Tree measurements by using Ground Based SAR

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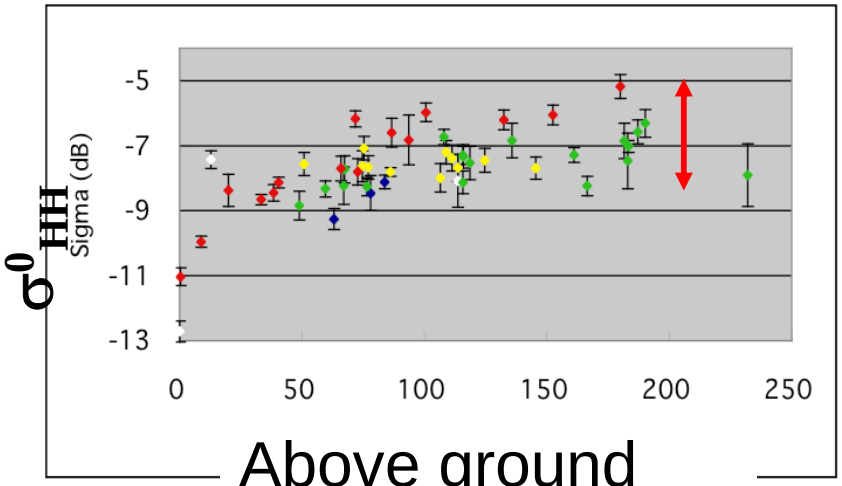
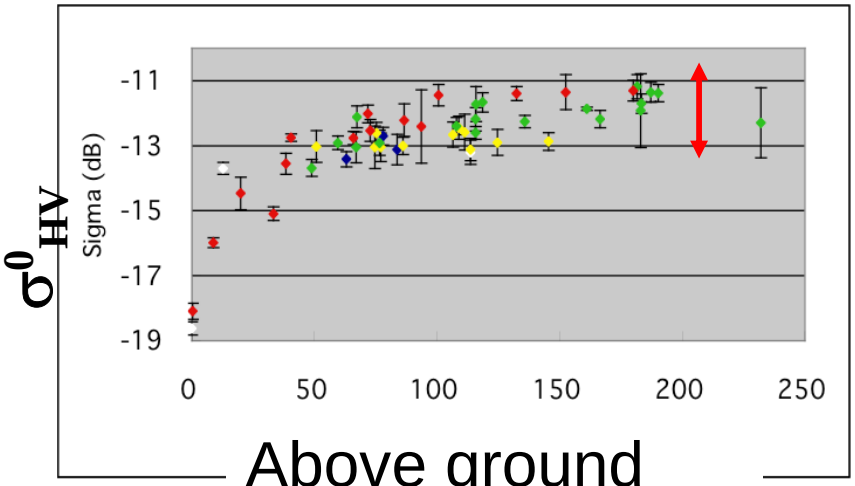
Previous study



Above ground Biomass(tons/ha)



Above ground Biomass(tons/ha)

PiSAR(L-band)

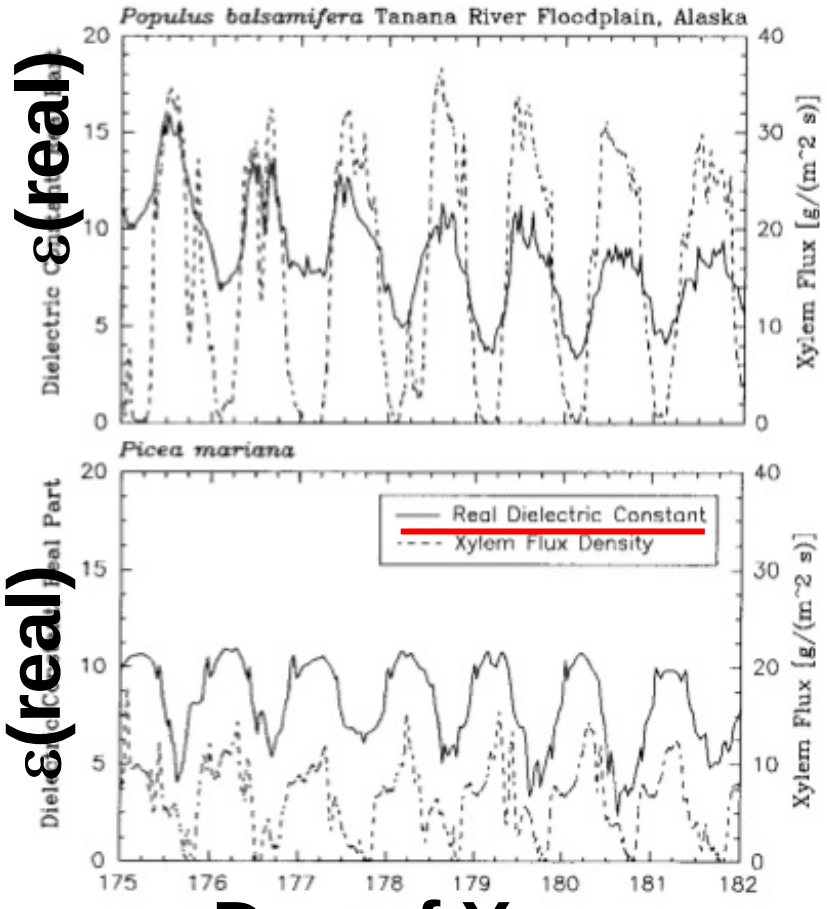
Large dispersion
=> Difference of tree number density

Large dispersion
=> ?

