

Validation Plan of the SMAP Soil Moisture Products in the GCOM-W Validation Sites in Mongolia, Thailand and Australia

Ichiro KAIHOTSU (Hiroshima U.), Toshio KOIKE (U. Tokyo),
Keiji Imaoka (JAXA) and Hideyuki Fujii (JAXA)

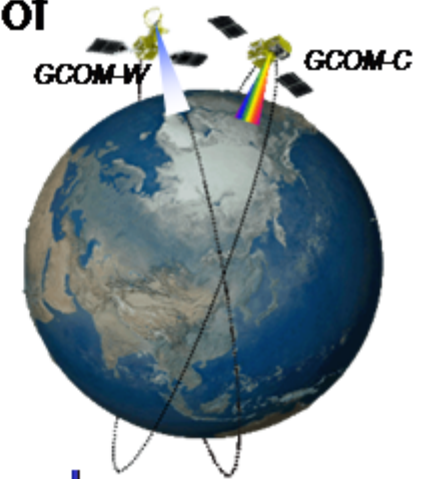
1. Background and purposes
2. Validation sites of GCOM-W
3. Validation results of AMSR-E and SMOS
4. Summary

Global Change Observation Mission (GCOM) of JAXA

- Follow-on mission of ADEOS-II (or Midori-II) and AMSR-E on EOS Aqua.
- Two (2) medium size satellites: **GCOM-W** and GCOM-C
- Three (3) consecutive satellite generations (GCOM-W1, -W2 and -W3) with one year overlap will result in over 13 years of observation.

▪ GCOM-W1

- Instrument:
 - AMSR follow-on instrument
- Contribute to:
 - Long-term observations related to global water and energy circulation.
 - Practical applications including numerical weather prediction and maritime applications.
- **Launch : November in 2011**



AMSR2 Instrument



- Deployable main reflector system with 2.0m diameter.
- Frequency channel set is identical to that of AMSR-E except 7.3GHz channel for helping RFI mitigation.
- Two-point external calibration with the improved HTS (hot-load).
- Deep space calibration maneuver to check consistency between main reflector and CSM.
- Add a redundant momentum wheel to increase reliability.

GCOM-W1/AMSR2 characteristics	
Scan and rate	Conical scan at 40 rpm
Antenna	Offset parabola with 2.0m dia.
Swath width	1450km
Incidence angle	Nominal 55 degrees
Digitization	12bits
Dynamic range	2.7-340K
Polarization	Vertical and horizontal

AMSR2 Channel Set				
Center Freq. [GHz]	Band width [MHz]	Pol.	Beam width [deg] (Ground res. [km])	Sampling interval [km]
6.925/7.3	350	V and H	1.8 (35 x 62)	10
10.65	100		1.2 (24 x 42)	
18.7	200		0.65 (14 x 22)	
23.8	400		0.75 (15 x 26)	
36.5	1000		0.35 (7 x 12)	
89.0	3000		0.15 (3 x 5)	5

Purposes

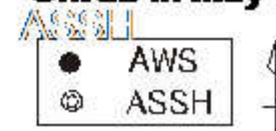
- ✂ To make a validation of GCOM-W soil moisture measurement algorithm and SMOS/SMAP soil moisture products in validation sites of GCOM-W in the Mongolian Plateau, east Thailand and east Australia
- ✂ To carry out globally synergy observation of surface soil moisture by GCOM-W, SMOS and SMAP



