

Above Ground Biomass Vegetation Roughness Index

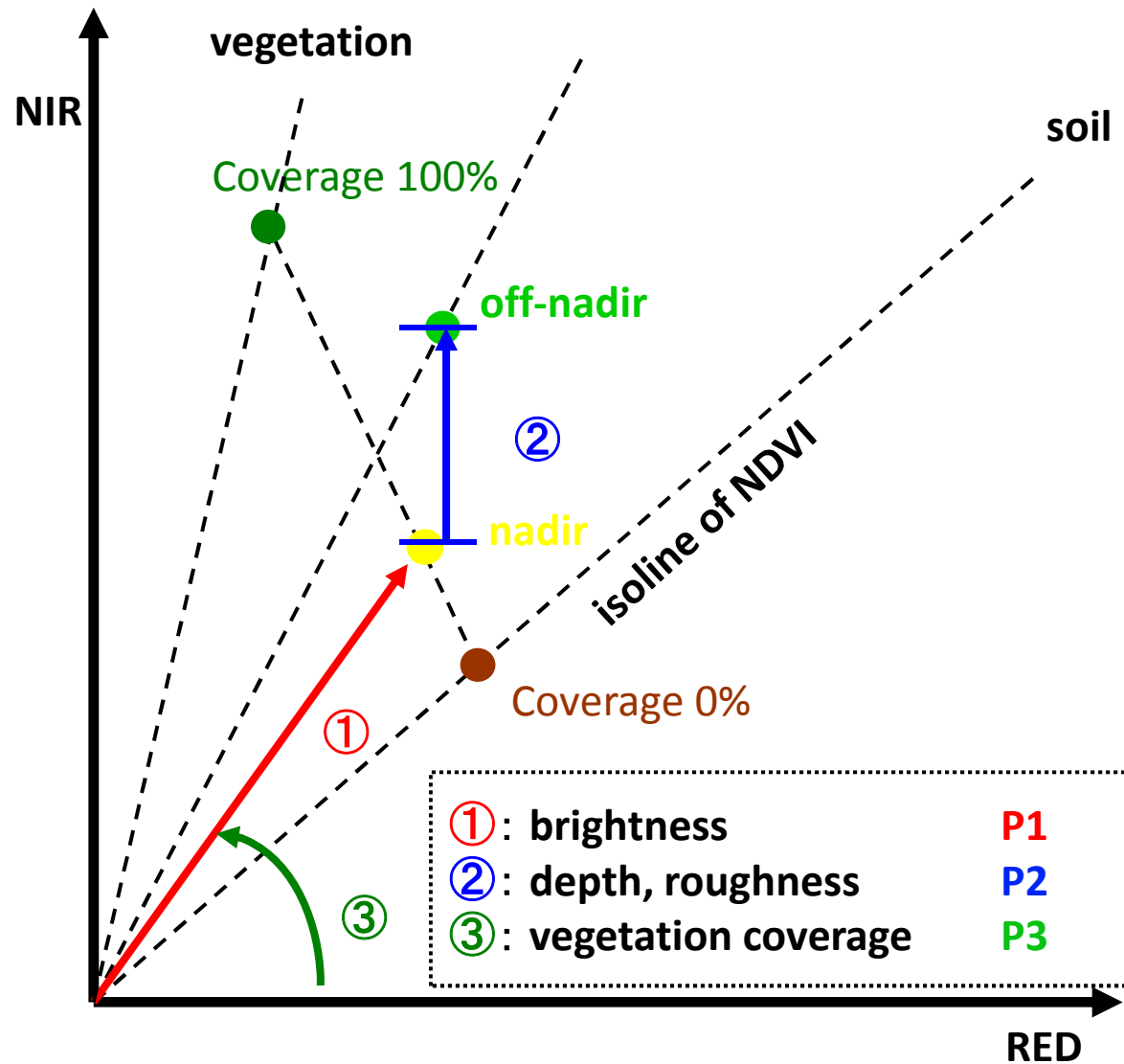
Water Stress Index

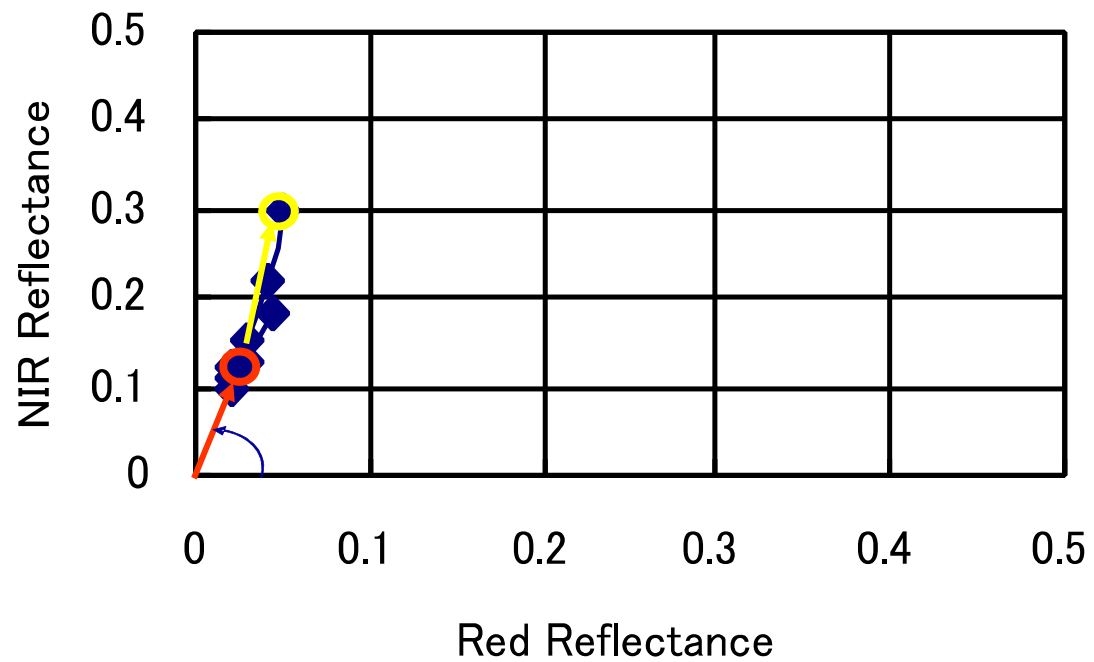
Koji Kajiwara, Yoshiaki Honda, *Satoshi Tanigawa* : Chiba University

Ysaku Ono, JAXA/EORC

Above Ground Biomass Vegetation Roughness Index

Reflectance Shift in RED-NIR plane





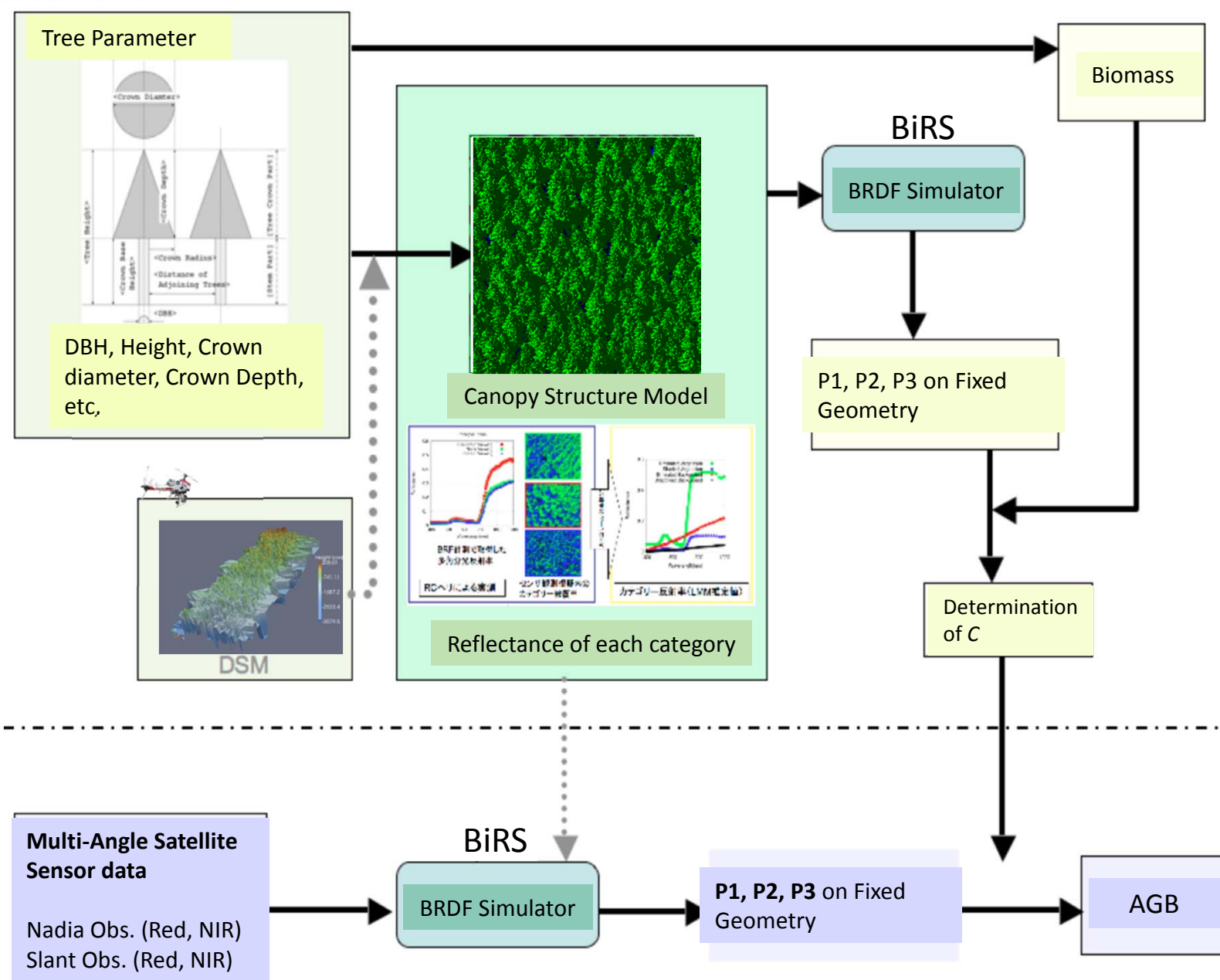
Red-NIR Plot of Broadleaf Forest

Biomass Estimation using P1,P2,P3

$$\textit{Biomass} = \underbrace{C}_{\substack{\text{Forest} \\ \text{Type} \\ \text{Dependent} \\ \text{Coefficient}}} \cdot \underbrace{\left(\frac{P2}{P1} + 1 \right)^3}_{\substack{\text{Volume} \\ \text{related} \\ \text{term}}} \cdot \underbrace{P3}_{\substack{\text{Vegetation} \\ \text{Coverage}}}$$