M. Watanabe, et al., IEEE Trans. Geosci, Remote Sensing, Vol. 44, 2006

Permittivity change of a tree

Diurnal change



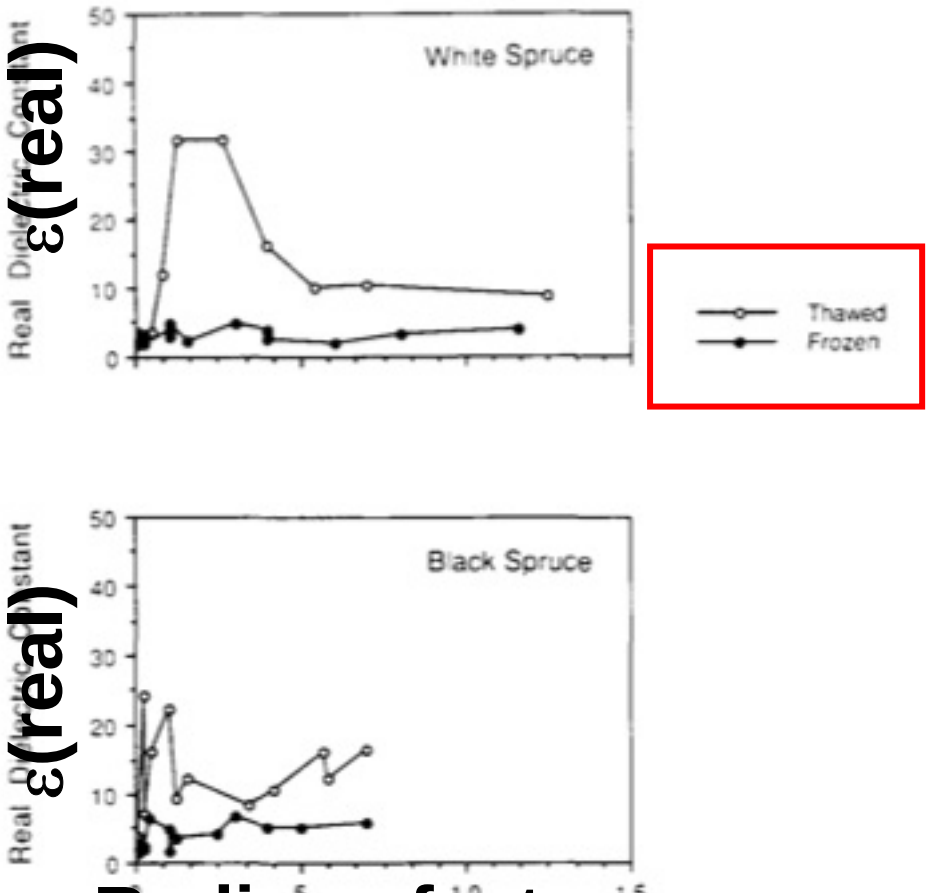
ε(real)

ε(real)

Day of Year

IEEE Trans. Geosci. Remote Sensing, Vol. 37, 1999
K. McDonald, et al.

Thawed/Frozen



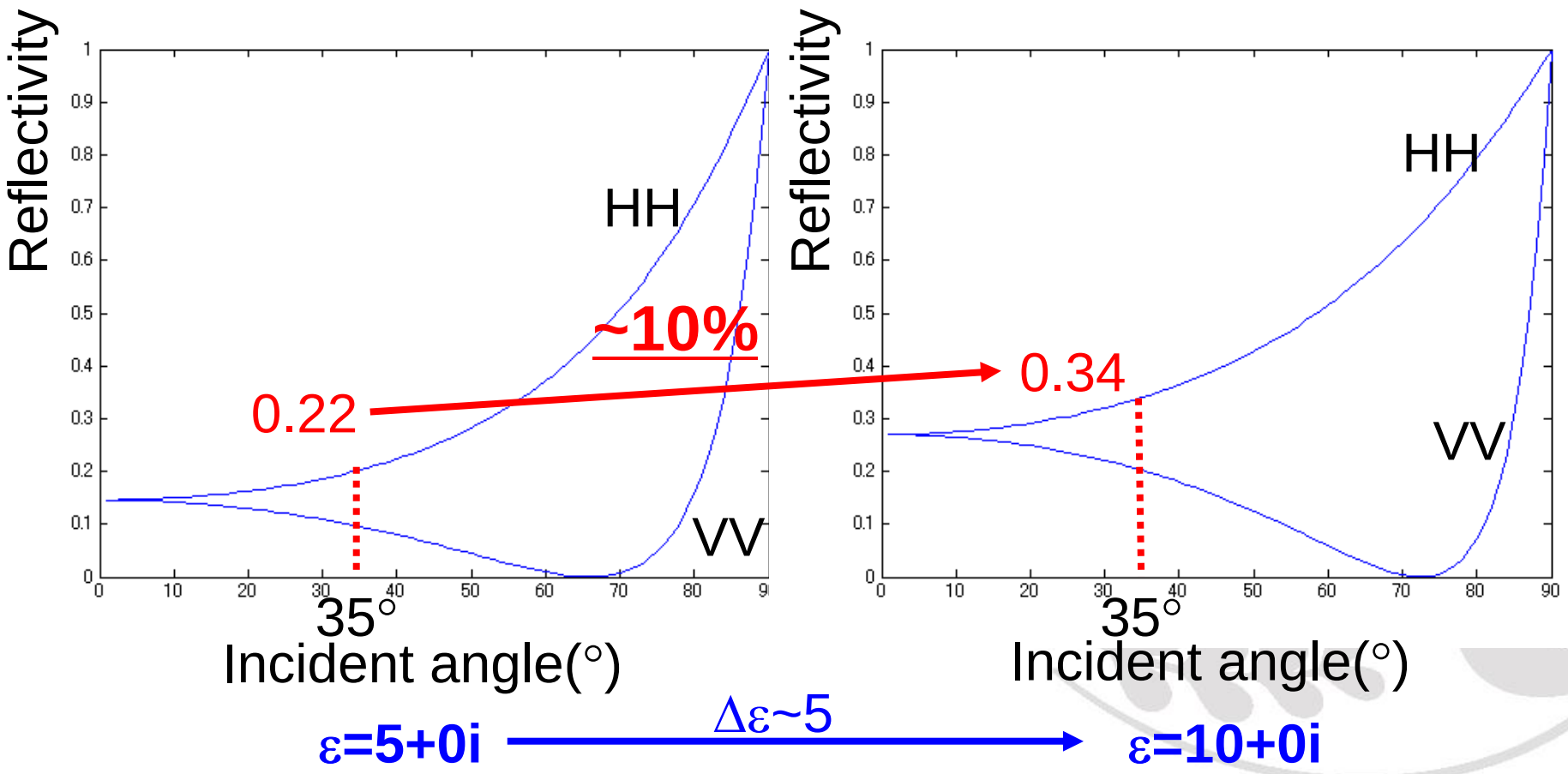
ε(real)

