Planning and preparation for validation of the atmospheric corrected reflectance

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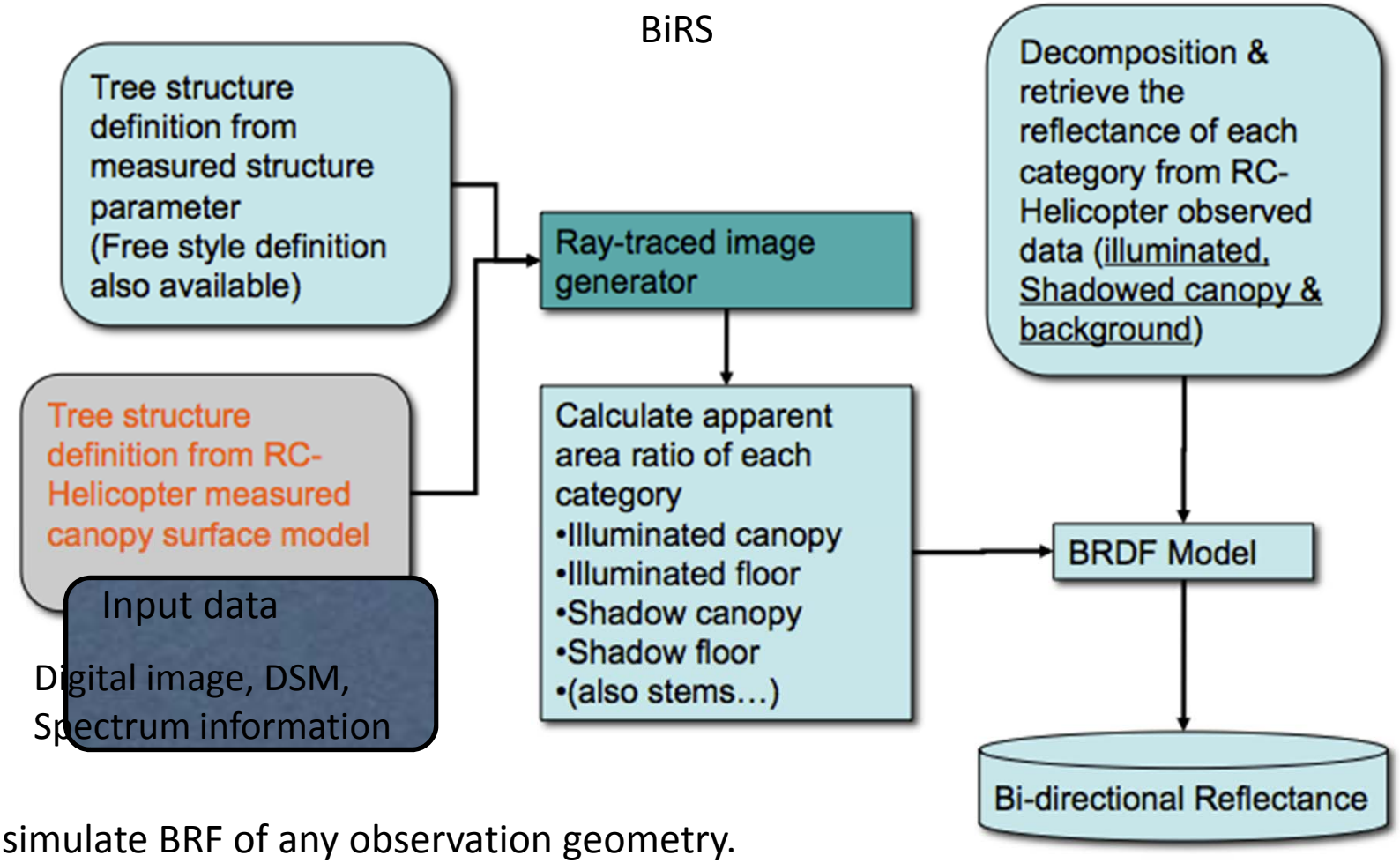
Validation Site List

In cooperation with Nasahara Team

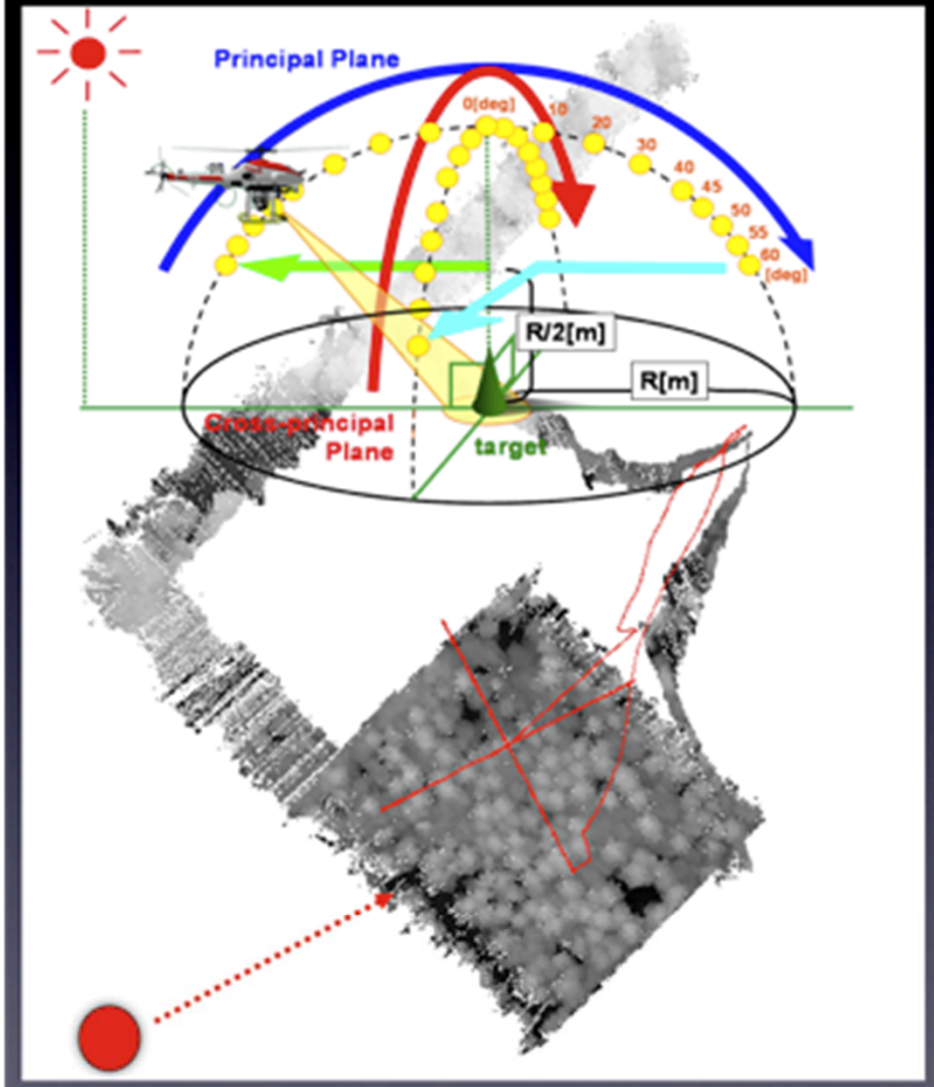
- 500m×500m size site
  - Yatsugatake,Yamanashi
  - Fujihokuroku ,Yamanashi
  - Tomakomai,Hokkaido
  - Uryu,Hokkaido
- Other size
  - Fujiyoshida,Yamanashi
  - Ashizuri,Kohchi
  - Kawamata,Fukushima
  - Togane,Chiba (Trial site)

