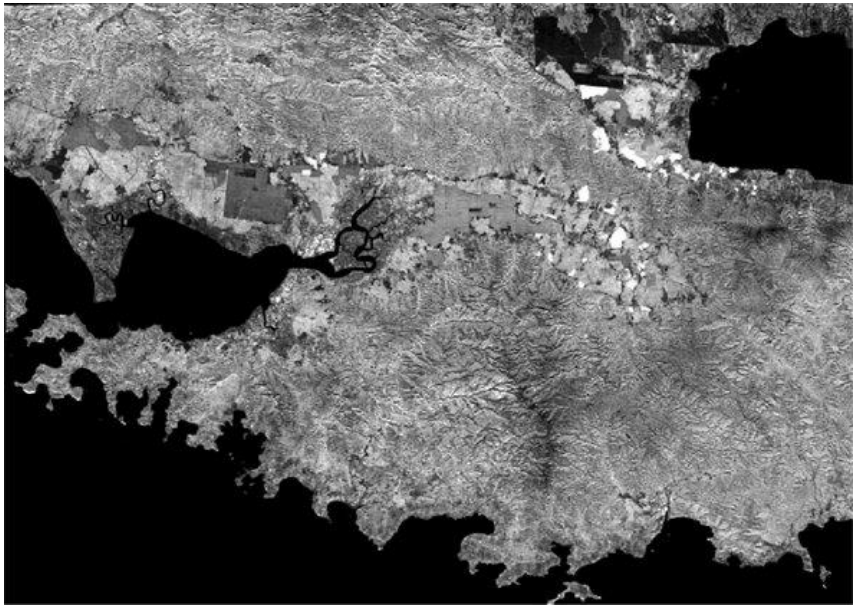


- Forest Other
- Grassland Bare Soil
- Lower Montane Forest (Secondary)
- Lowland Forest (Secondary)
- Mangrove (Other)
- Mangrove (Short)
- Mangrove (Tall)
- Mid Montane Forest (Secondary)
- Oil Palm Plantation (Mature)
- Oil Palm Plantation (Young)
- Scrub (Medium)
- Scrub (Short)
- Scrub (Tall)
- Swamp Forest
- Void
- Water
- Woodland

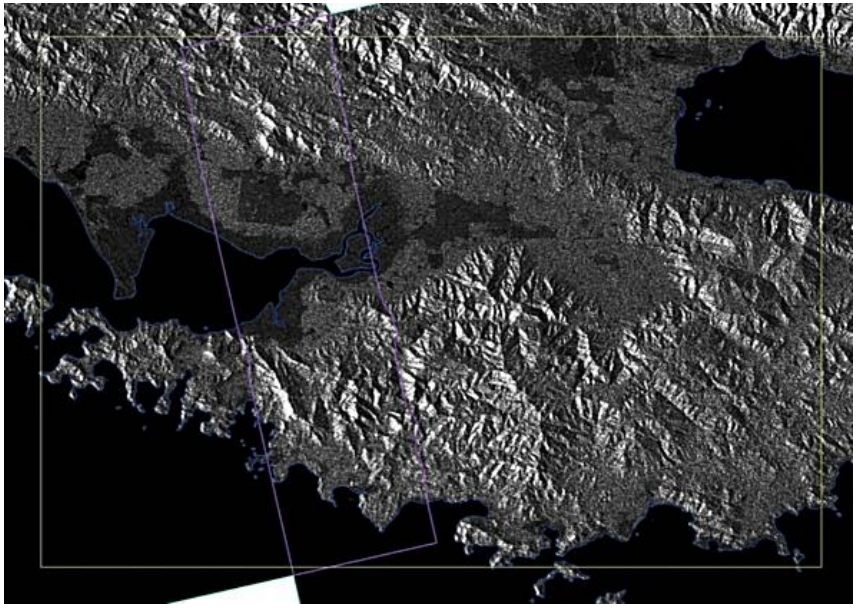
Project Objectives

Milne Bay
Estimate forest AGB using 2012 data
Determine the relationship between 2010 Lhv PALSAR 1 L1.1 FBD and AGB
Match the PALSAR 2 data over the AOI
Retrieve AGB estimates using PALSAR 2
Estimate AGB/Carbon change

Terrain-corrected GeoSAR 2012 X-band – P-band DEM height: surrogate veg. height



PALSAR 2010 Lhv Beta0



K&C 4 Objectives

The project would support K&C thematic drivers (**C**arbon cycle science, **C**limate Change, International **C**onventions, Environmental **C**onservation) by providing estimates of Carbon change and potentially establish a methodology for monitoring forest change.