ε(real)

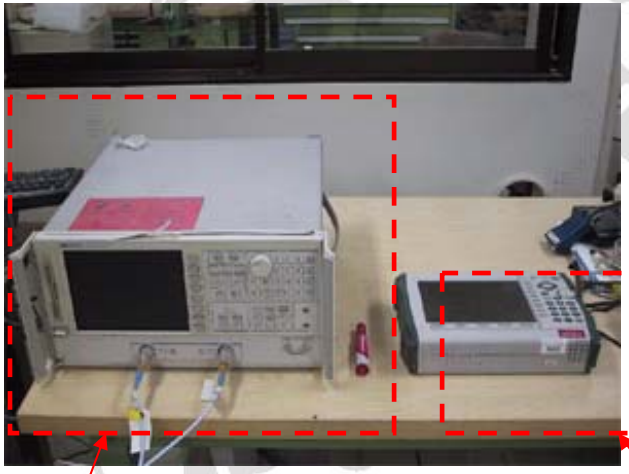
Radius of a tree

IEEE Trans. Geosci. Remote Sensing, Vol 32, 1994
JoBea Way, et al.

Permittivity => Reflectivity



Polarimetric Ground Based SAR (GB-SAR)



- Mobility and Availability
- Easy to measure

To analyze a scattering mechanism

To estimate a diurnal change of the permittivity

CENTER FO
NORTHEAST
ASIAN STUD

Three tree measurements with GB-SAR

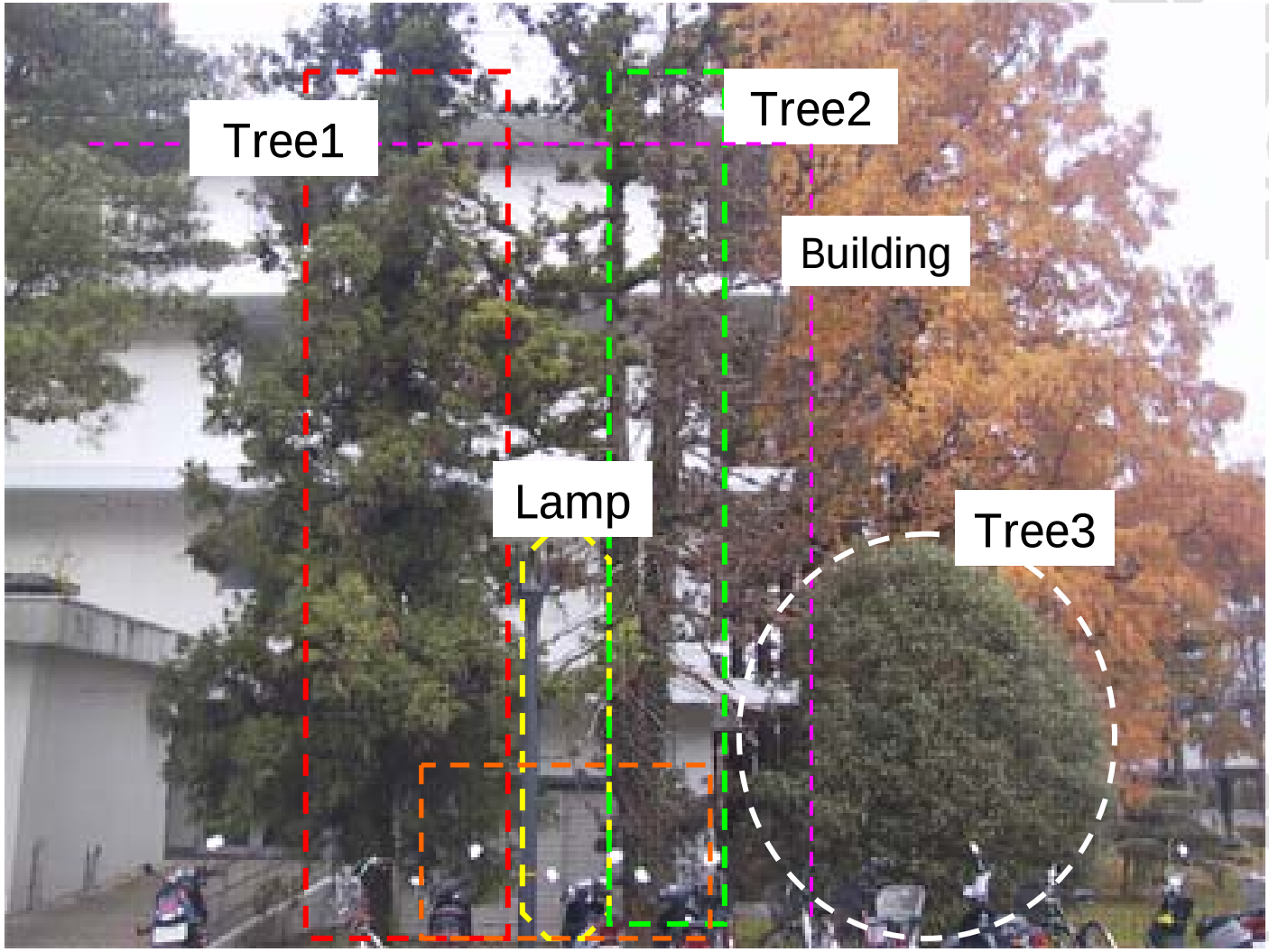
Exp.1) Nov. 27, 2007@Tohoku University

Exp. 2) Dec. 22, 2007@Riverbank in Sendai
(with PALSAR observation)