- P1, P2, P3 should be used fixed geometry (normalized geometry).
- To obtain the P1, P2, P3 at fixed geometry, satellite observed reflectance has to simulate with BRDF model.

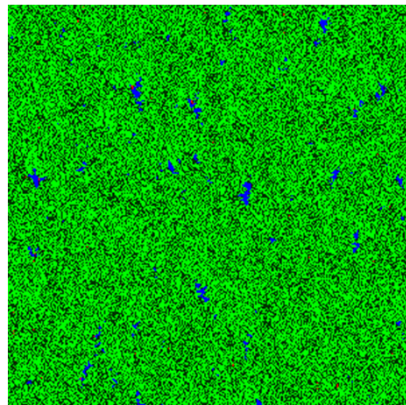
Schematic diagram for AGB estimation



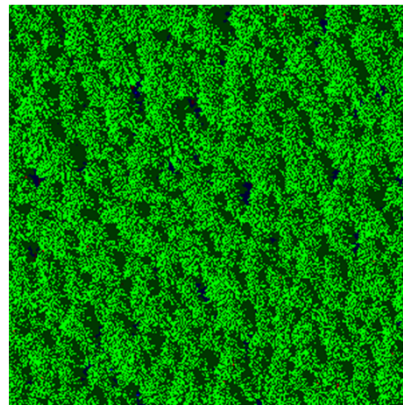
BiRS output category images

Mean Adjacent Tree Distance = 3.87m, Mean Tree Height = 10m, Crown Depth = 5.0m

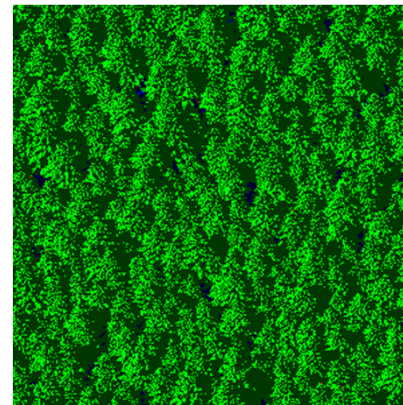
SOZ= 40deg, SEZ = 40deg



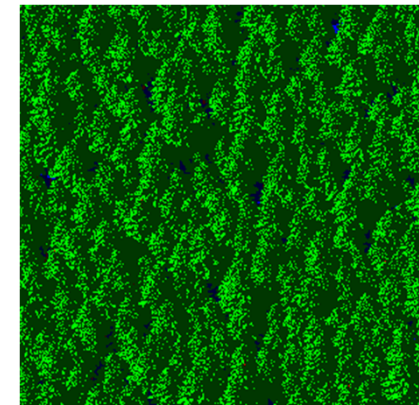
REA = 0



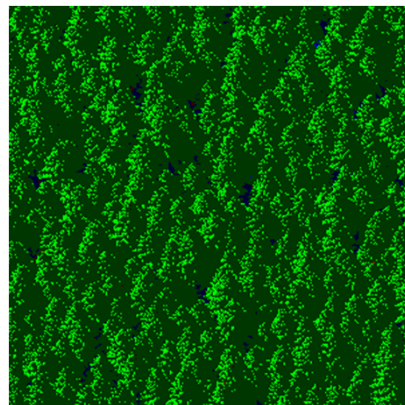
REA = 30



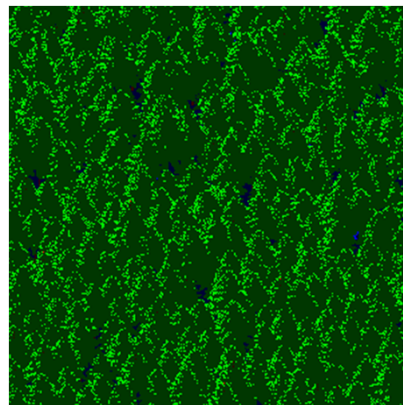
REA = 60



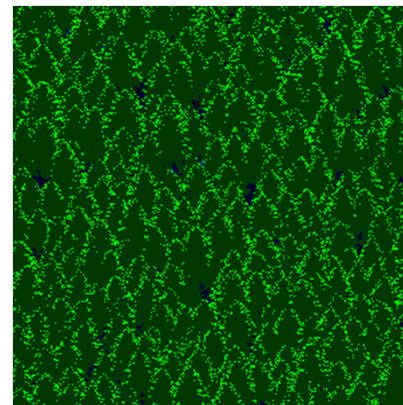
REA = 90



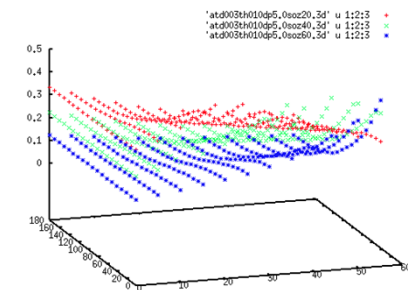
REA = 120



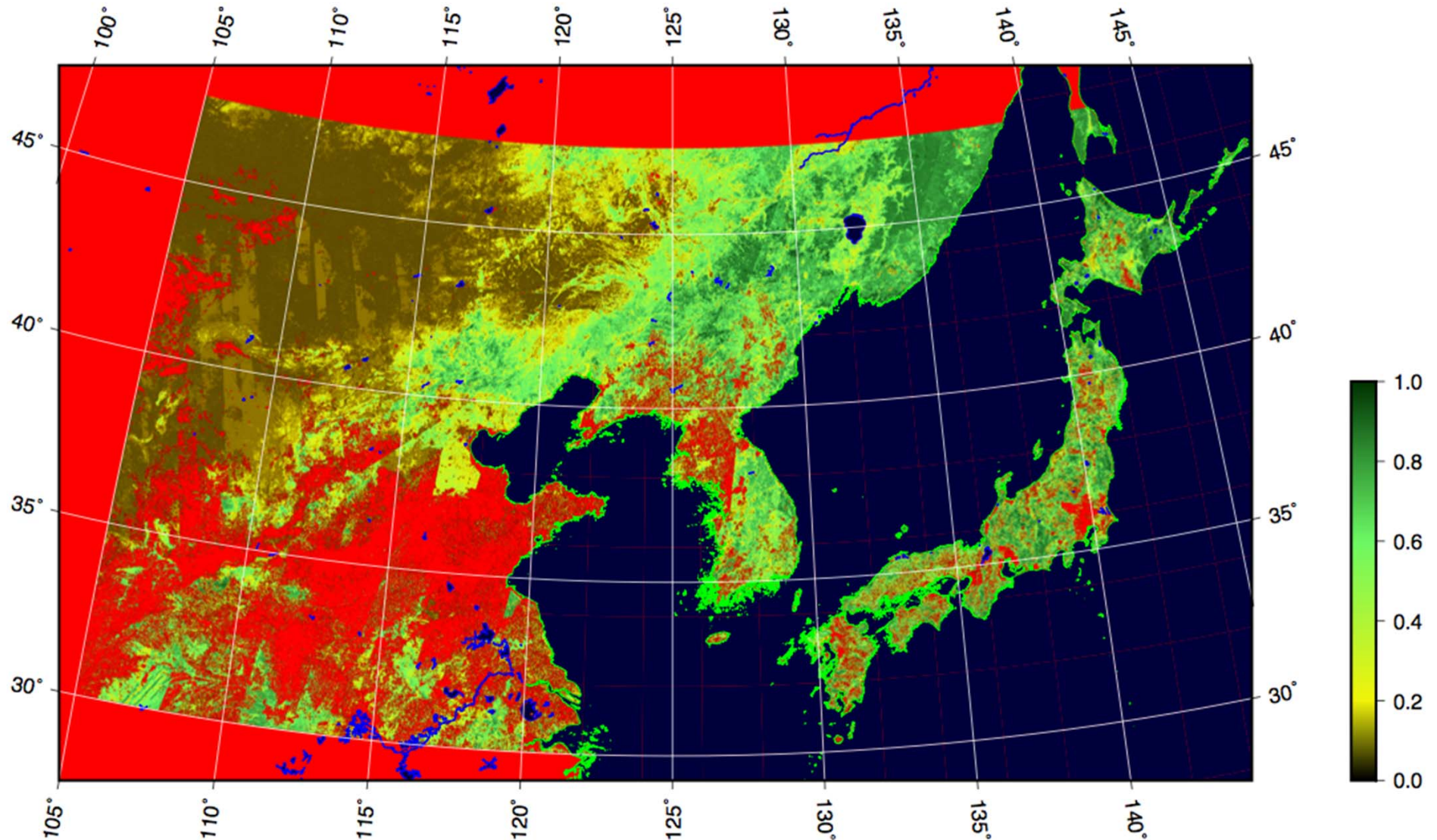
REA = 150



REA = 180



Processing result for 2010 summer on East Asia (AGB)