Project Results

Estimate of forest AGB using 2012 data was achieved using the method described in

TROPICAL FOREST BIOMASS RECOVERY USING GEOSAR OBSERVATIONS

M L Williams[1], T Milne[2], I Tapley[3], J J Reis[1], M Sanford[1], B Kofman[1], S Hensley[4]

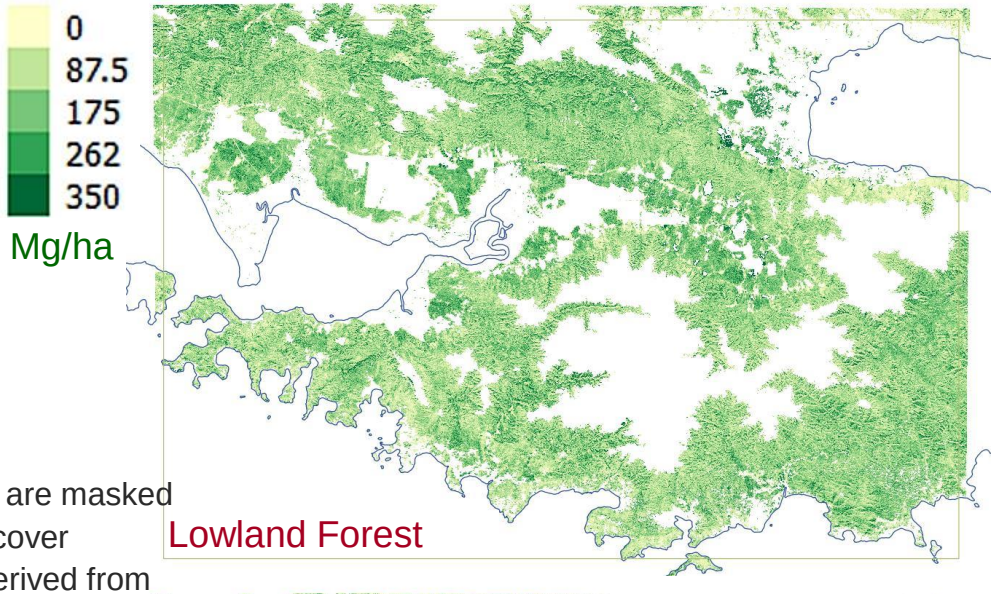
[1]Fugro-EarthData Inc., 7320 Executive Way, Frederick, MD 21704, USA.
[2] School of BEES, UNSW Sydney NSW 2052, Australia.
[3]Horizon Geoscience Consulting, Perth, WA, Australia
[4]Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Drive, Pasadena, CA 91109, USA.

2009, model $B = a \times h_{XP}^{n}$
Is functionally equivalent to
that used in **Tree height integrated into pantropical forest biomass estimates**

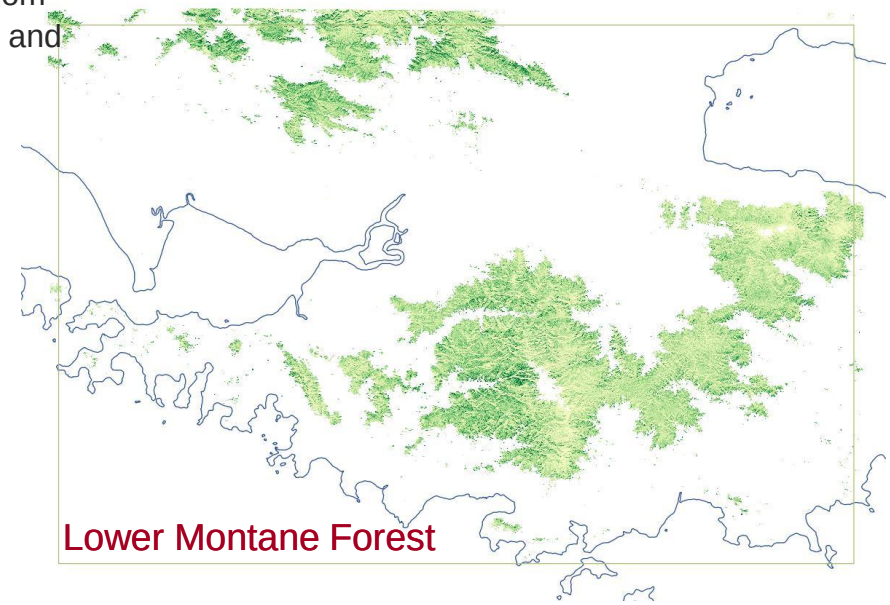
T. R. Feldpausch *et al.*,
Biogeosciences, 9, 3381–3403, 2012
www.biogeosciences.net/9/3381/2012/
doi:10.5194/bg-9-3381-2012