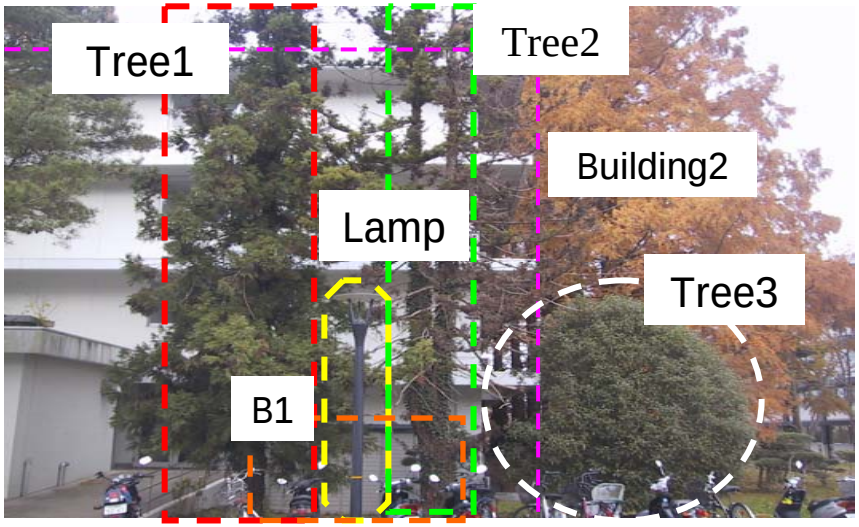
Exp. 3) Jan. 22, 2008@Tohoku University

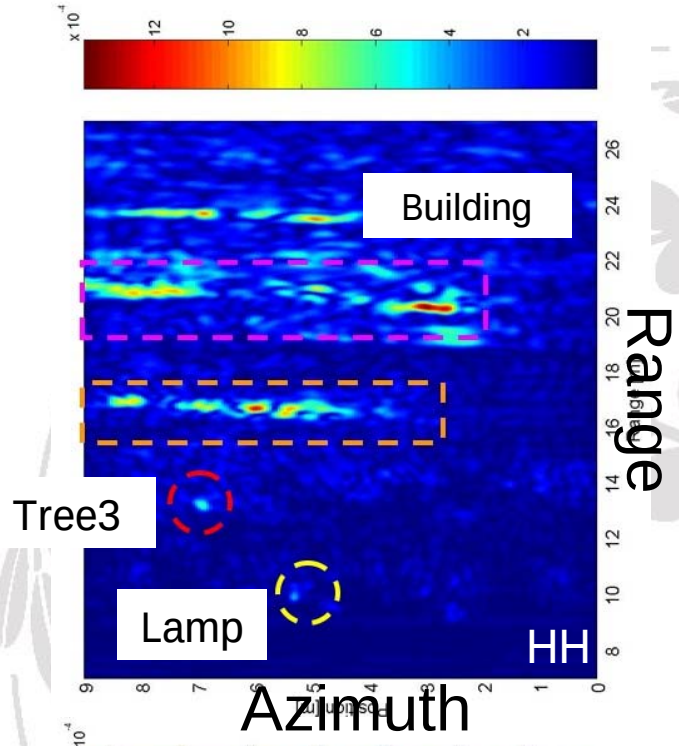
Freq. Range: **0.8GHz~1.8GHz**

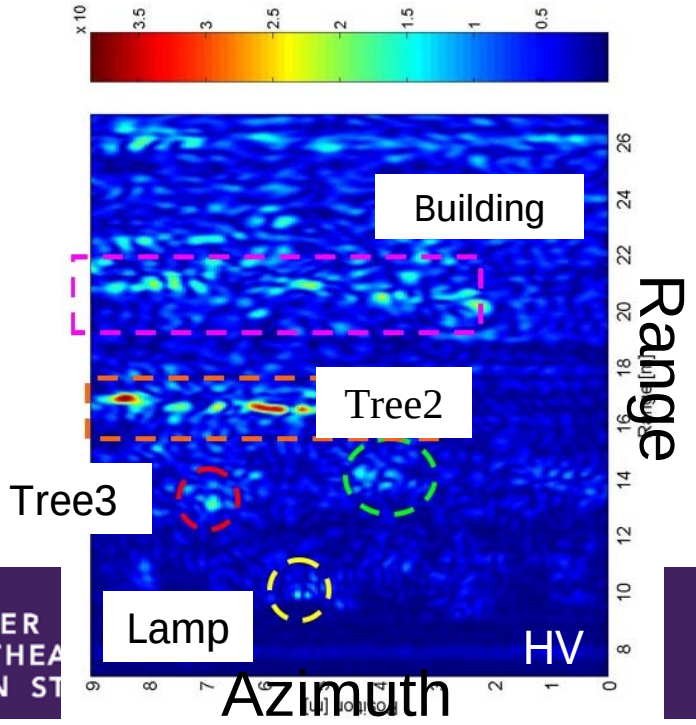
Exp. 1) Nov. 27, 2007@Tohoku University

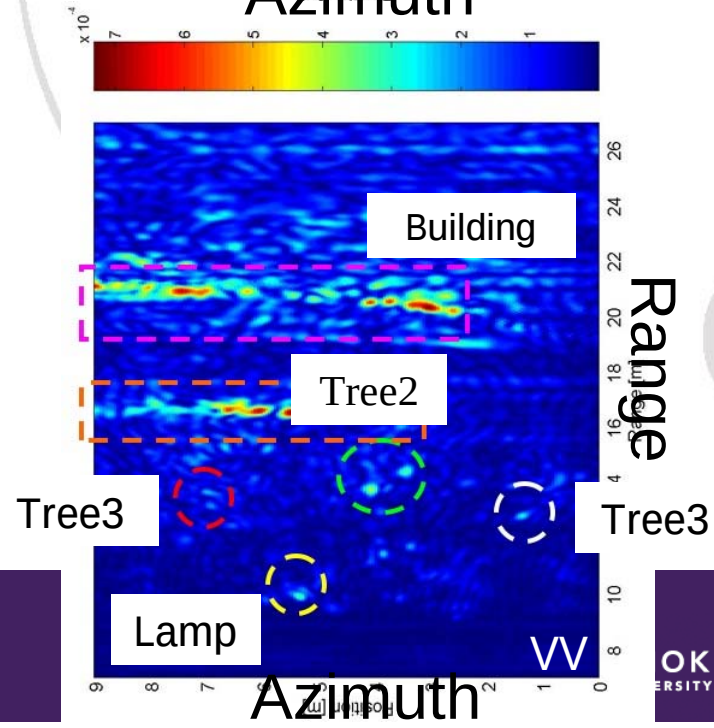


Radar image


Tree1
Tree2