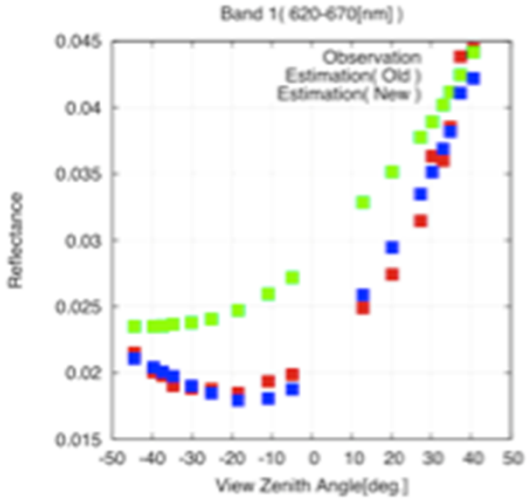
Developed BRDF simulator

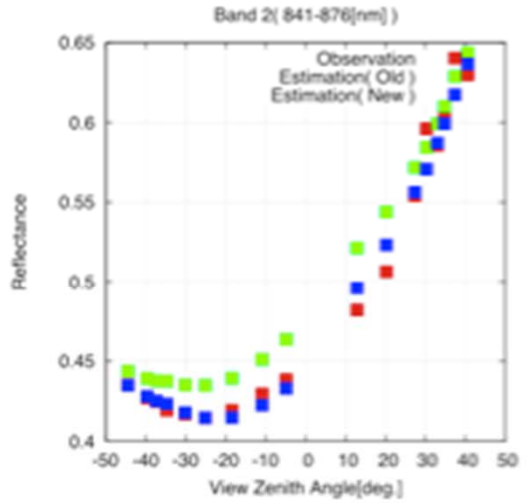
BiRS



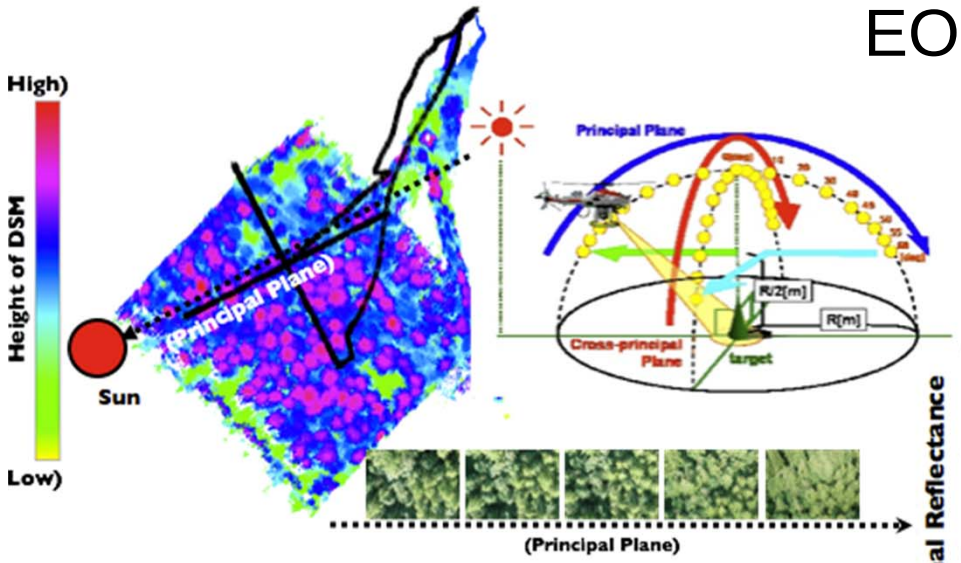
BiRS can simulate BRF of any observation geometry.

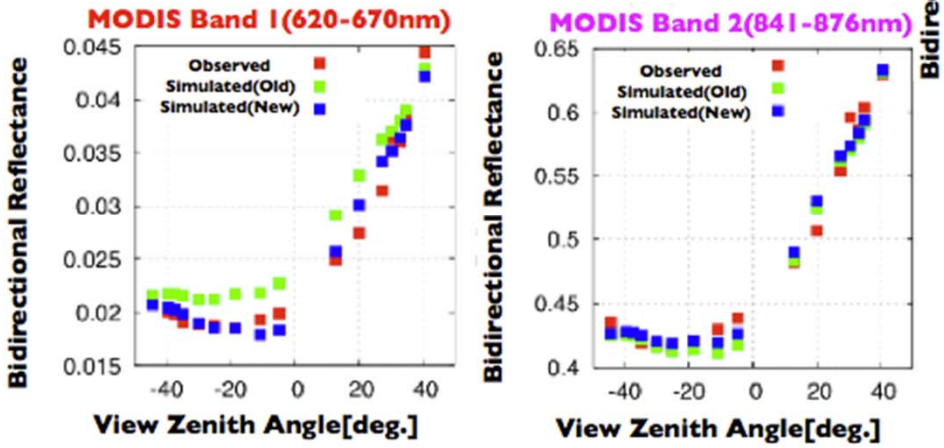

Principal Plane
0[deg]
10
20
30
40
45
50
55
60
[deg]
R/2[m]
R[m]
Cross-principal Plane
target


Band 1(620-670[nm])
Observation
Estimation(Old)
Estimation(New)
Reflectance
0.045
0.04
0.035
0.03
0.025
0.02
0.015
-50 -40 -30 -20 -10 0 10 20 30 40 50
View Zenith Angle[deg.]