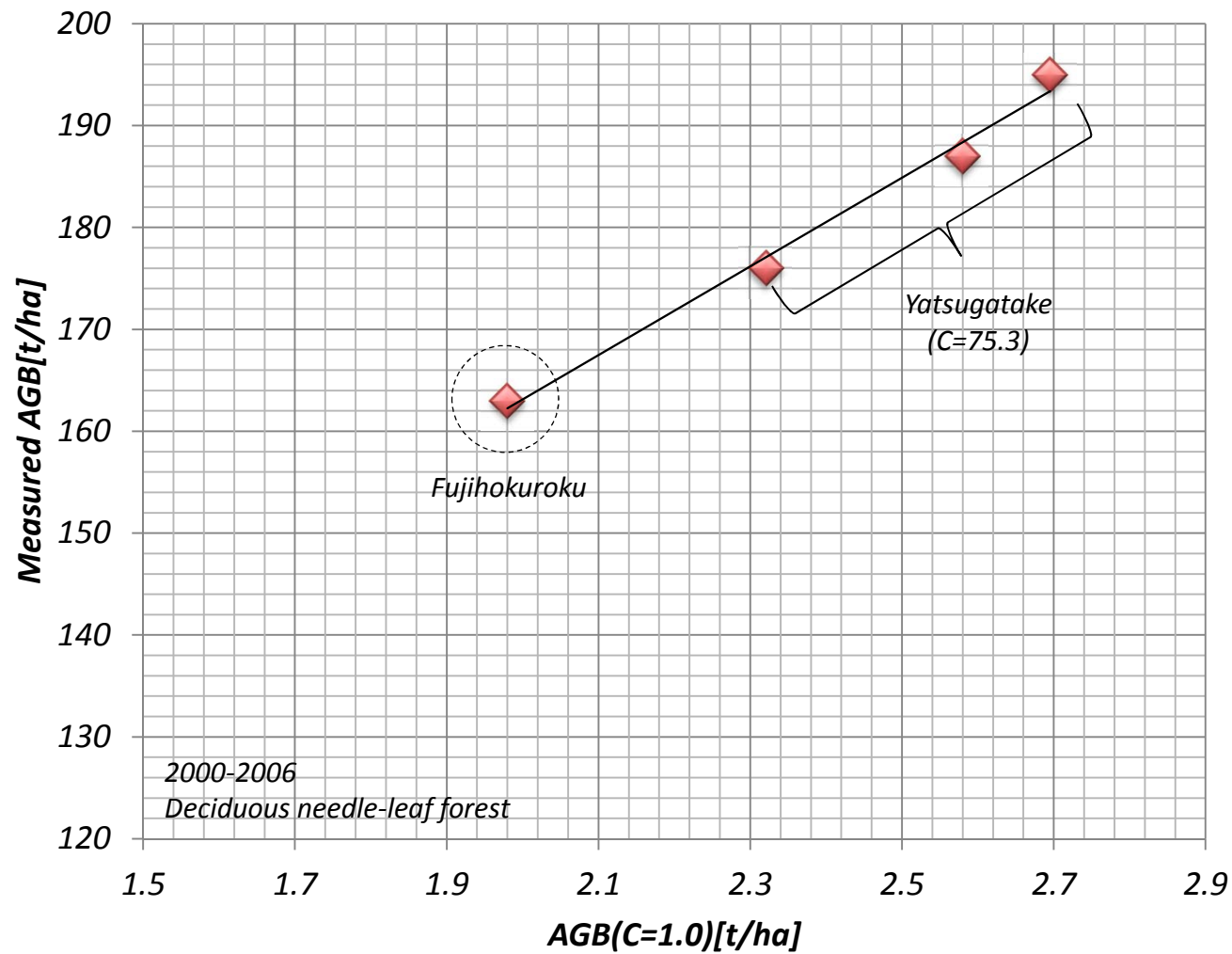


Red color indicates invalid STSG/reflectance combination found or nadir NDVI < 0 pixel

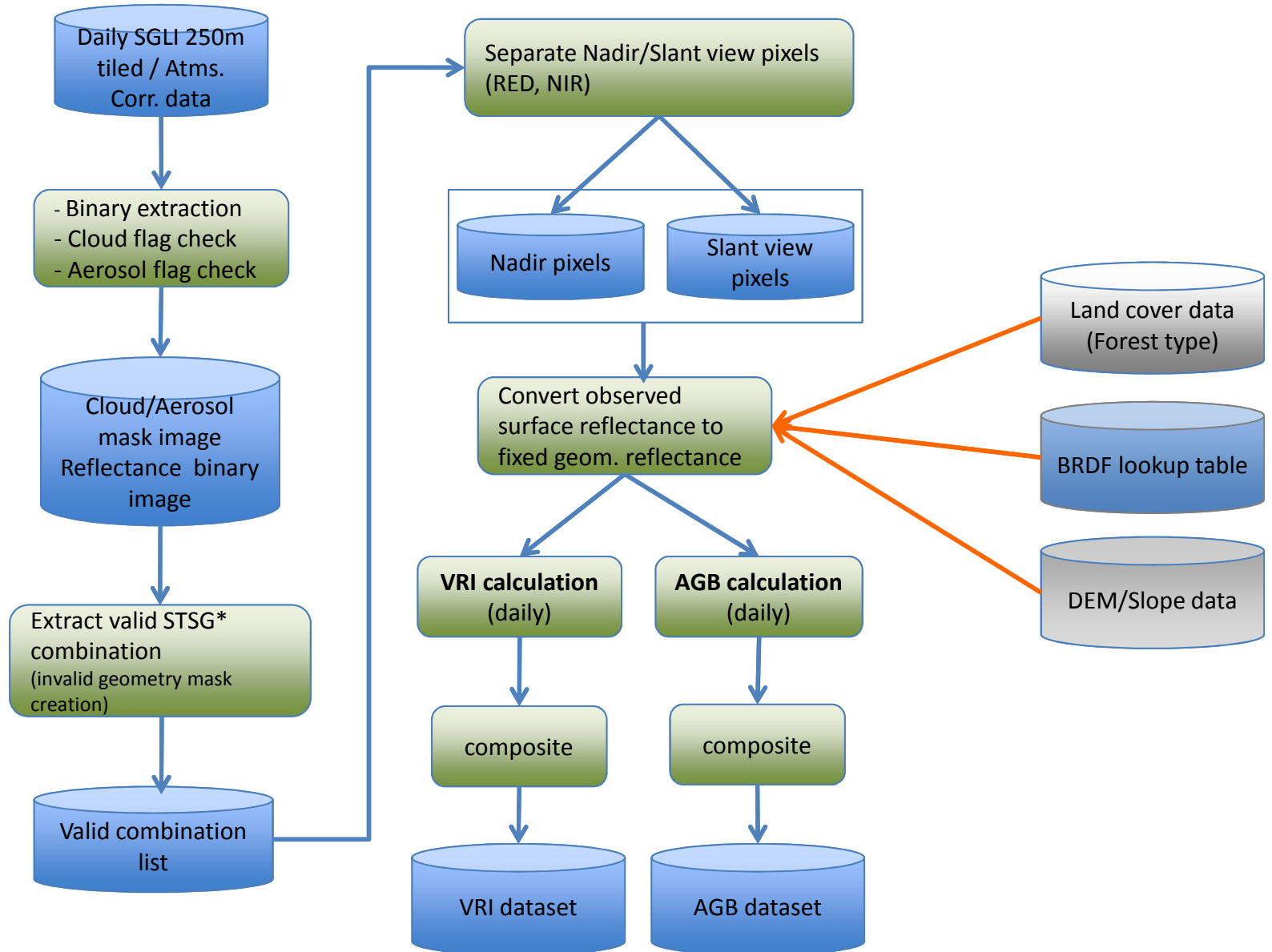
Used data: MOD09GA(Terra), MYD09GA(Aqua) 7/1 to 9/30 (92 days maximum composite)