Building2
Lamp
Tree3
B1


Building
Tree3
Lamp
HH
Range
Azimuth

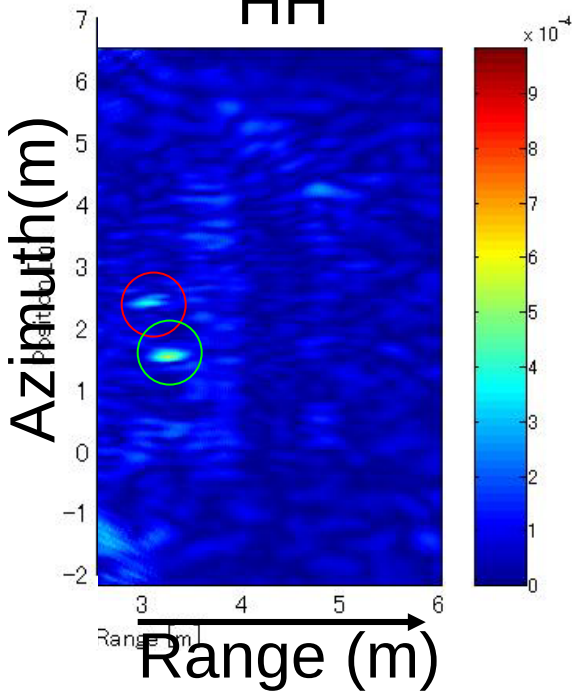

Building
Tree2
Tree3
Lamp
HV
Range
Azimuth


Building
Tree2
Tree3
Tree3
Lamp
VV
Range
Azimuth

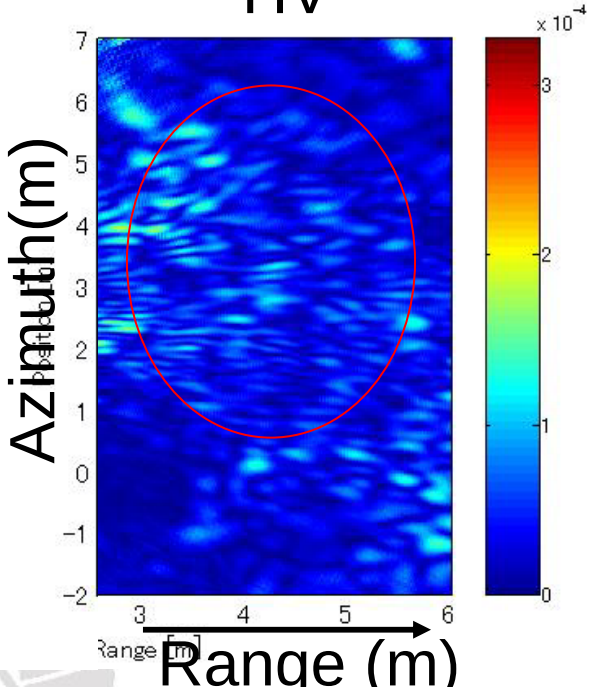
Exp. 2) Dec. 22, 2007@Riverbank in Sendai (with PALSAR observation)