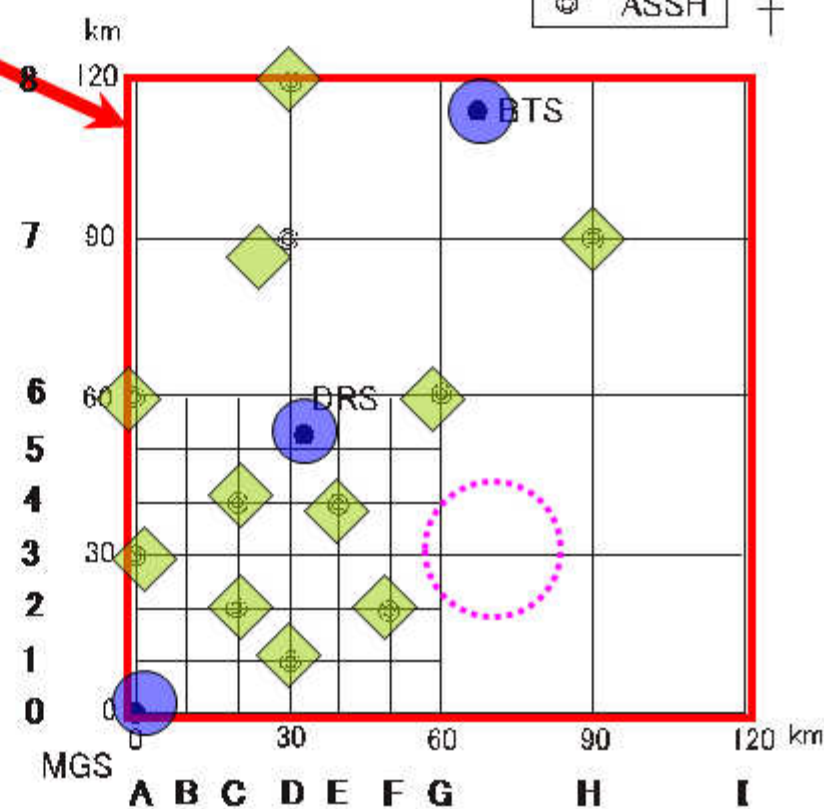
Shortgrass in May-June



Shrub in May-June



Working stations in the MAVEX (Mongol AMSR/AMSR-E/ALOS Validation Experiment) study area as of Sep., 2010 (● : AWS (Automatic Weather Station), ◆ : ASSH (Automatic Station for Soil Hydrology), SA : Study area of AMPEX/MAVEX, UB: Ulaanbaatar)

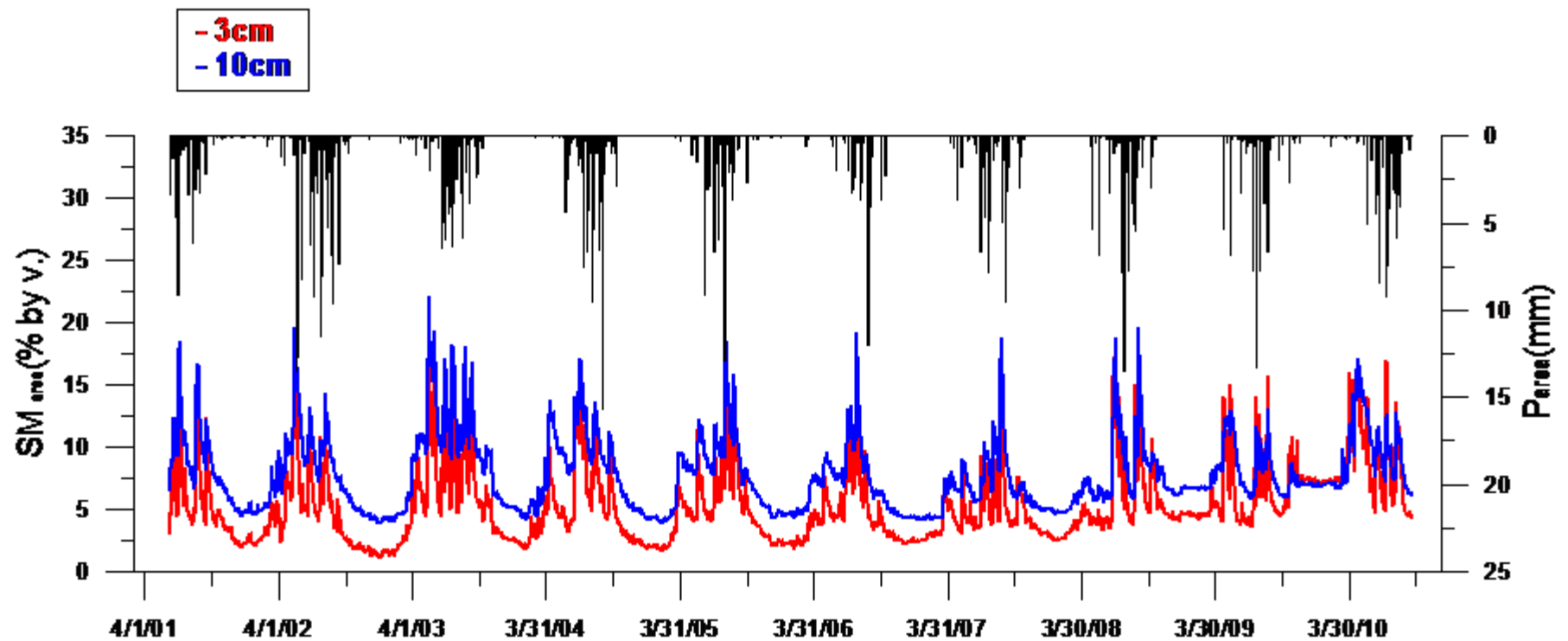


1) DR soil moisture probes, soil temperatures sensors etc.