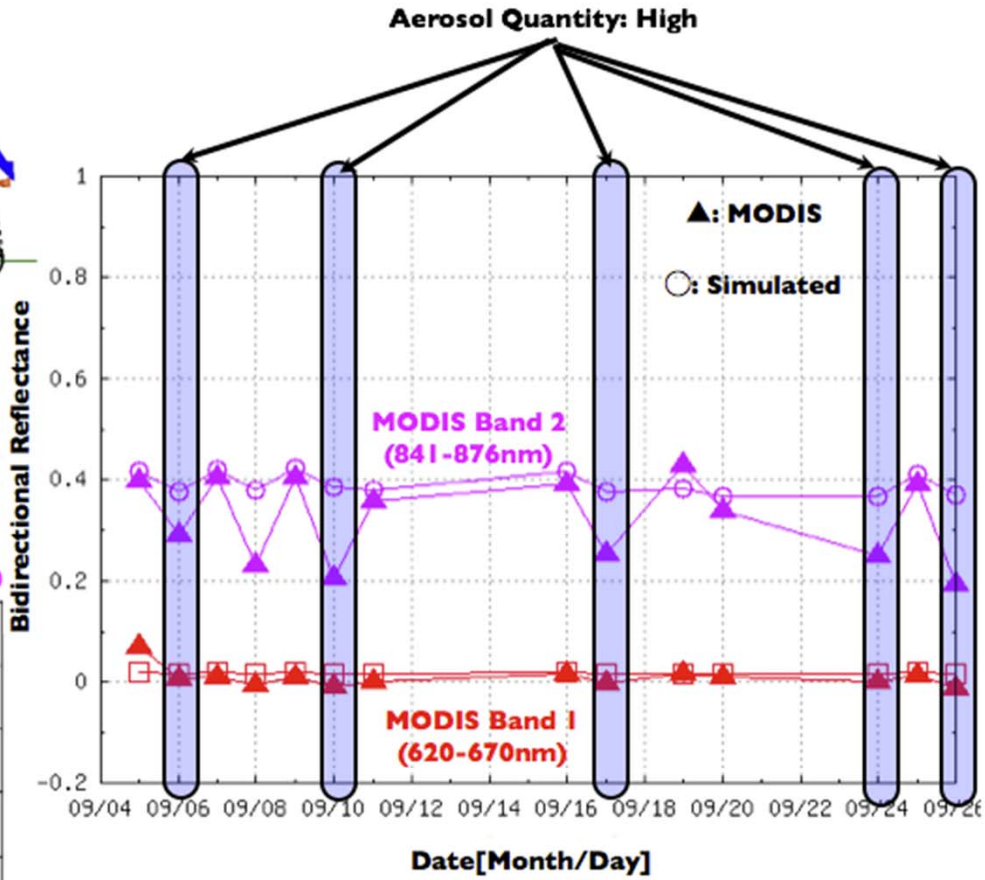

Band 2(841-876[nm])
Observation
Estimation(Old)
Estimation(New)
Reflectance
0.65
0.6
0.55
0.5
0.45
0.4
-50 -40 -30 -20 -10 0 10 20 30 40 50
View Zenith Angle[deg.]

BiRS has already been installed in the PC of EORC.





【Verification of Simulator based on Field Observation】

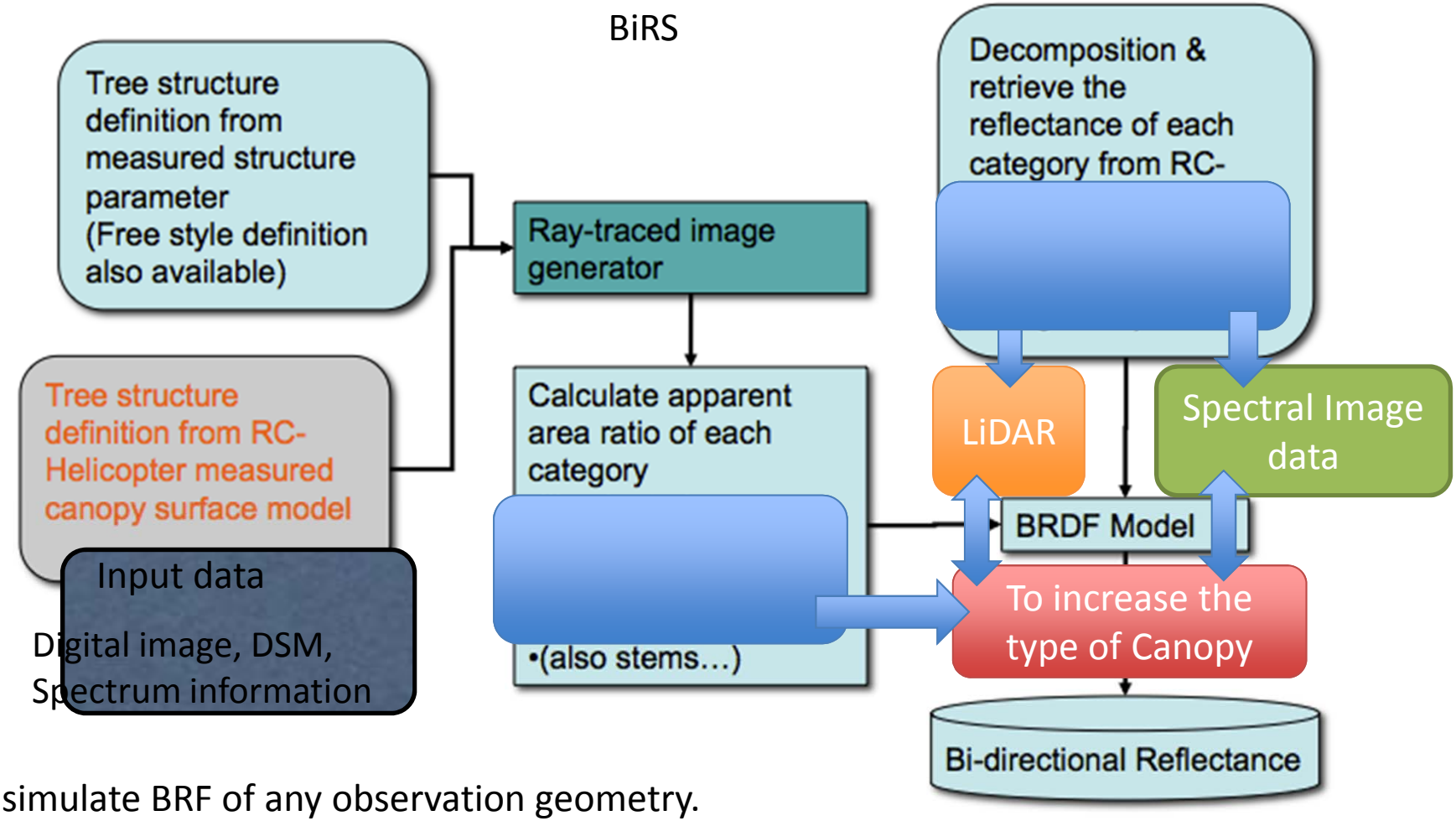


【Verification of MODIS Product】

Next step

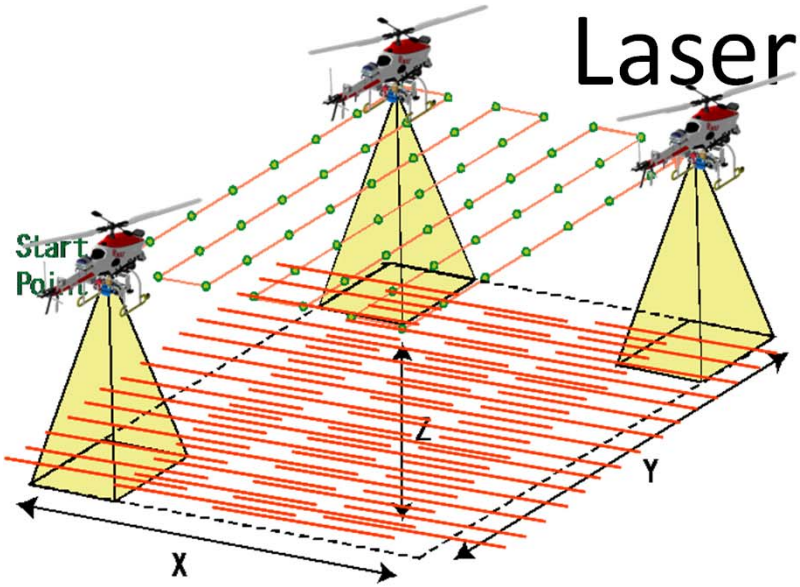
- BiRS for homogeneous forest is completed
- Mixed forest ratio is high in the world's forests
- Development of BiRS for mixed forest is required
- To increase the species of tree