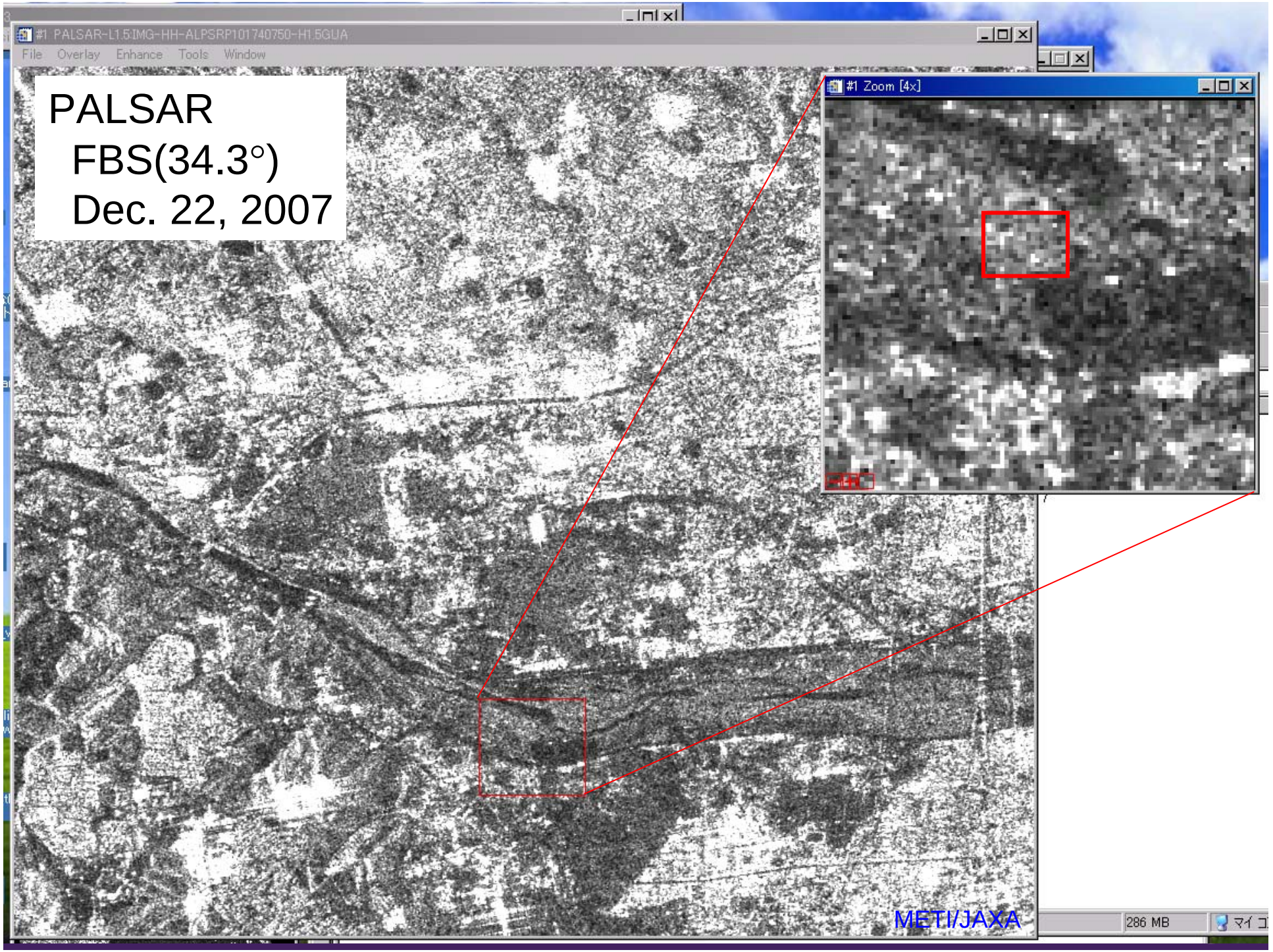
GB-SAR image

HH

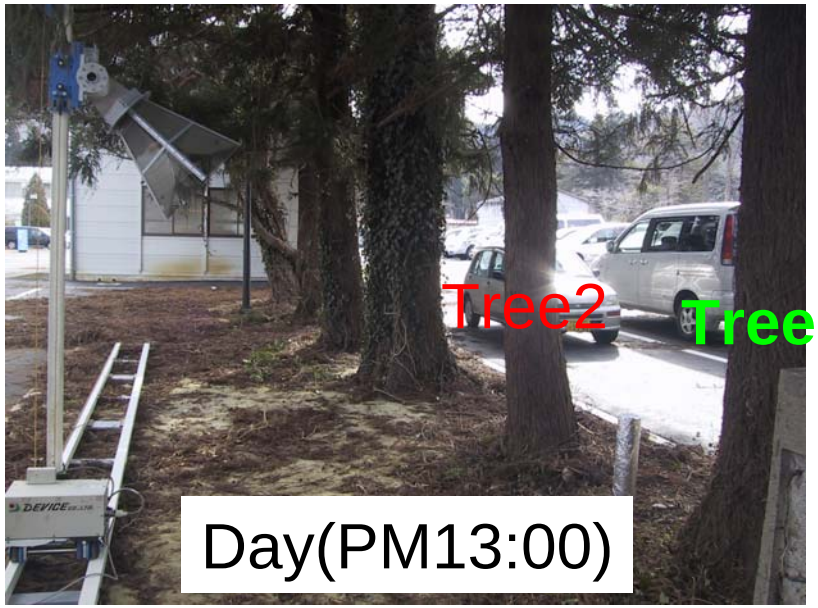


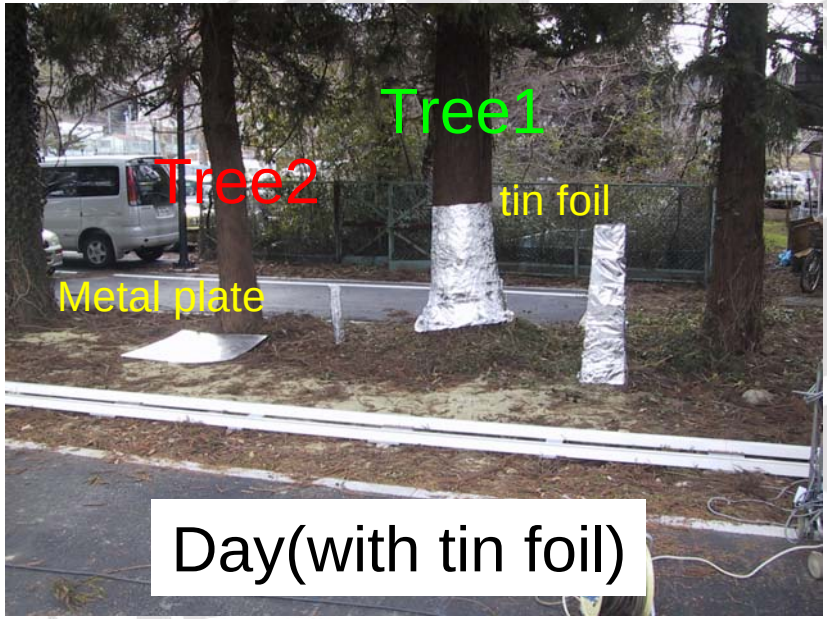
HV

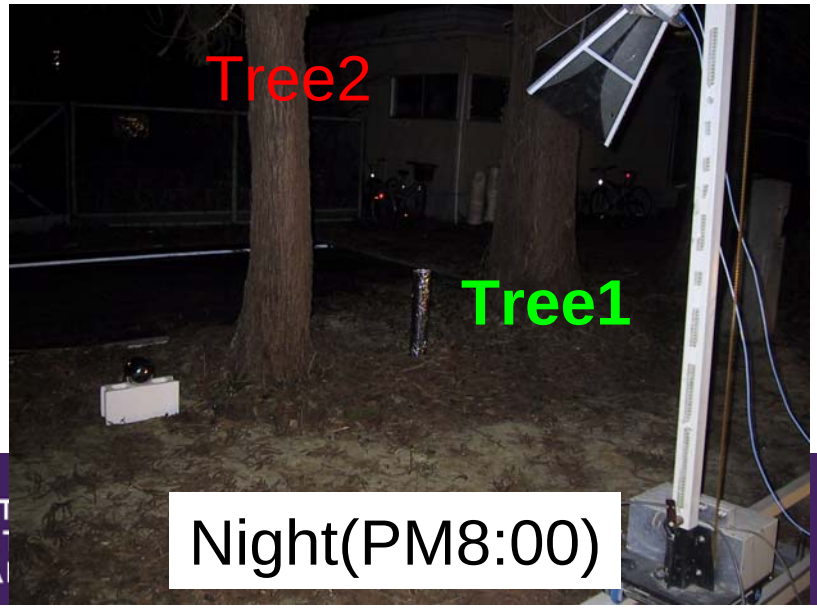



#1 PALSAR-L1.5IMG-HH-ALPSRP101740750-H1.5GUA
File Overlay Enhance Tools Window