8 tiles: h25v04, h26v04, h26v05, h27v04, h27v05, h28v04, h28v05, h29v05

Algorithm Validation using in-situ measurement data

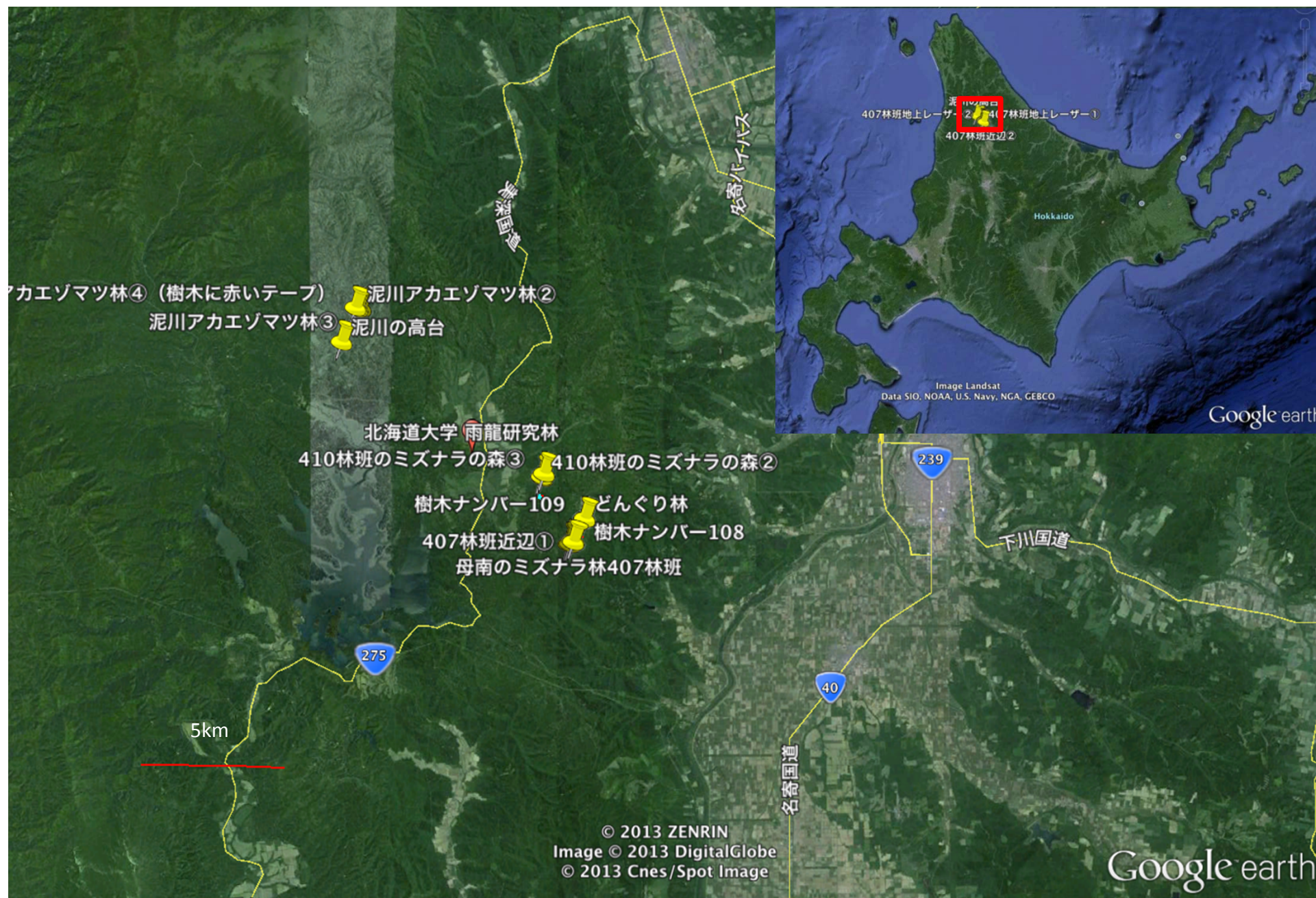


Process flow of AGB, VRI

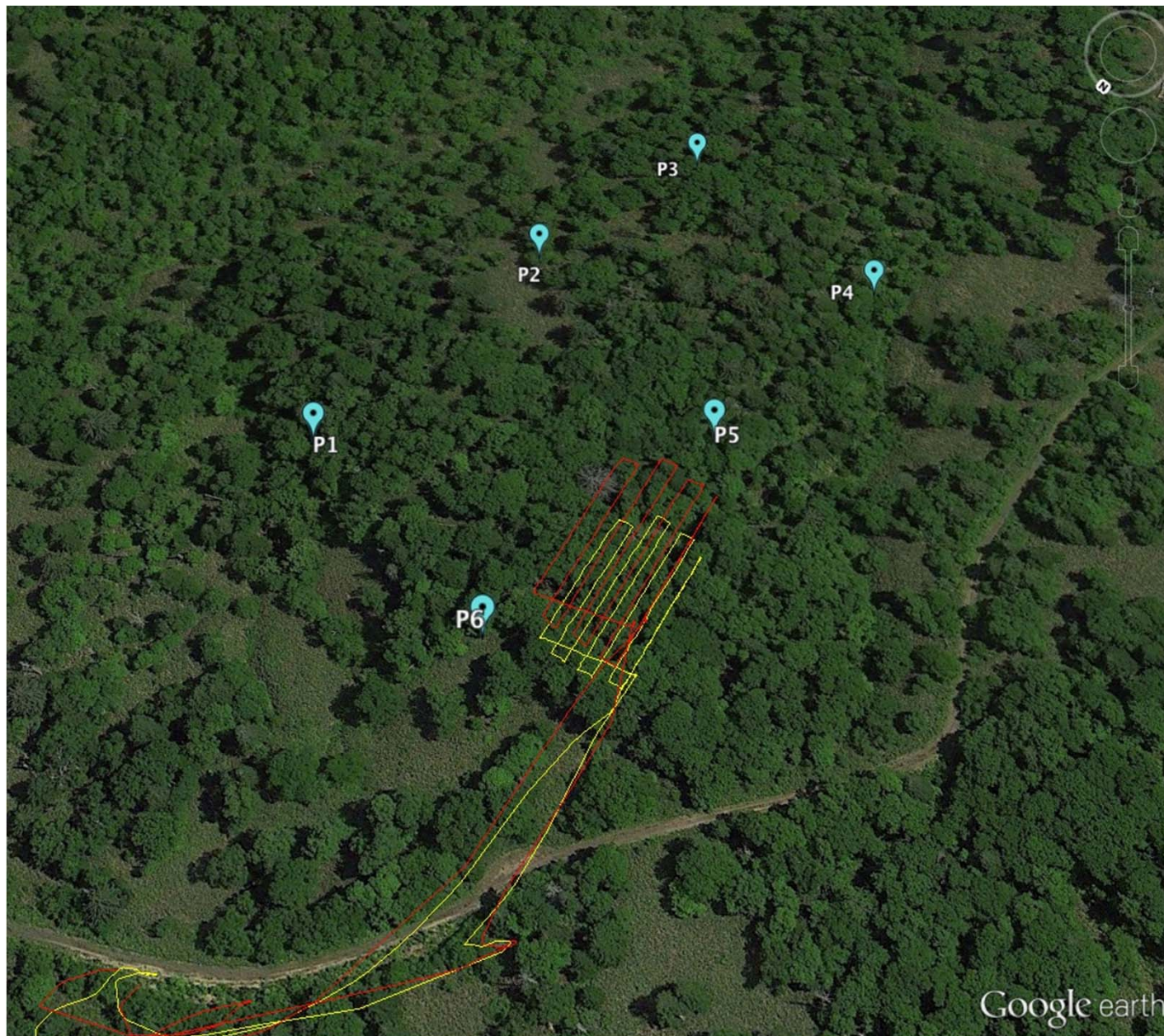


STSG* :
Sun-Target-
Sensor Geometry

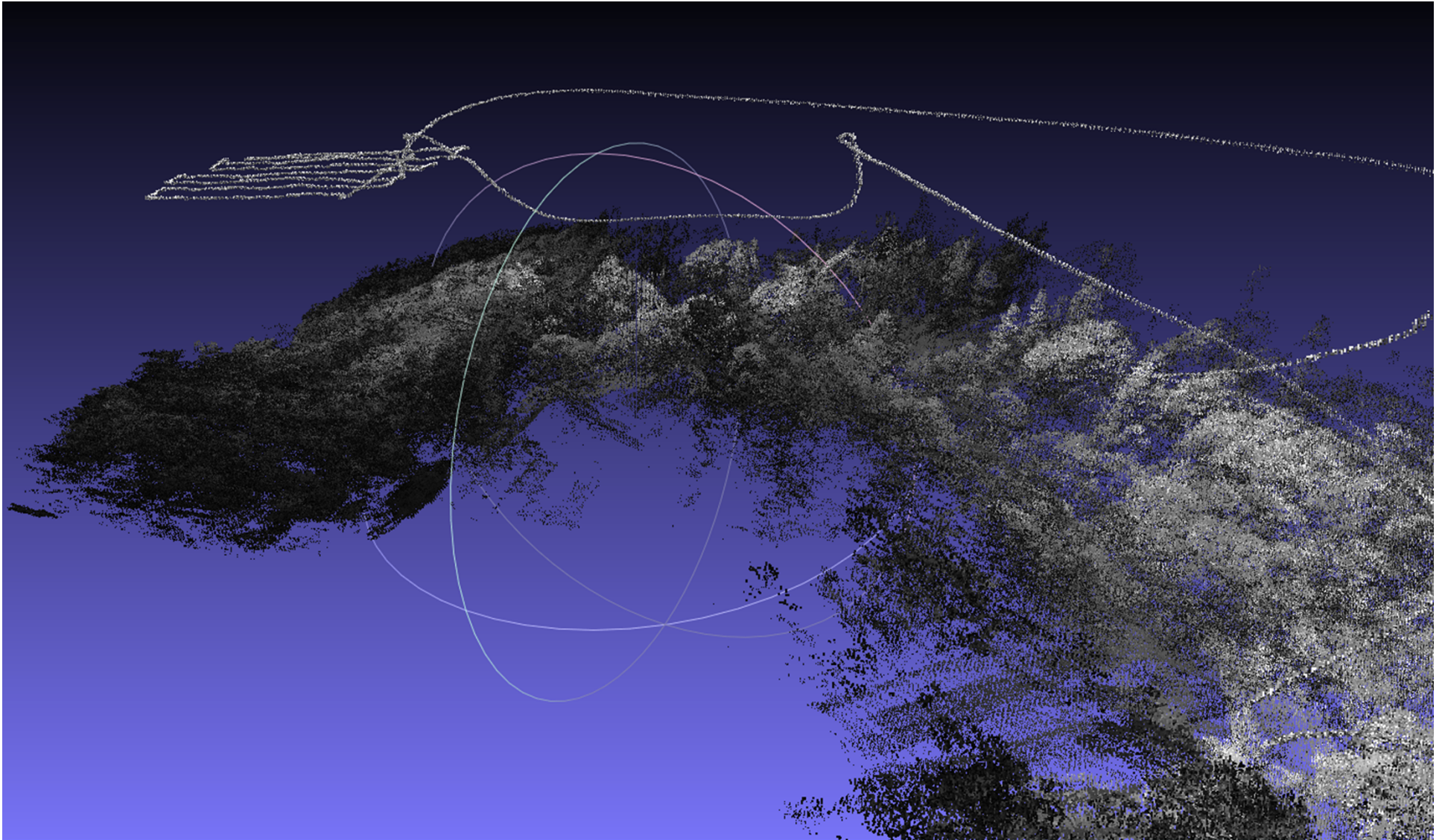
Field campaign @ Uryu Experimental forest site, Hokkaido Univ.