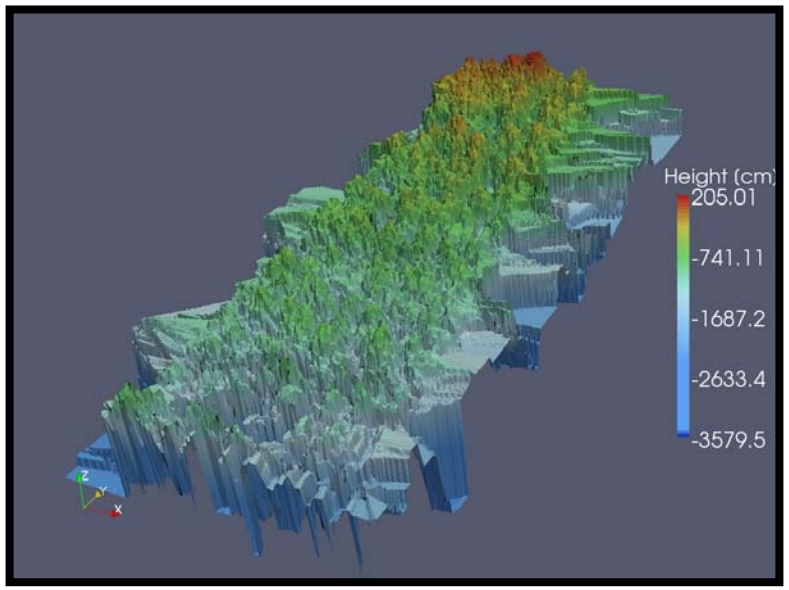
BRDF simulator for mixed forest

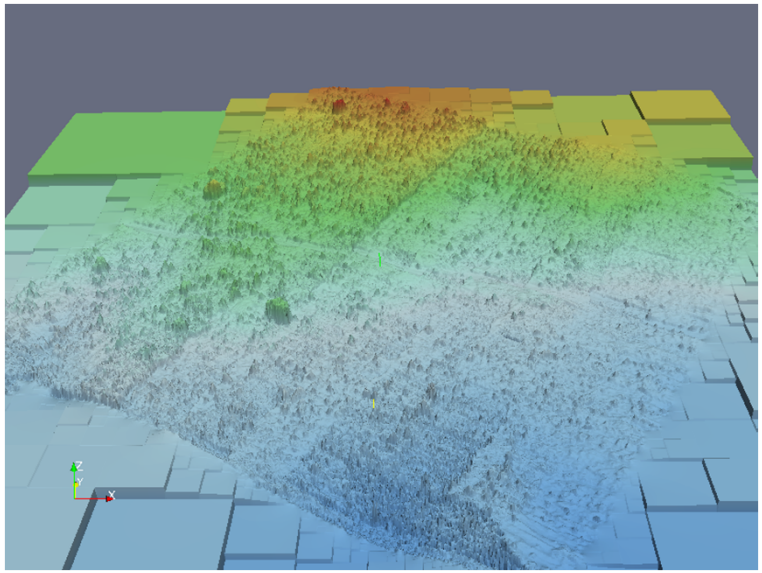


BiRS can simulate BRF of any observation geometry.

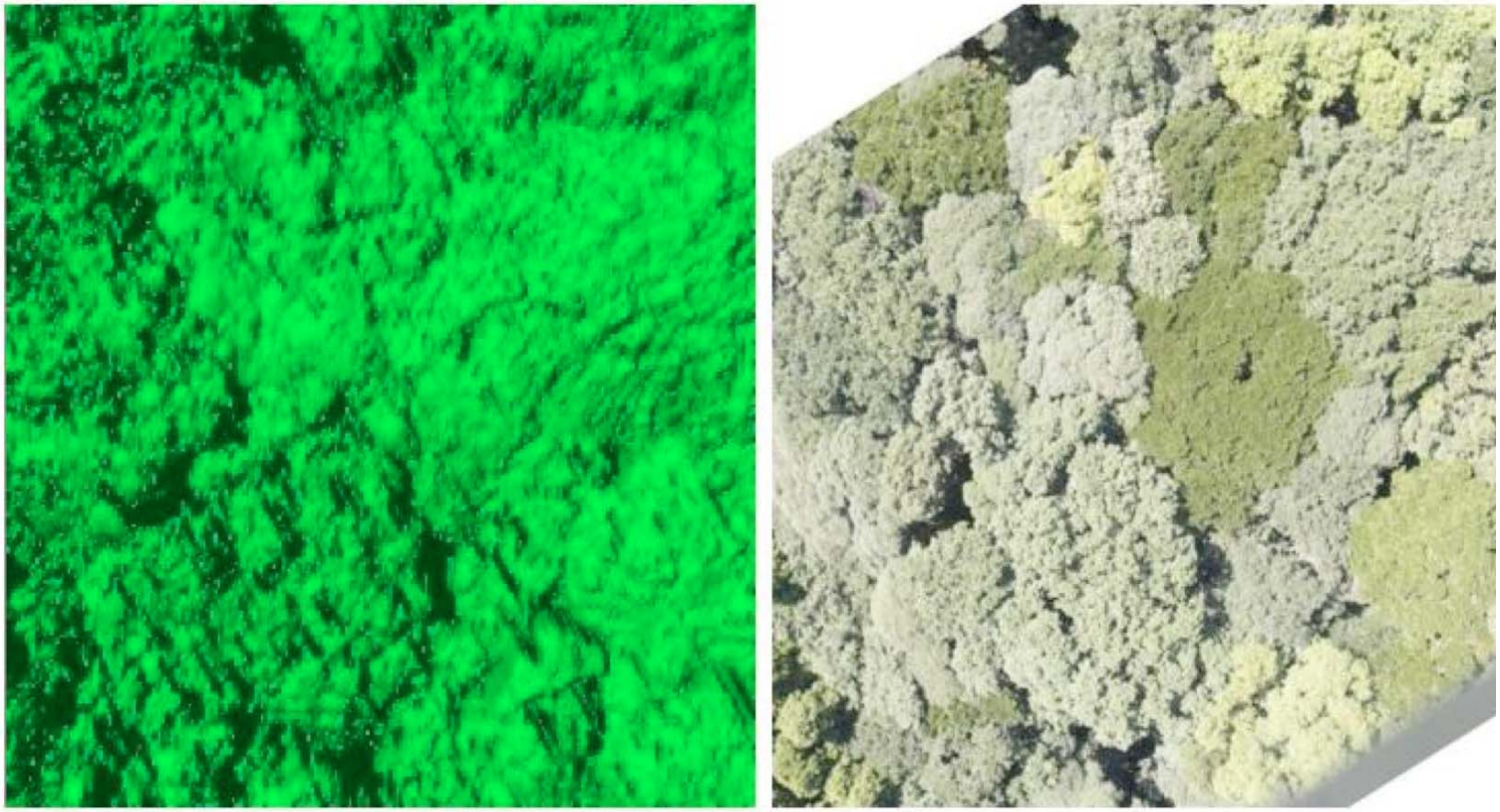
Canopy surface measurement using Laser S