PALSAR
FBS(34.3°)
Dec. 22, 2007
#1 Zoom [4x]
METI/JAXA
286 MB

Exp. 3) Jan. 22, 2008@Tohoku University



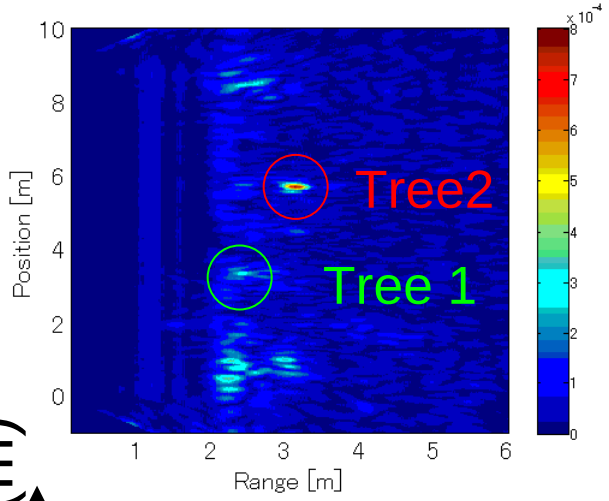


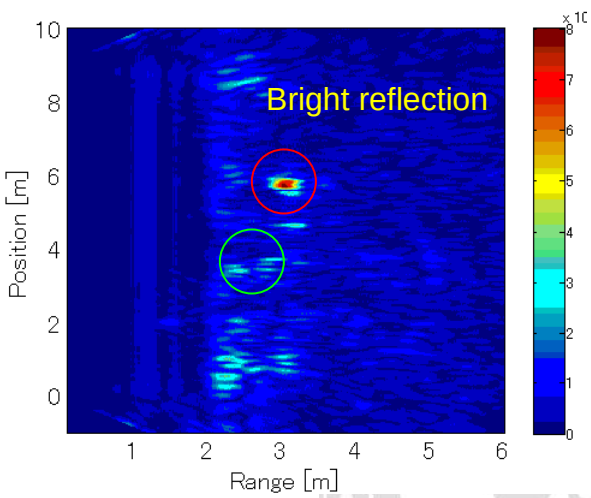


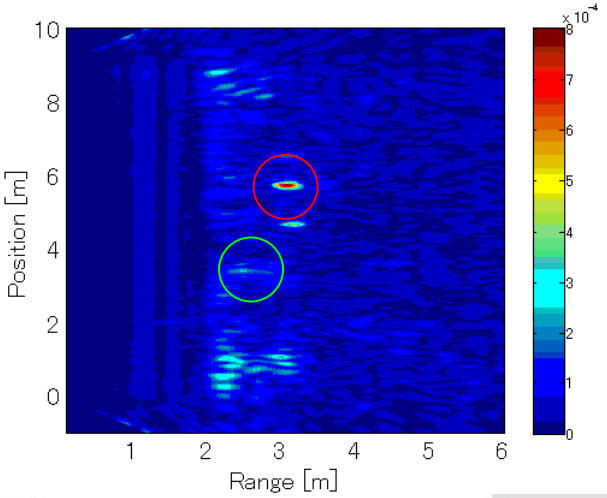
Day

Day(with tin foil)