Japanese Oak Forest (Uryu site)



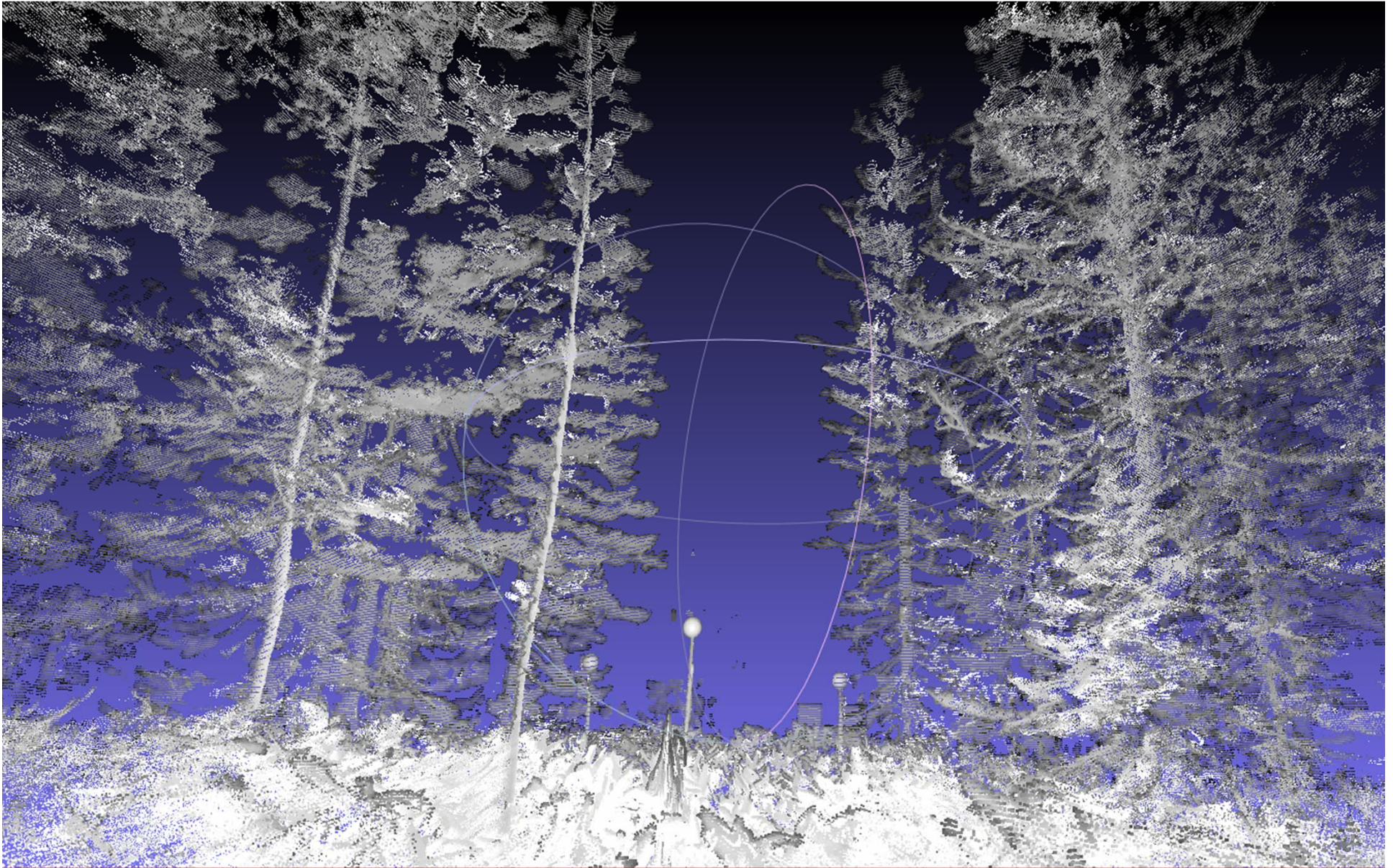
Japanese Oak Forest (Uryu site)



Japanese Spruce forest (Uryu; Dorokawa site)



Japanese Spruce forest (Uryu; Dorokawa site)



Water Stress Index

Water stress detection method

For the water stress detection, developed CDNT.
(Compensated Day Night Temperature-difference)

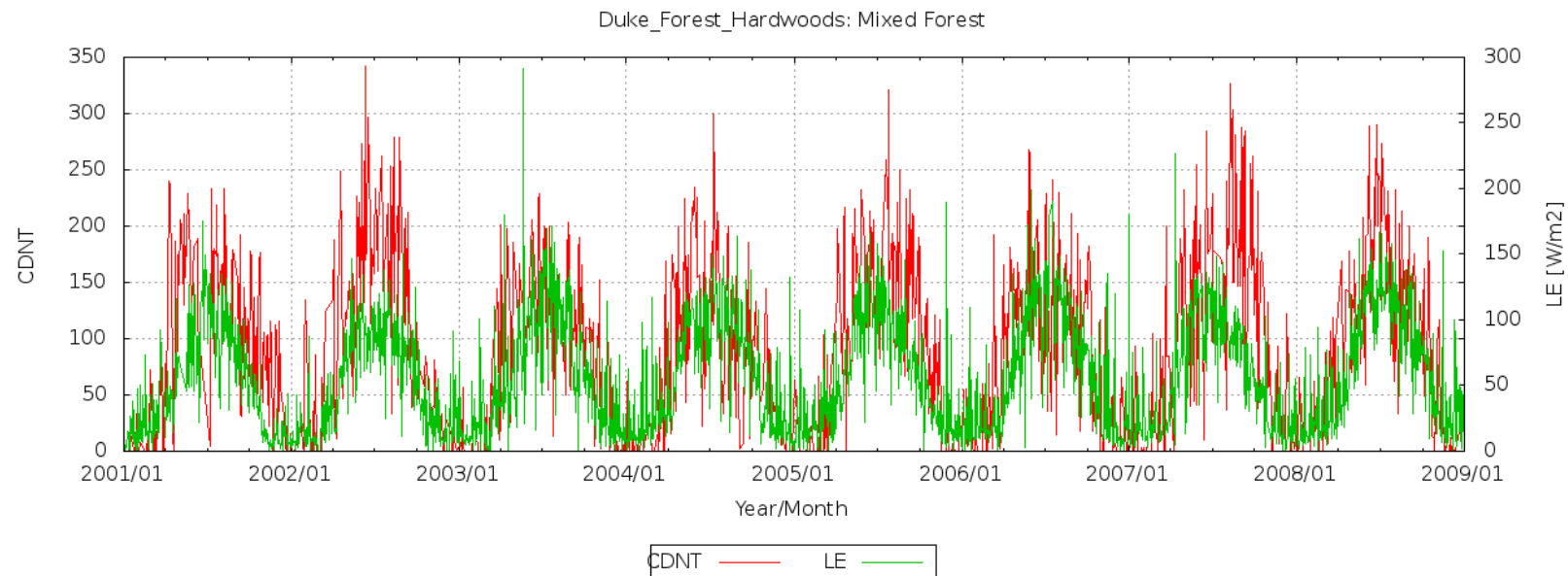
$$CDNT = (T_{day} - T_{night}) \times (T_{night} - 273.15)$$