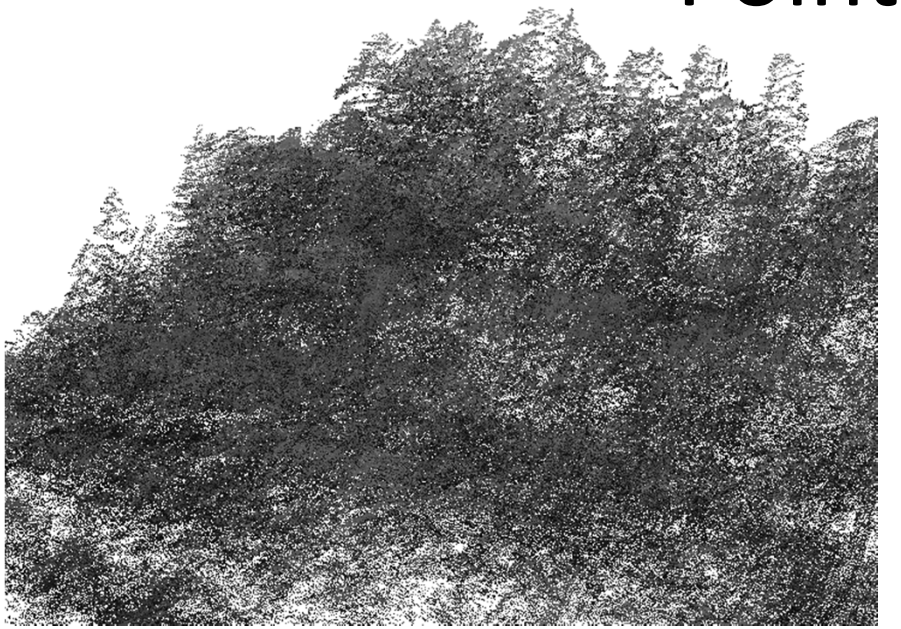


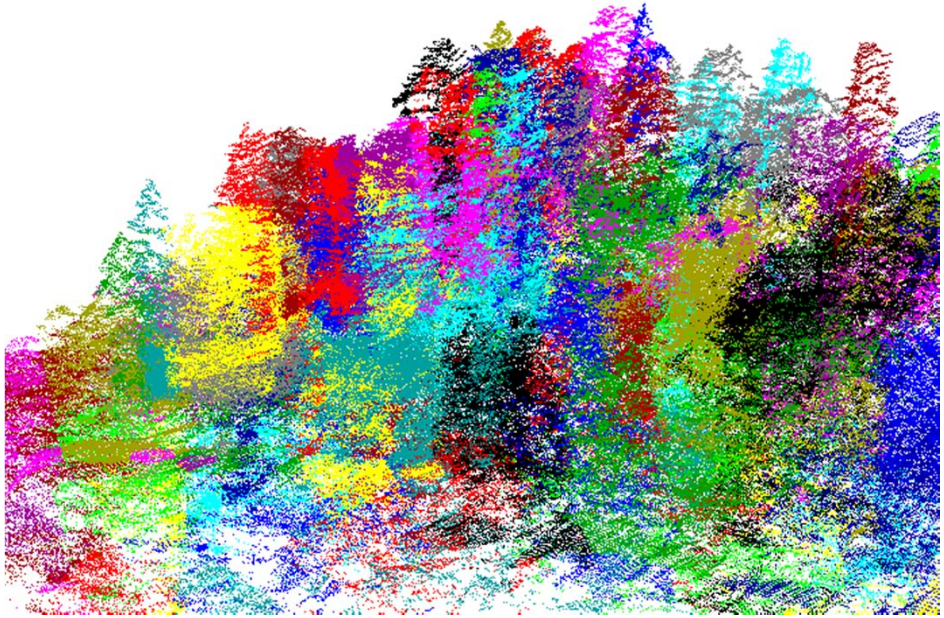


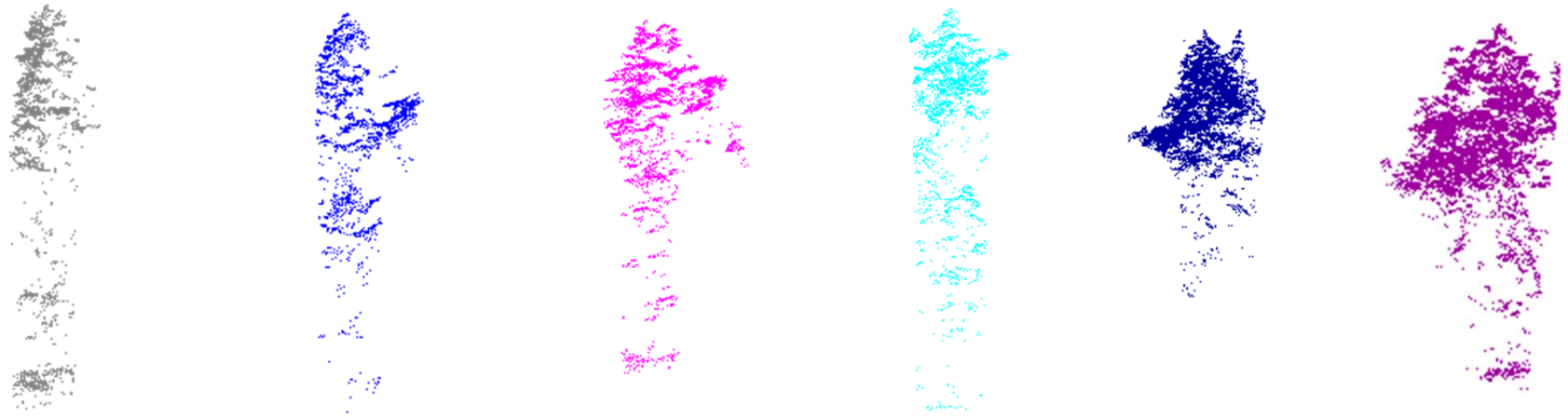
Comparison between DSM shade image & Still image



Extraction of individual trees from Point cloud







BRDF Liner Mixture Model

$$BRDF_{\lambda}(\theta_s,\varphi_s,\theta_o,\varphi_o)=\sum_{i=1}^{n} CR_i(\theta_s,\varphi_s,\theta_o,\varphi_o)\times RF_{\lambda,i}$$