and AGB estimates are statistically consistent with those obtained using

T Neeff *et al.*, Tropical *Forest Biomass Measurement by Backscatter and DEM Information as Derived from Airborne SAR*, Proceedings of the International Geoscience and Remote Sensing Symposium, 2003.

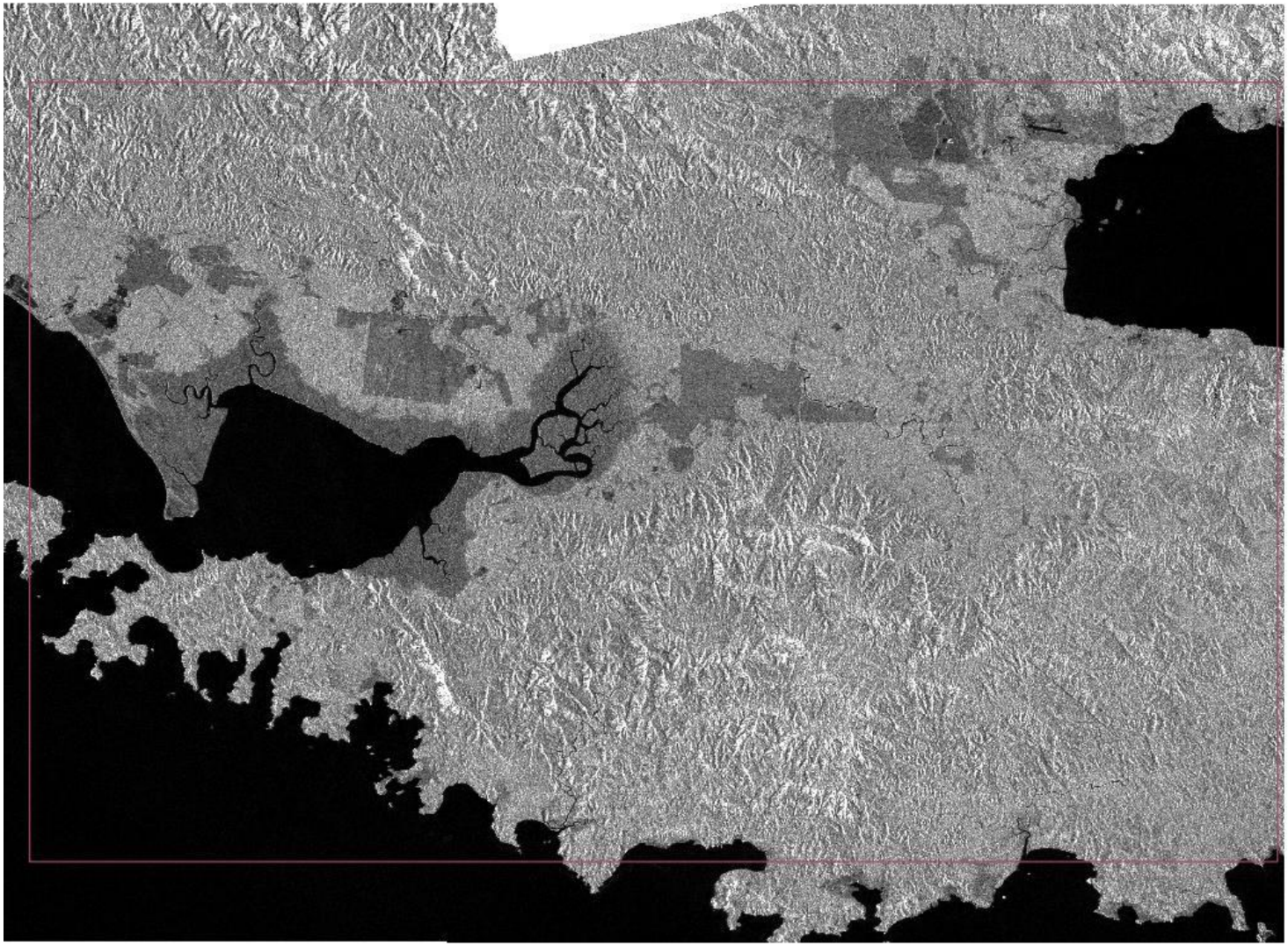


AGB estimates are masked using the land cover classification derived from 2012 GeoSAR P-Band and X-Band data.