T_{day} : Daytime land surface temperature

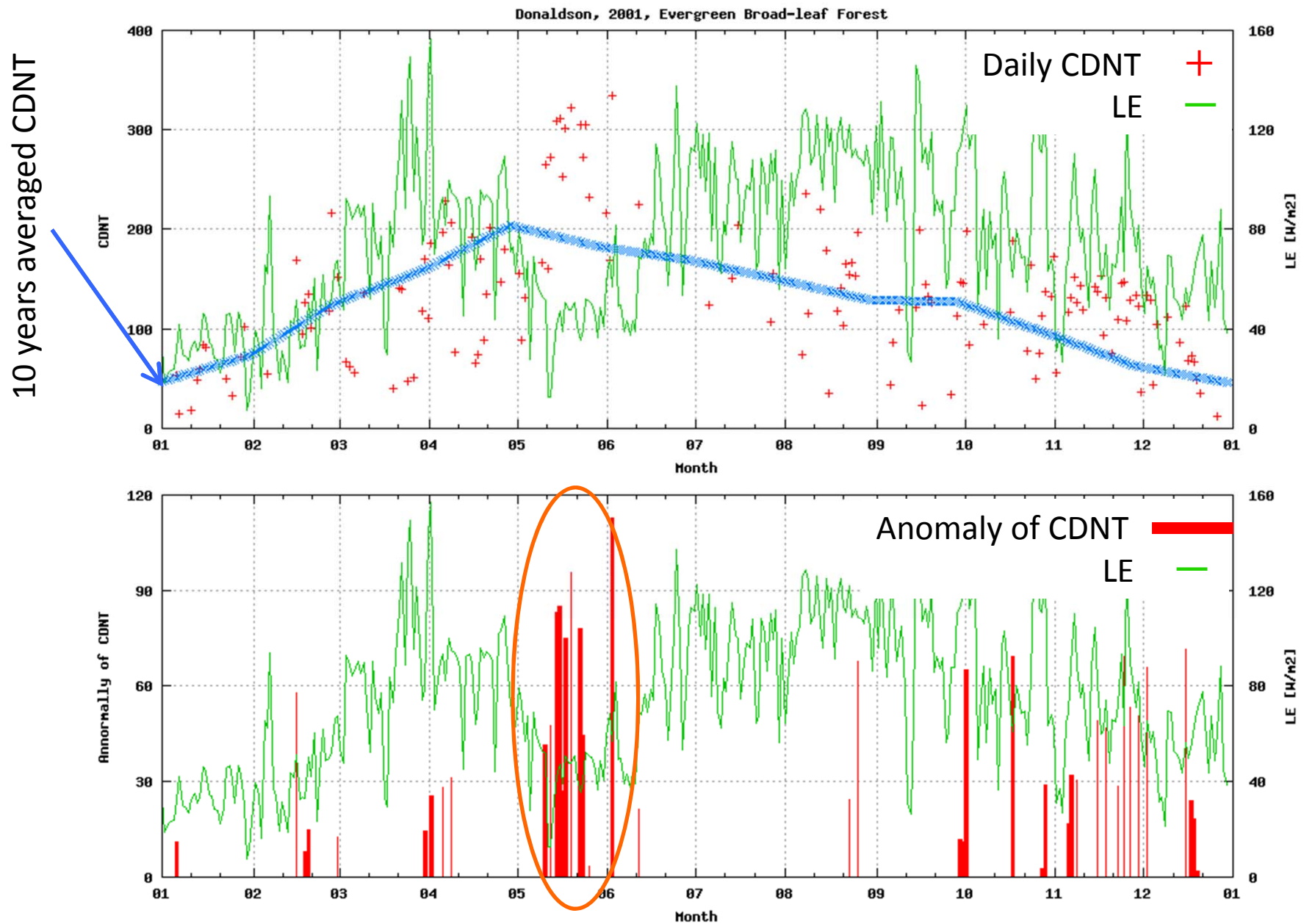
T_{night} : Nighttime land surface temperature

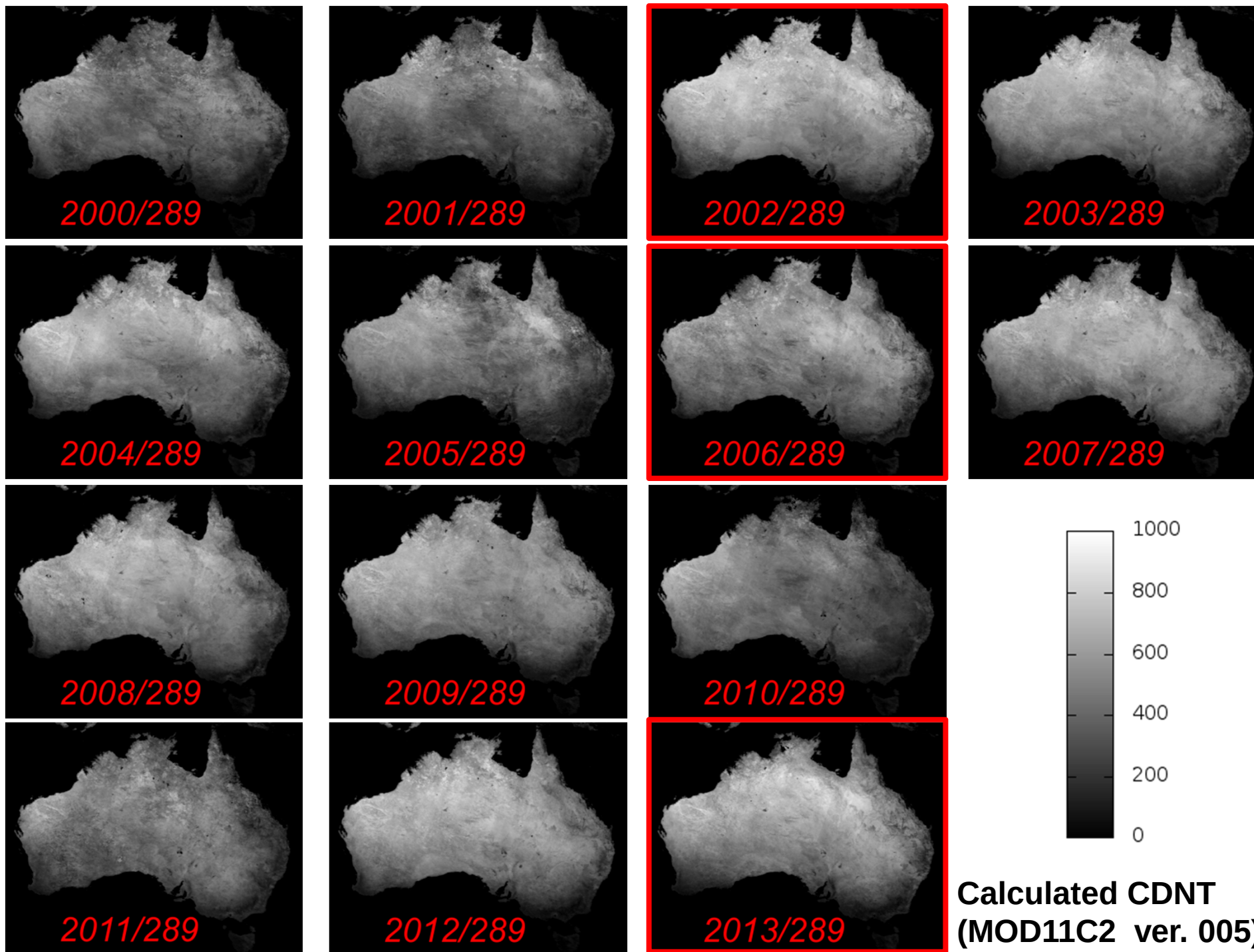
$(T_{night} - 273.15)$: When less than or equal to 0, the value is set to 0.

CDNT has closed relationship with latent heat flux.



Anomaly of CDNT (Evergreen Broad leaf forest)

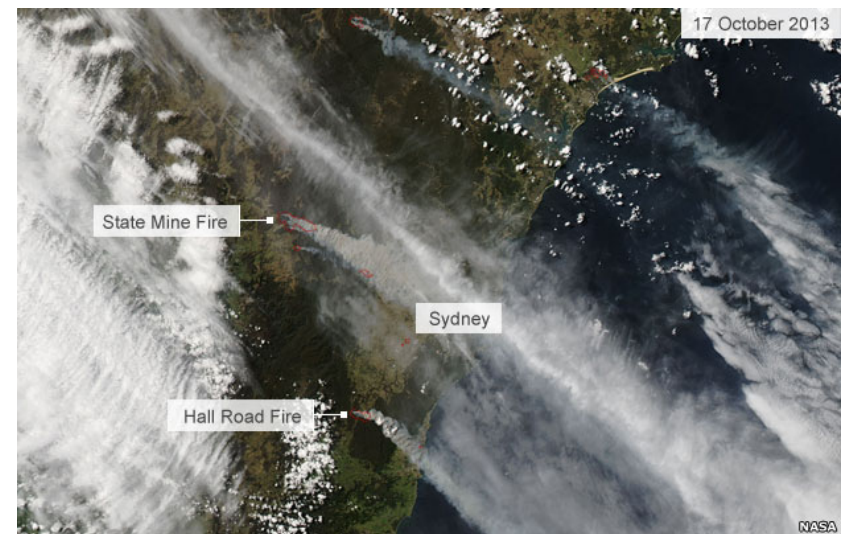
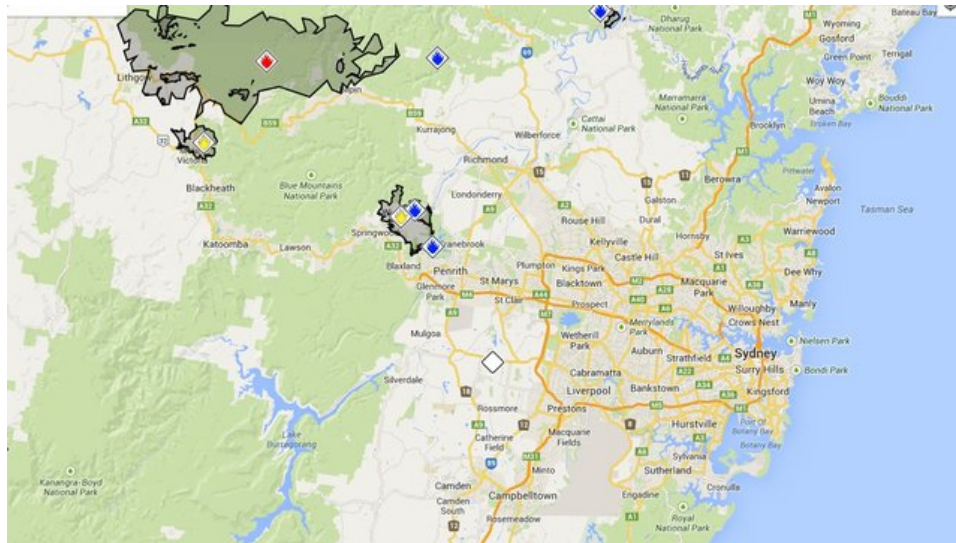