θ_s : Solar Zenith Angle

φ_s : Solar Azimuth Angle

θ_o : *Sensor* Zenith Angle

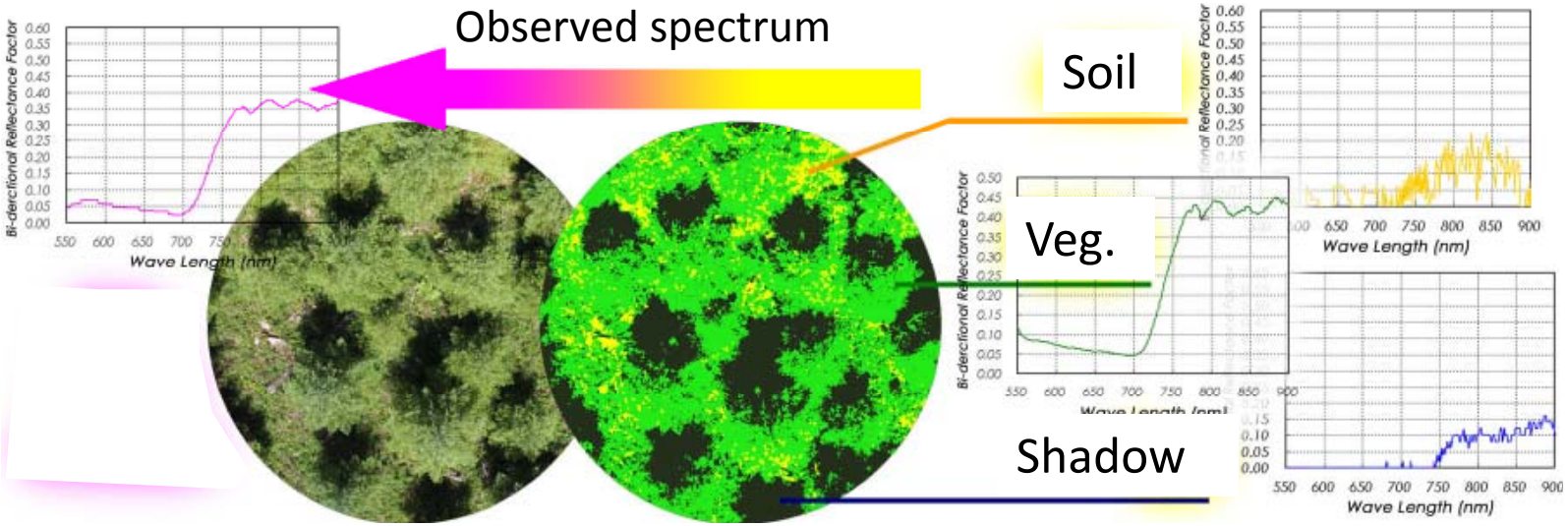
φ_o : *Sensor* Azimuth Angle

CR : Cover Ratio

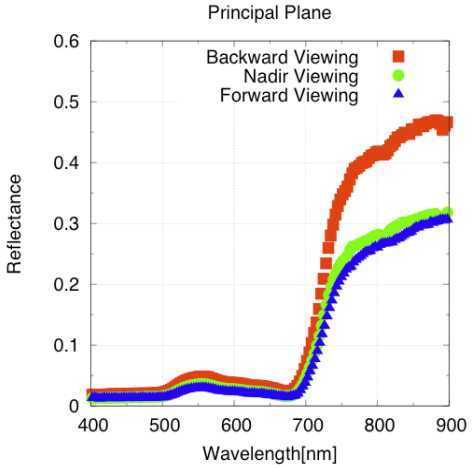
RF : Reflectance

λ : Wave length

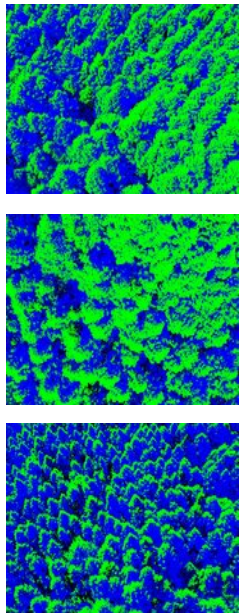
i : Category Number



Category Cover Ratio & Spectrum (from Helicopter measurement)