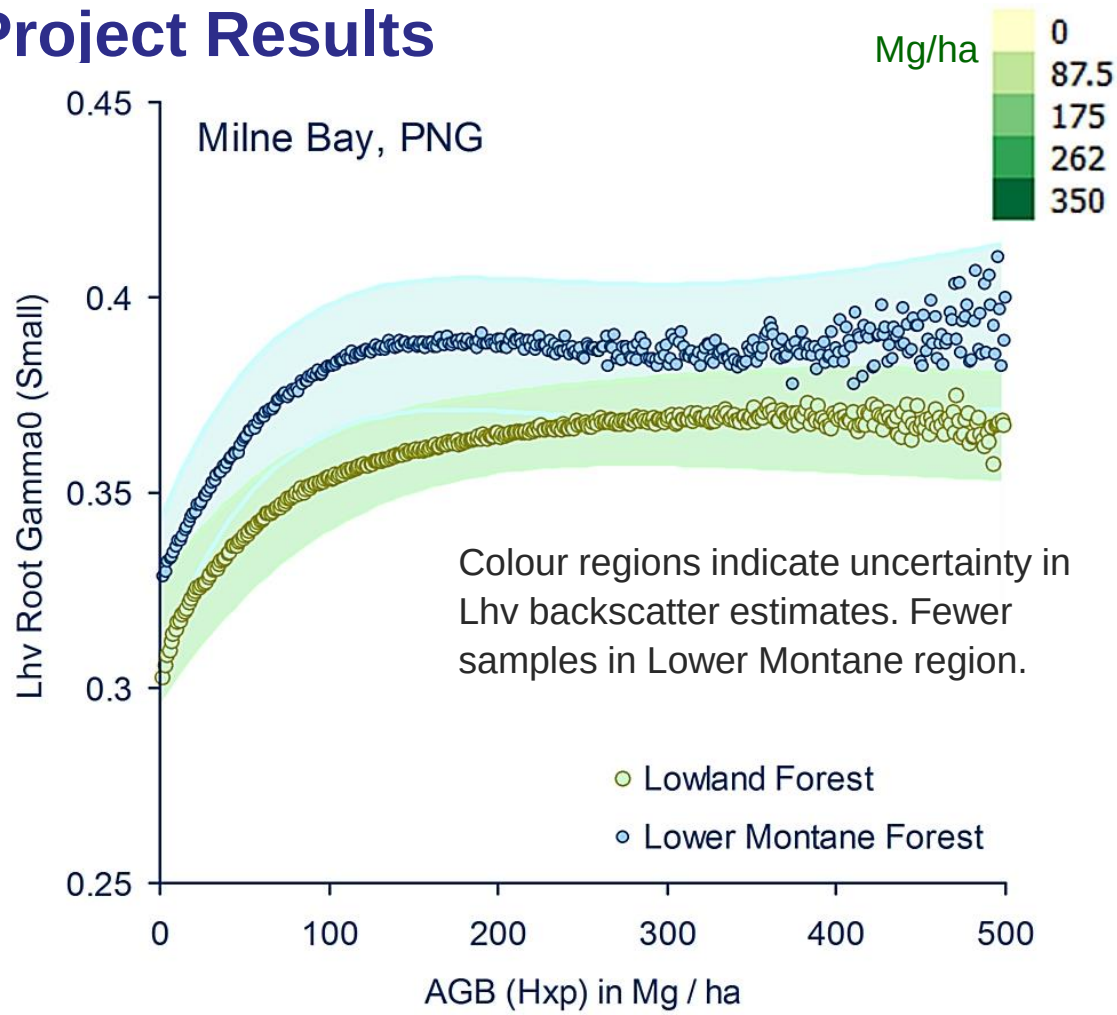
Project Results

PALSAR 1 Lhv root Gamma0 (D. Small calculation) was terrain-corrected and correlated against the AGB estimates from the GeoSAR *hXP* calculation using masks for Lowland Forest and Lower Montane Forest generated from the 2012 classification using the GeoSAR 5m data.