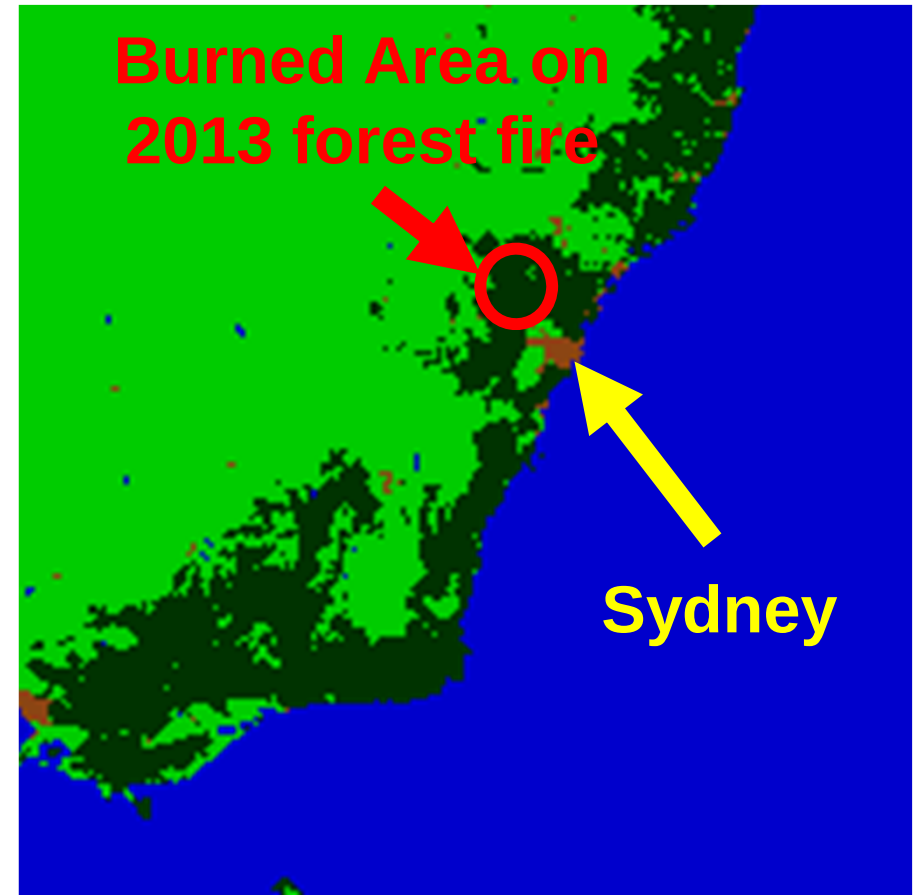
Drought in Australia

- 2002-2003
- 2006-2007

**Explosive forest fires, October 2013.
The Australian government declared a state of emergency.**



New south wales rural fire service map

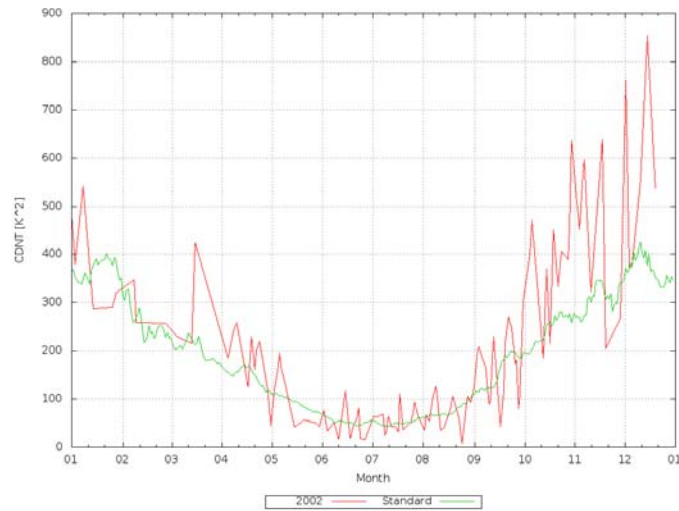


Land Cover Type Yearly L3 Global 0.05Deg CMG
MCD12C1, IGBP (Type 1)

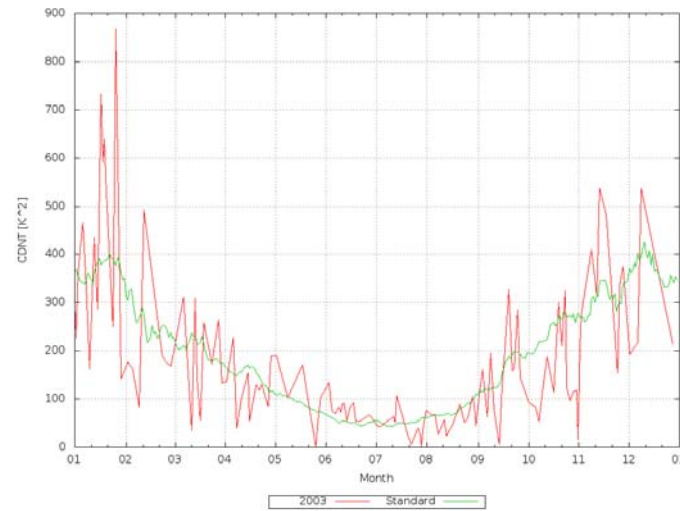
Dark green	: Forest, Class 1-5
Light green	: Grass land, Class 6-12
Brown	: Others, Class 13-16 and 255

CDNT calculated result (MOD11C1, Pixel X:6607, Y:2469)

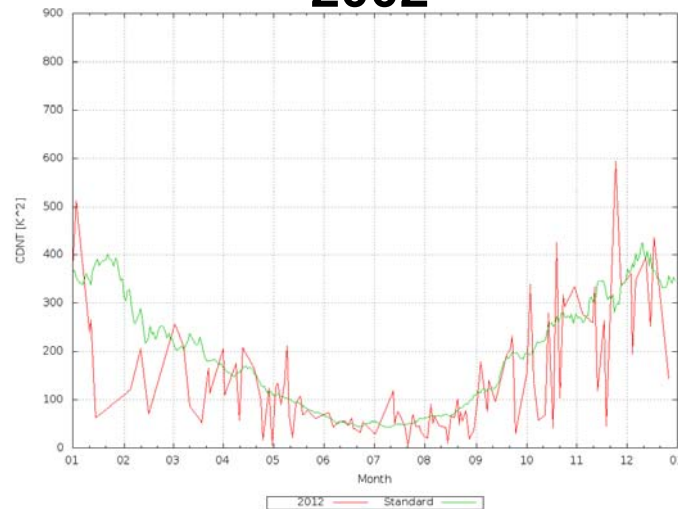
Standard CDNT (Method: Euclidean distance)