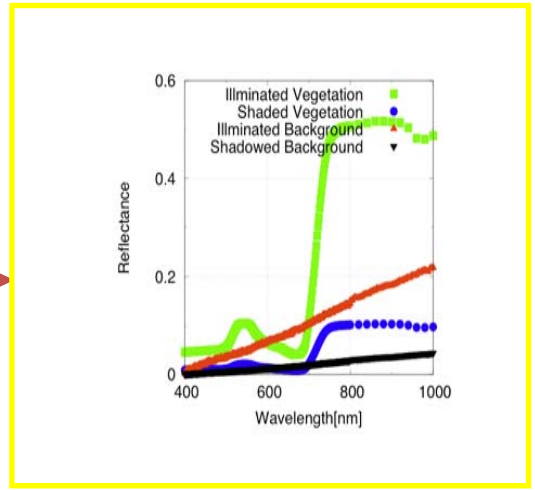


Observed Spectral Reflectance on different sensor angles



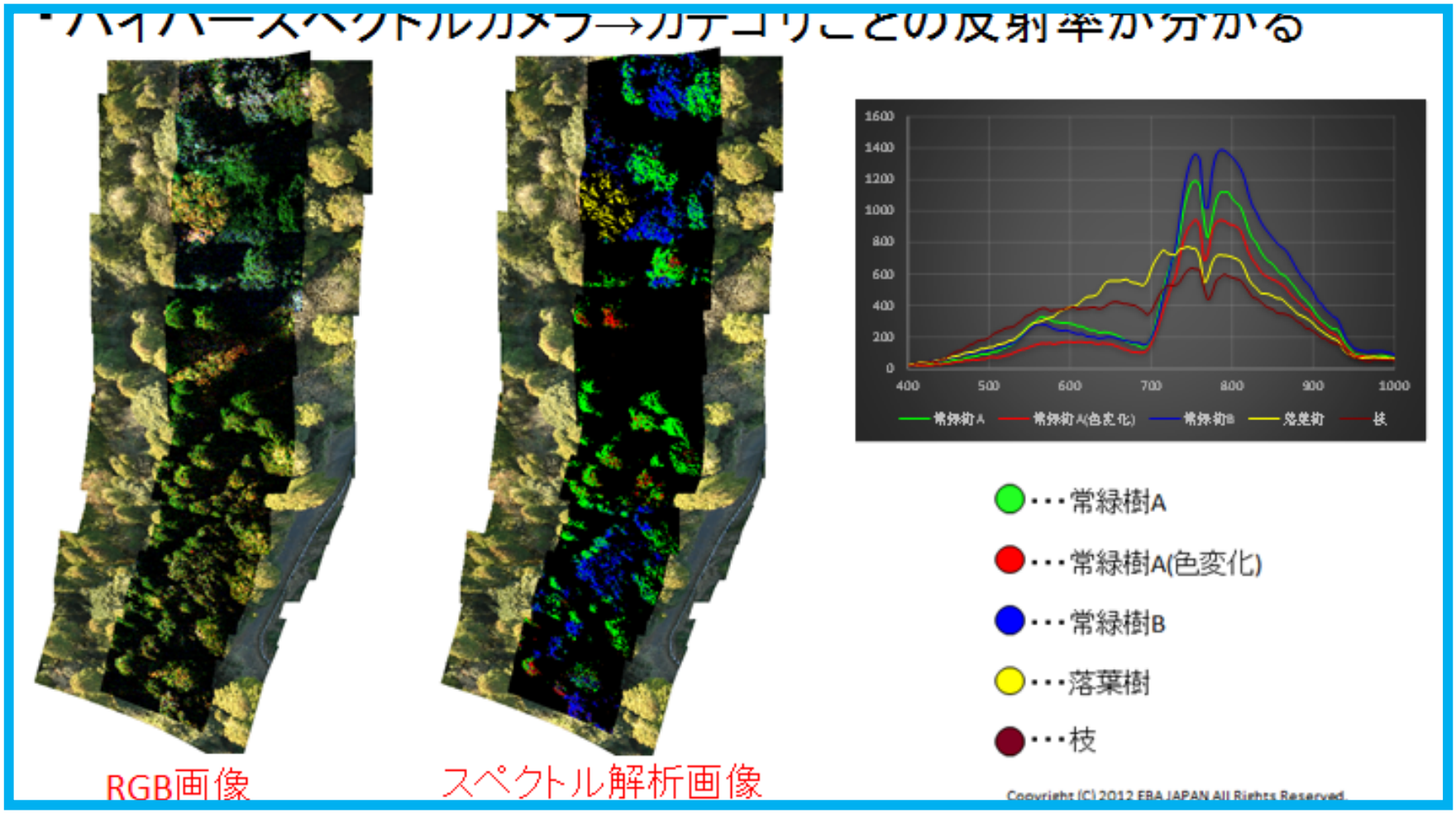
Apparent Cover Ratio of Categories

Obtained from Helicopter measurement



Spectral Reflectance of each Category

Hyper spectral camera on FUGINS

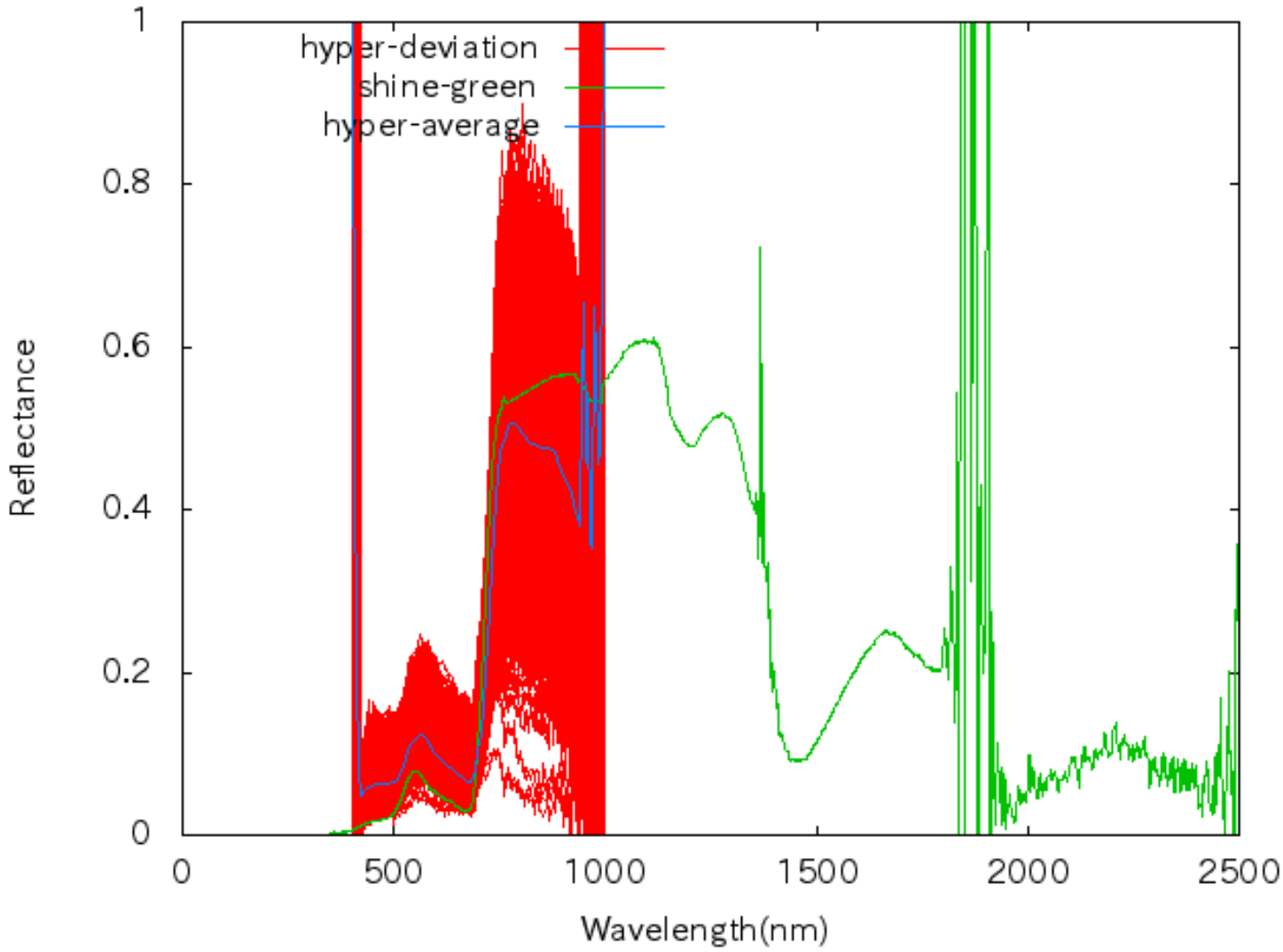


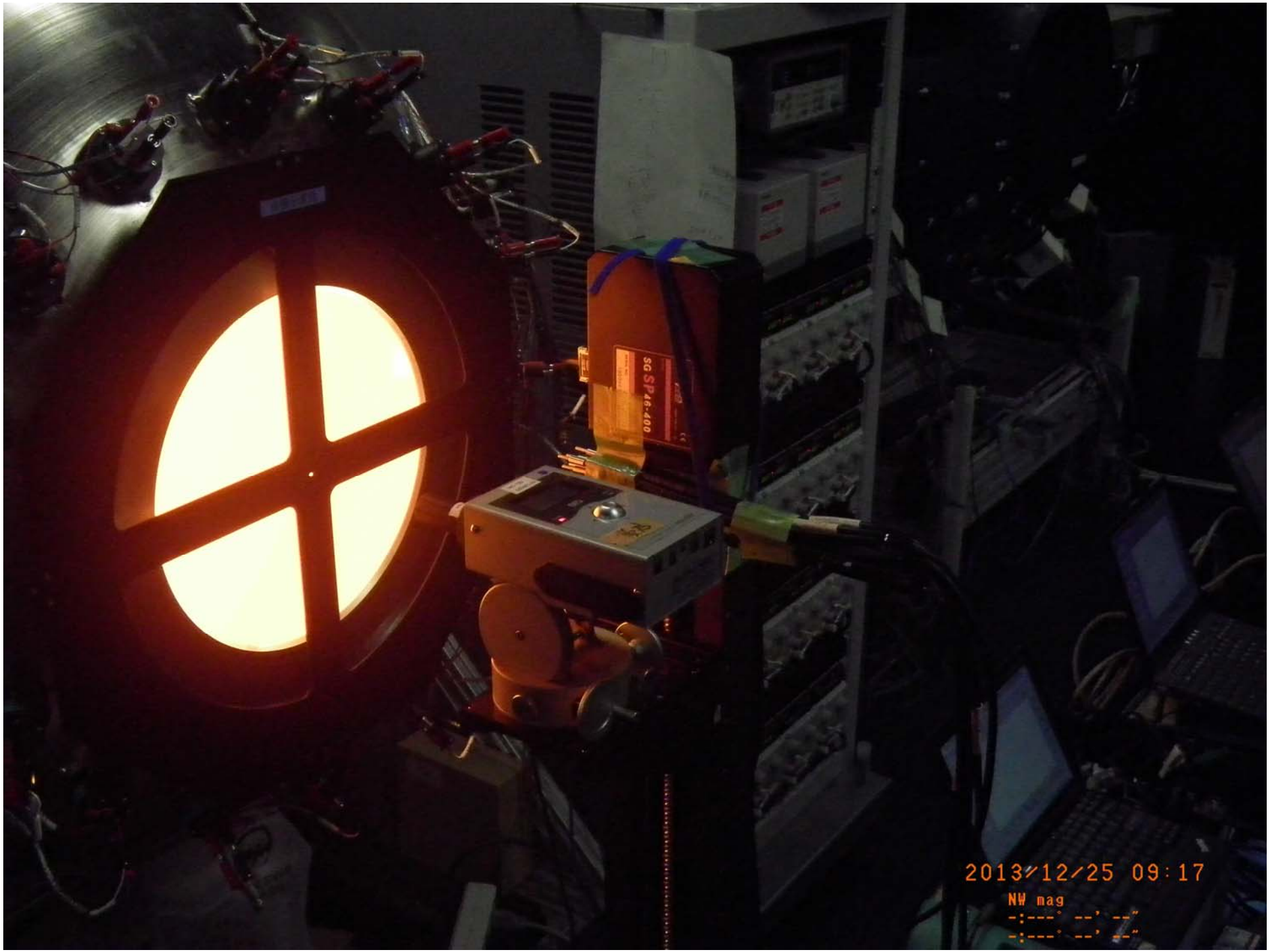
Hyper spectral camera candidate

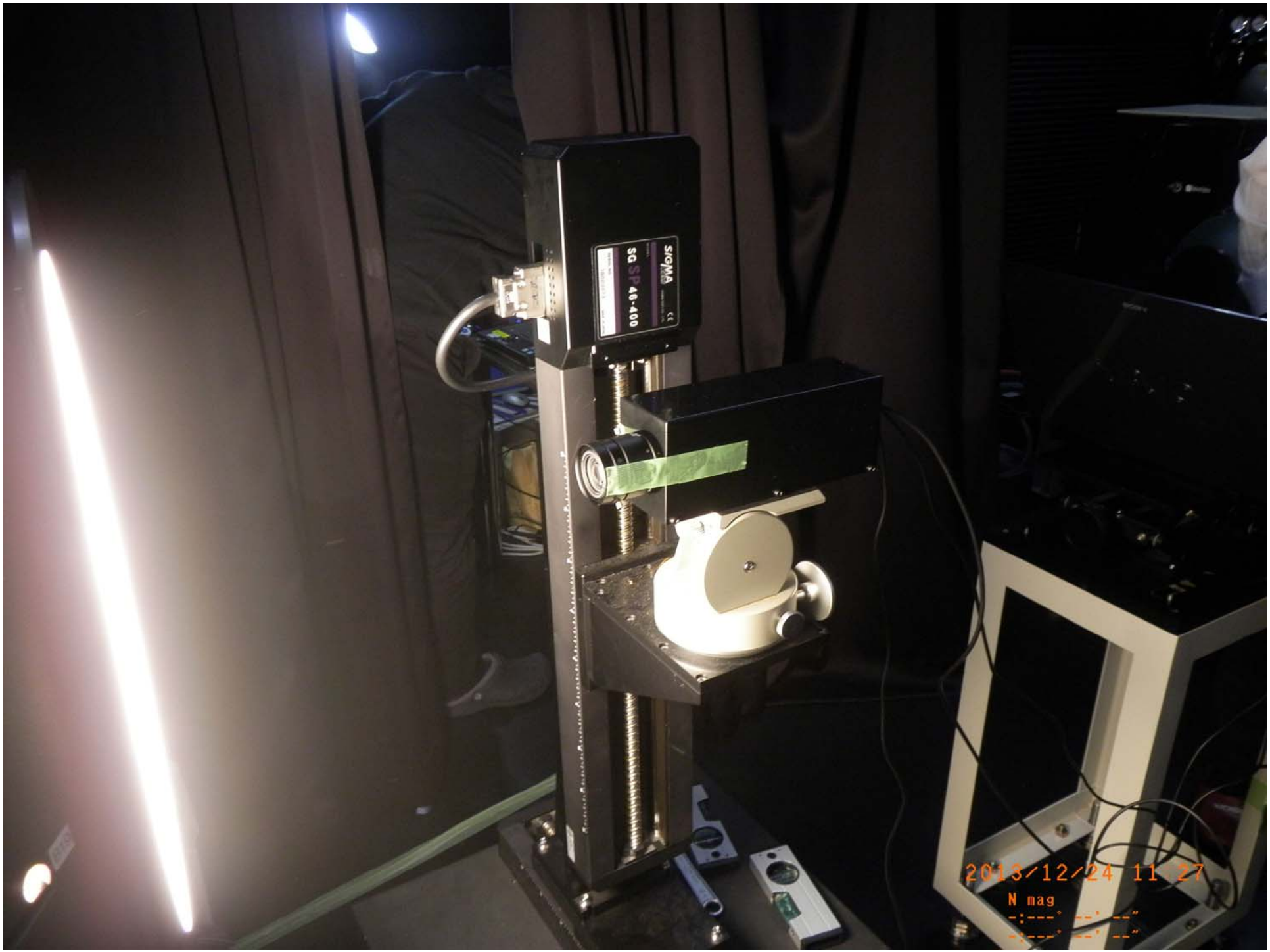
- For UAV
  - Light
  - Small
- NH-3(to NIR)
- NH-7(to NIR)
- SIS（to short wave IR)

NH-7 (Hyper spectral camera)

Problems of spectral image




SG SP46-400
2013/12/25 09:17
NW mag


SG SP 40-400
2013/12/24 11:27
N mag

SIGMA
SG
49-400
2013/12/24 15:03

Summary

- Improvement of BiRS
  - Tree species information added to the DSM data
  - Reflectance data of each tree species (Sun, shade)
  - Consider use of hyper spectral camera data
- Test of hyper spectral cameras
  - Collection of field data
  - Cooperation of Dr. Sakuma