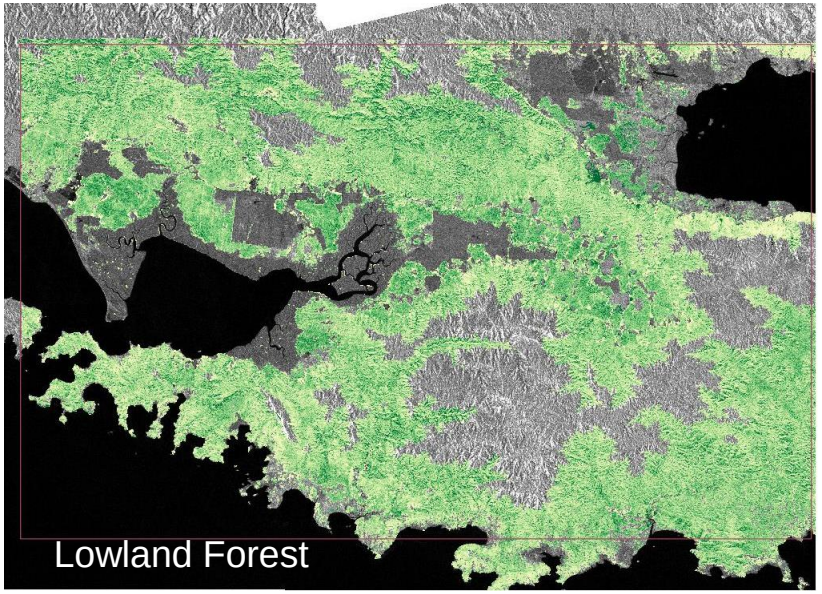
Orthorectified PALSAR L1.1 FBD: Lhv Gamma0 calculated from Beta0 using method of David Small and following residual terrain correction against range incidence angle. Effects of slope/layover still evident in steeper areas.