Night



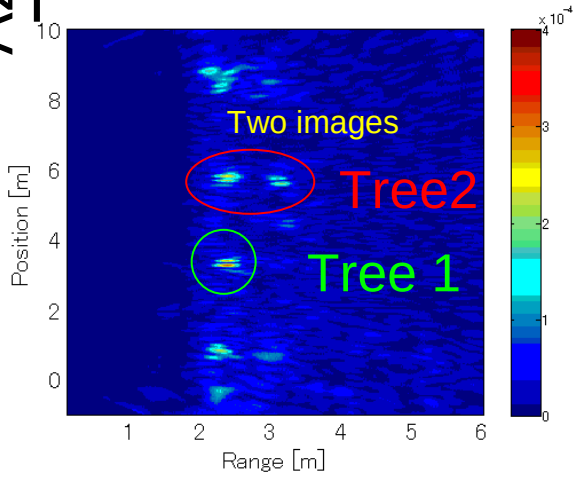


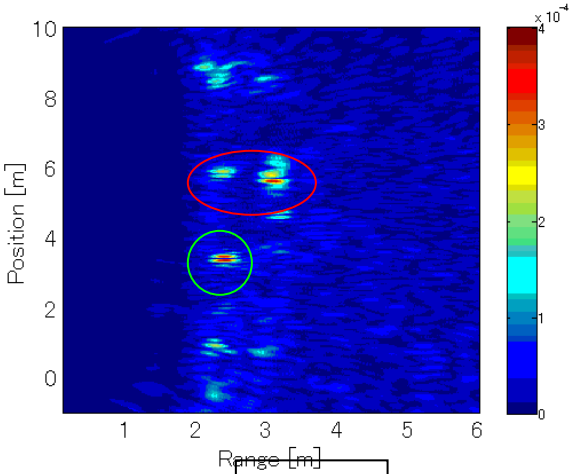


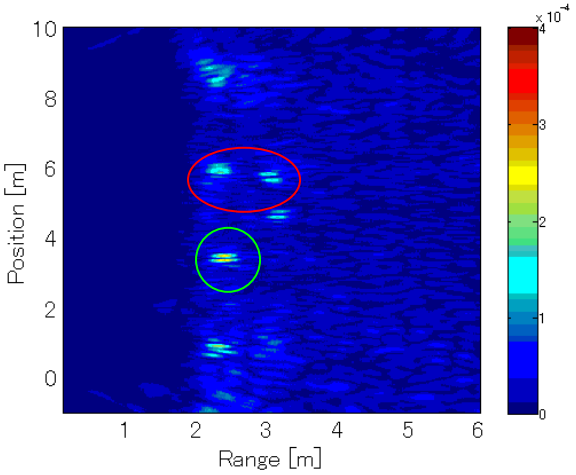
HH

Azimuth(m)

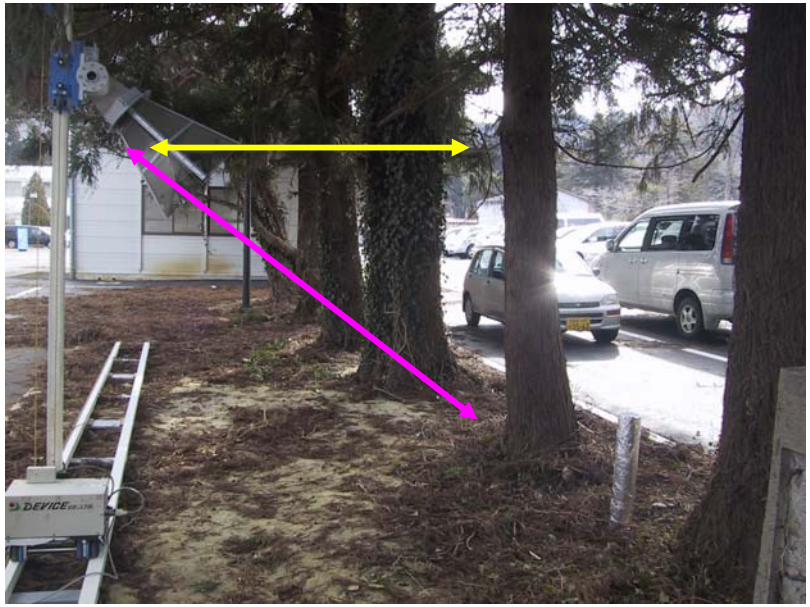
Range(m)



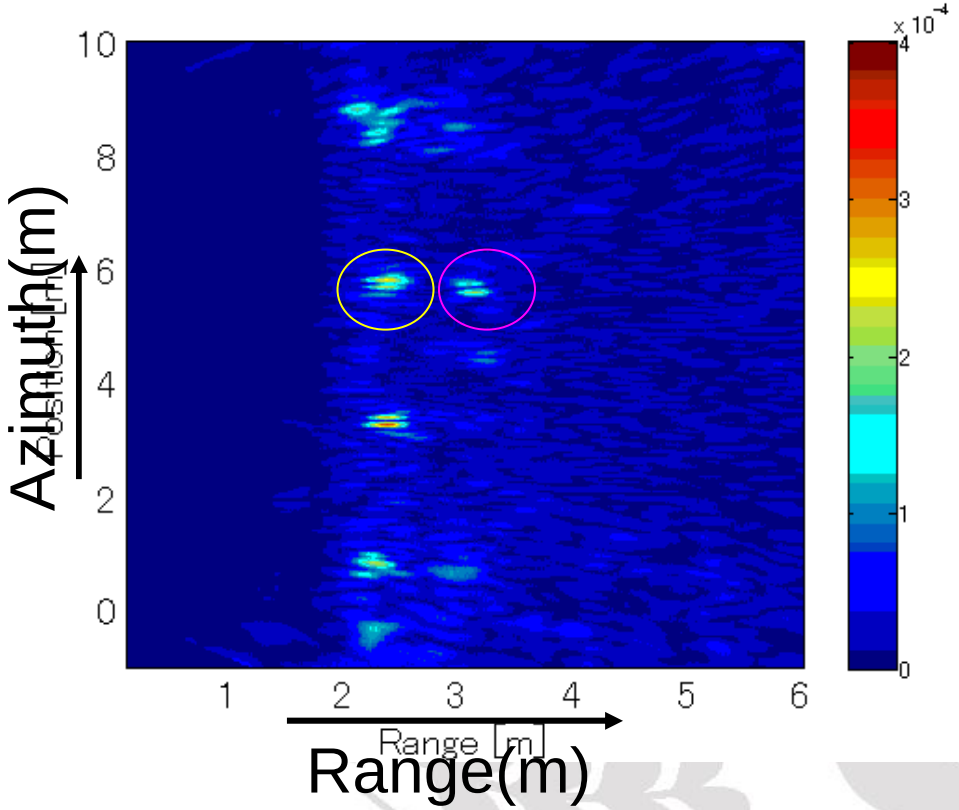




HV



Broad antenna pattern



HV

Summary

- Start to use GB-SAR for estimating
  - Dominant scattering processes
  - A diurnal change of permittivity

  of a tree.

Future

- Link the GB-SAR data with PALSAR data.
- Examine the origin of the uncertainty of the biomass-σ^0 relation