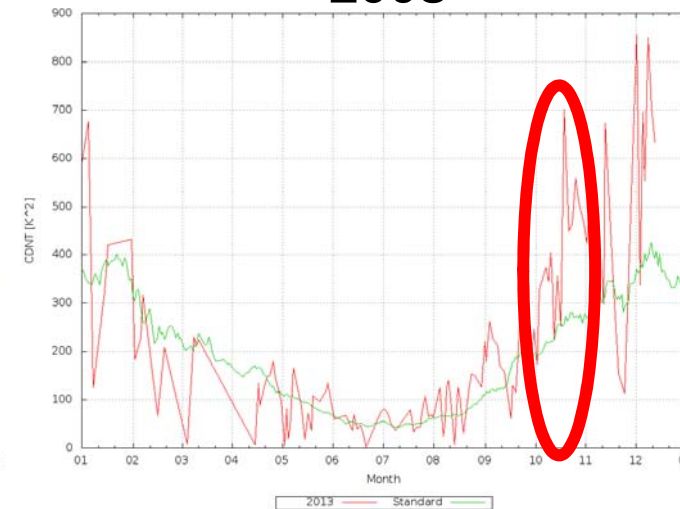
2002



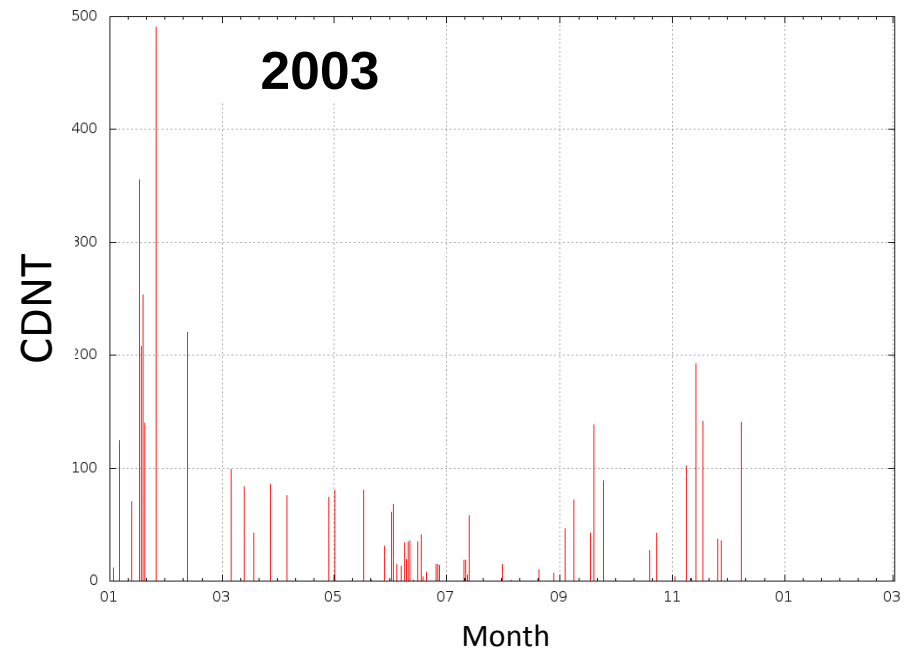
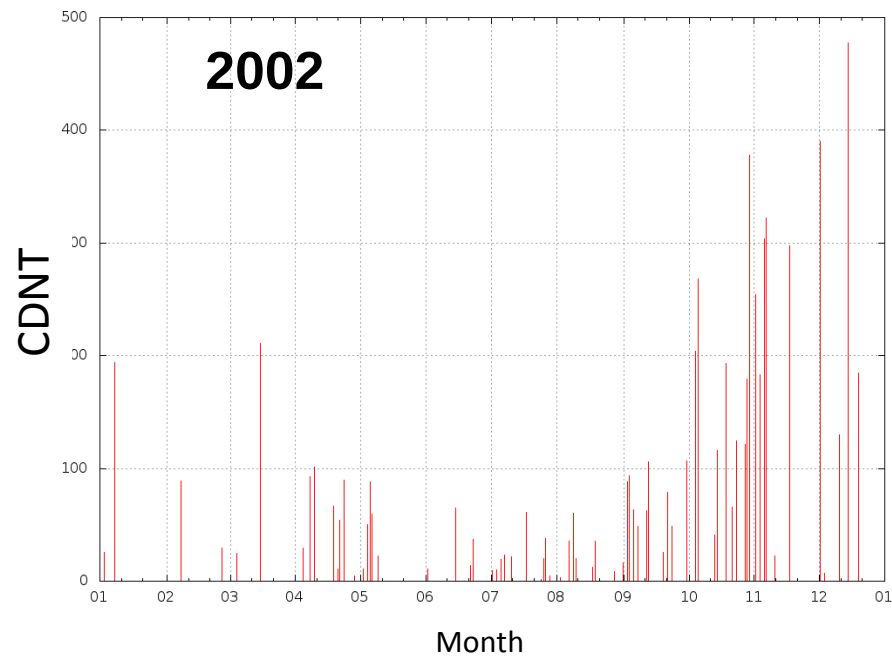
2003



2012

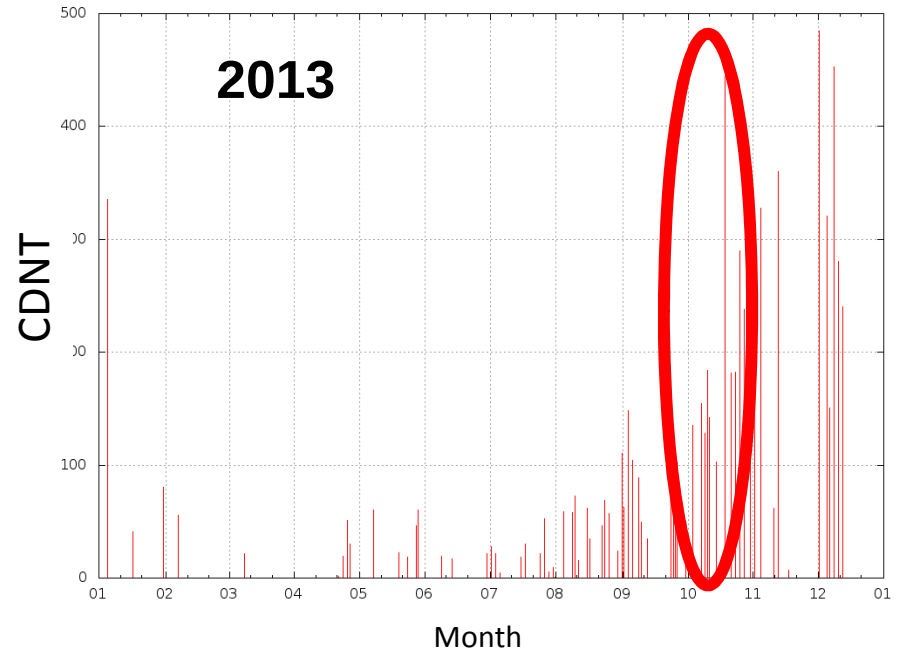


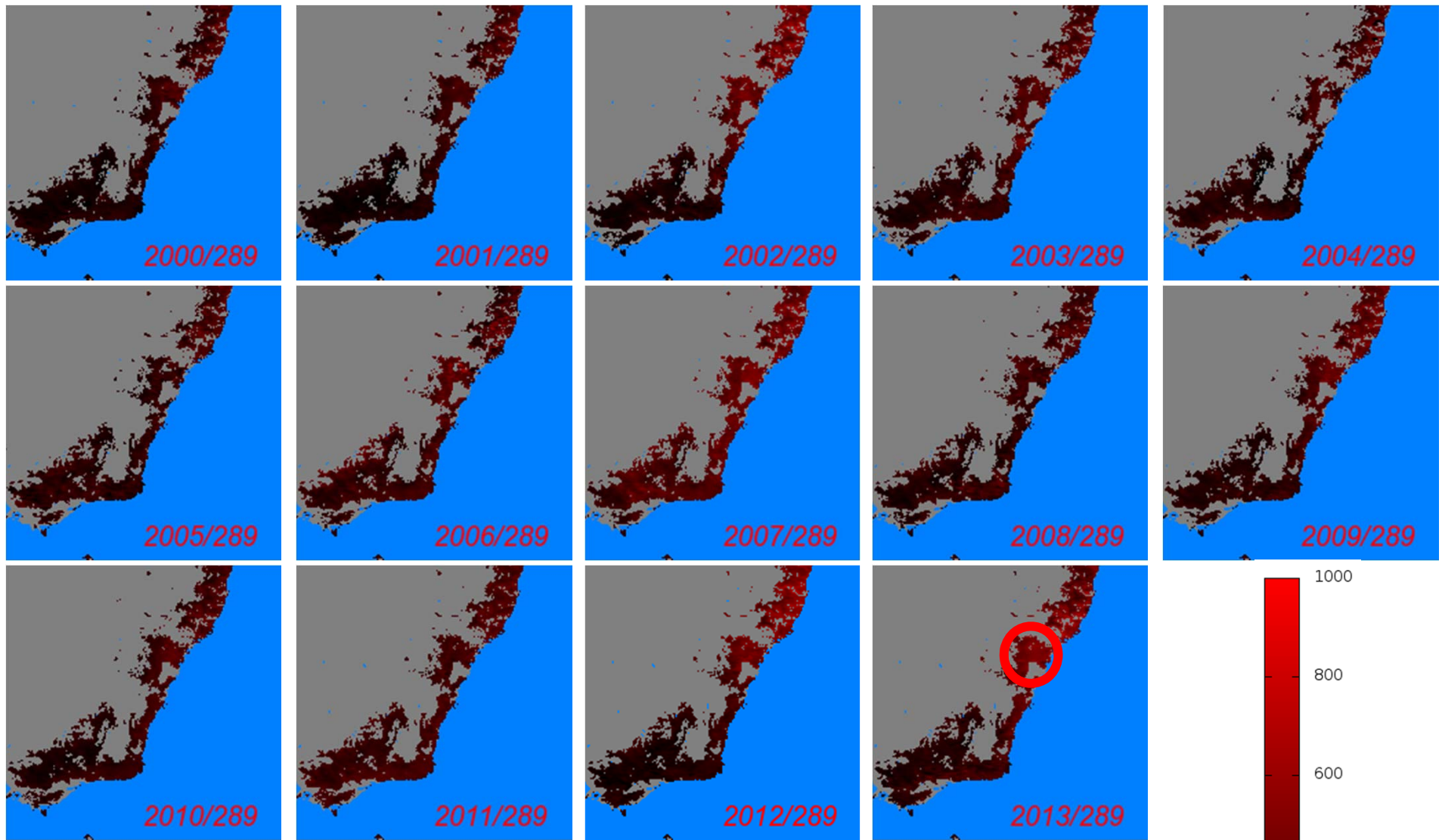
2013



CDNT anomaly

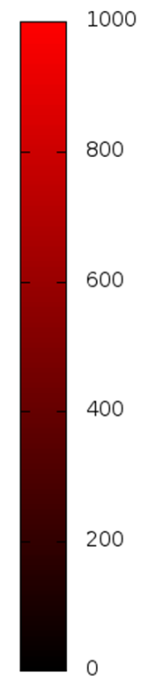
Difference from the standard value
(10 years mean).





Year/DOY

**Calculated only forest area
(MOD11C2 ver. 005)**



Summary

AGB&VRI

AGB estimation algorithm for single tree species has been completed except terrain/slope effect.

Broad leaf & mixed forest in-situ data has been collected in Uryu experimental forest.

WSI

It has confirmed that CDNT anomaly can be indicate the dry situation for forest.

In order to unify the different CDNT value and range for different vegetation type, it is necessary to adjust for them.