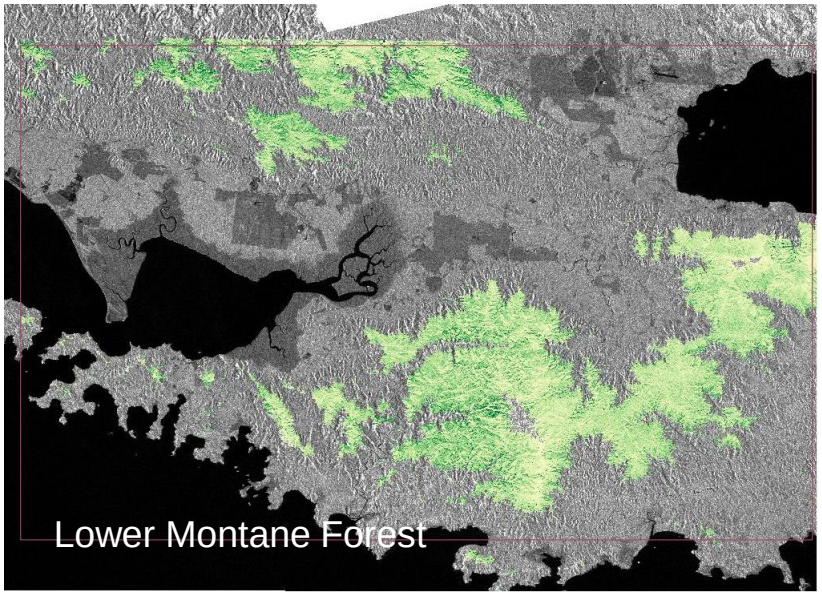
Project Results



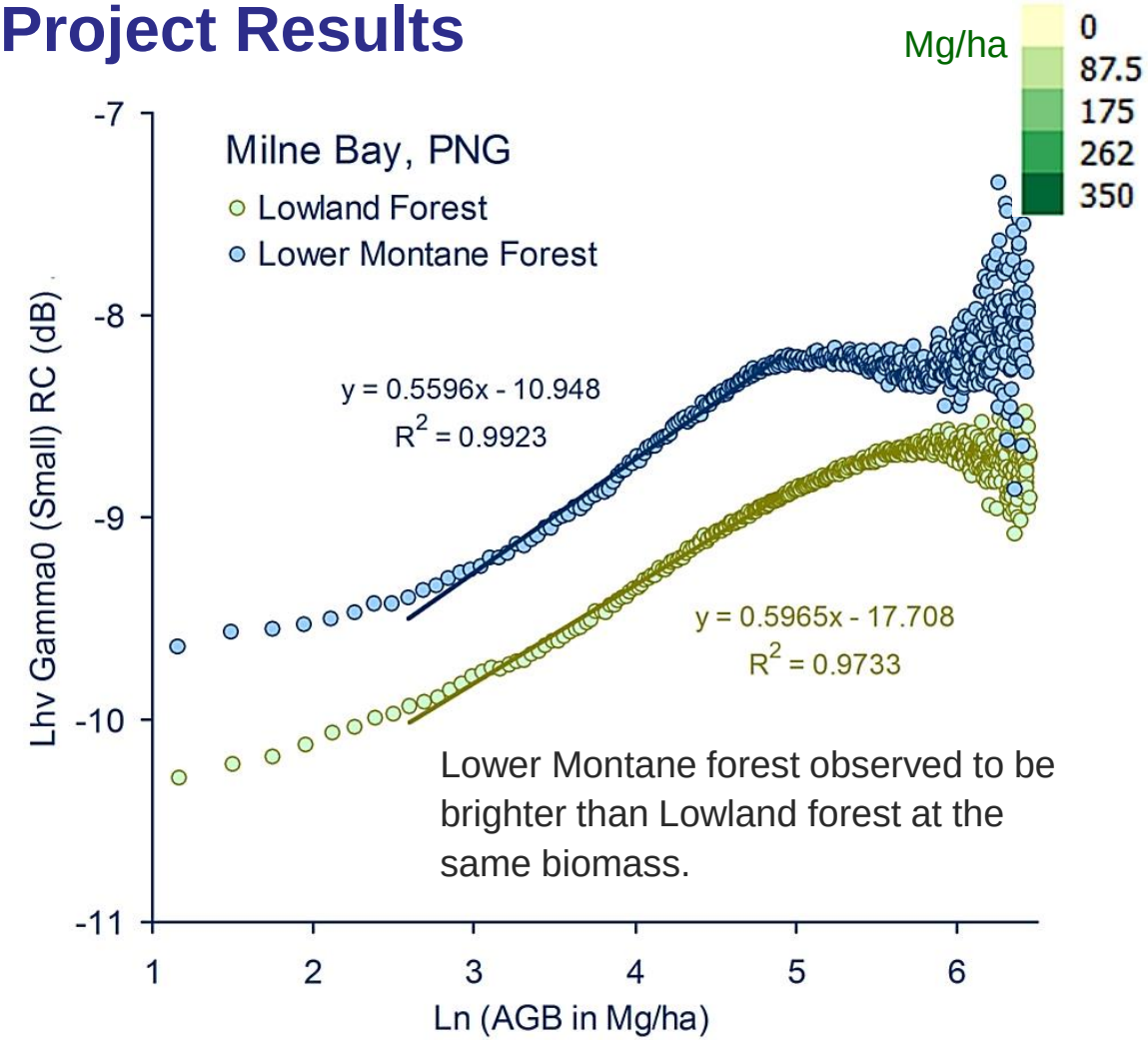
Colour regions indicate uncertainty in Lhv backscatter estimates. Fewer samples in Lower Montane region.

Dependence of Lhv Root Gamma0 on AGB estimated using GeoSAR X-band – Pband DEM height difference by forest class.



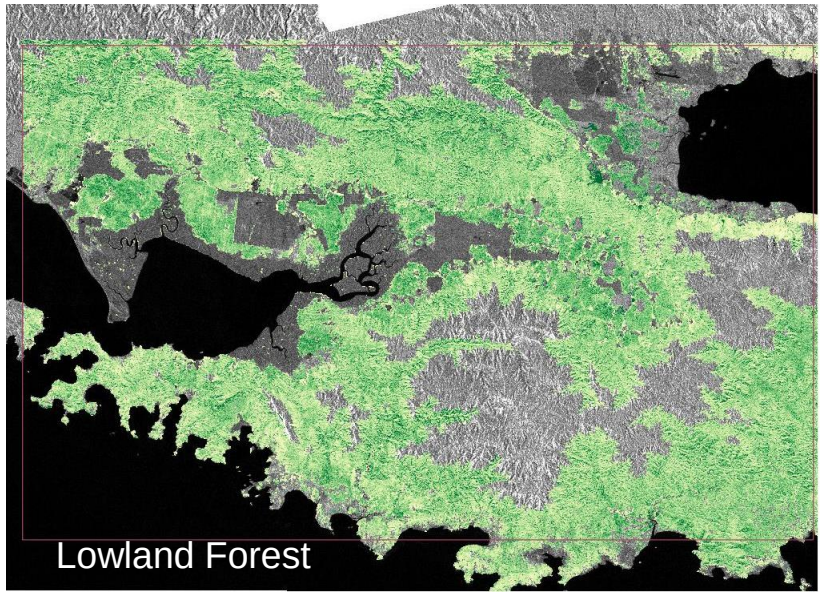


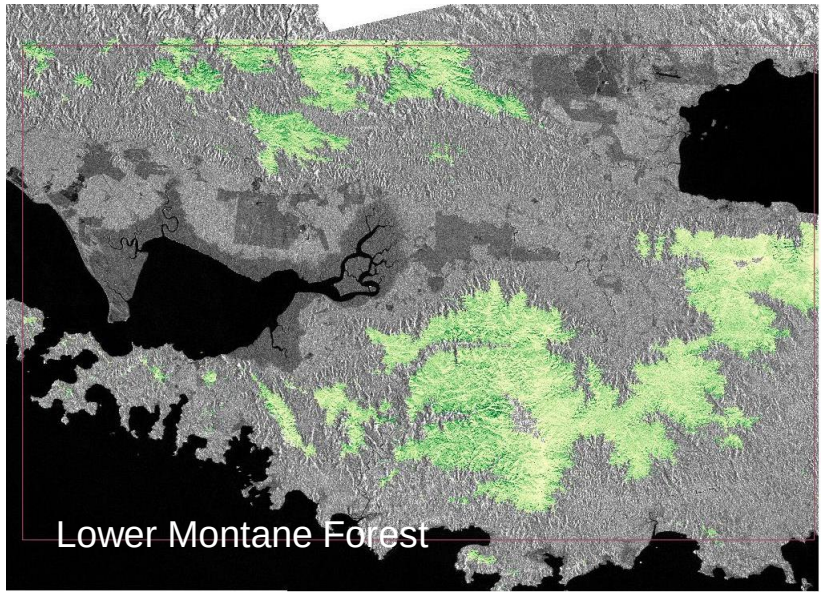
Project Results



Lower Montane forest observed to be brighter than Lowland forest at the same biomass.

Dependence indicates that reliable inversion for biomass in the "pre-saturation" region is possible. Choice indicated by linear regression is not necessarily optimal for AGB inversion.





Project milestones and deliverables

Limited activity is planned before end March 2018 as anticipated support for the Project from PNG partners has yet to eventuate as a result of major organizational changes (PNG DEC transition to CEPA agency)

Resources permitting the analysis of at least one PALSAR 2 observation set will be considered to investigate the possibility of making the AGB estimate contemporary and permitting a change estimate.

Otherwise activity will be confined to result consolidation and report writing.

Deliverables will include a baseline AGB estimate for the Milne Bay AOI, and an updated estimate using PALSAR 2 if resources permit, along with a final report for K&C 4 and a potential publication.

The possibility of recovering support from PNG is being investigated and if successful an extension of K&C 4 beyond March 2018 would be helpful.

Thank you (particularly to Ake ;-) for your patience.

A K Milne and M L Williams 2018

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