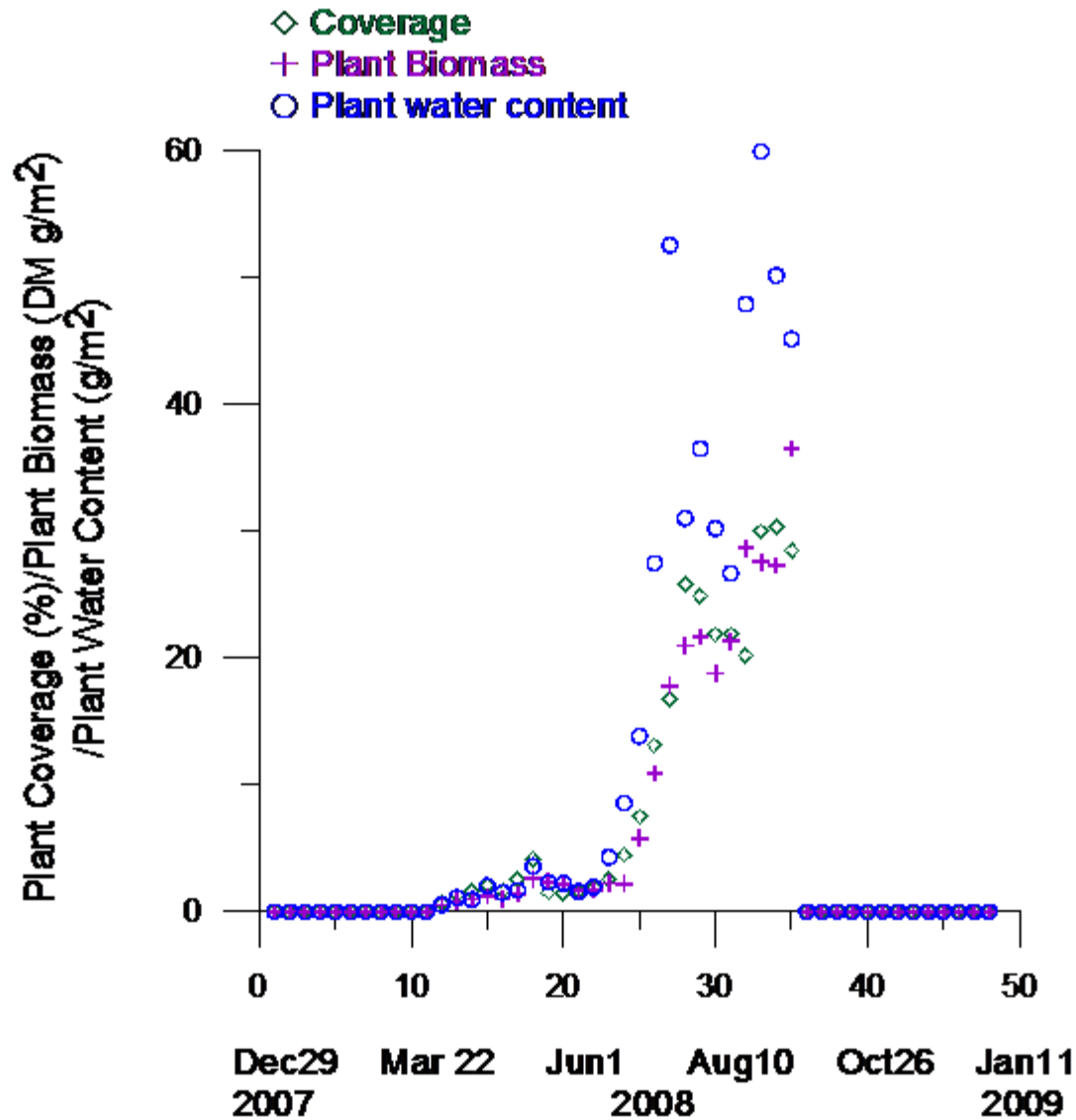
Study area for the AMSR-E/ AMSR2 validation in the Mongolian Plateau (MAVEX site)



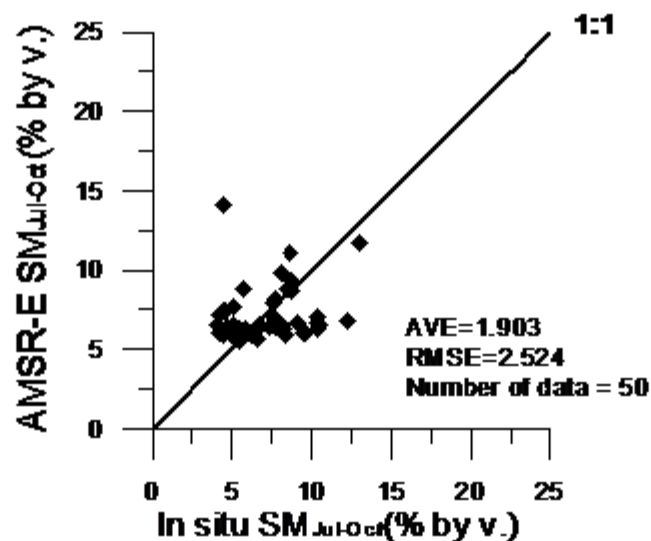
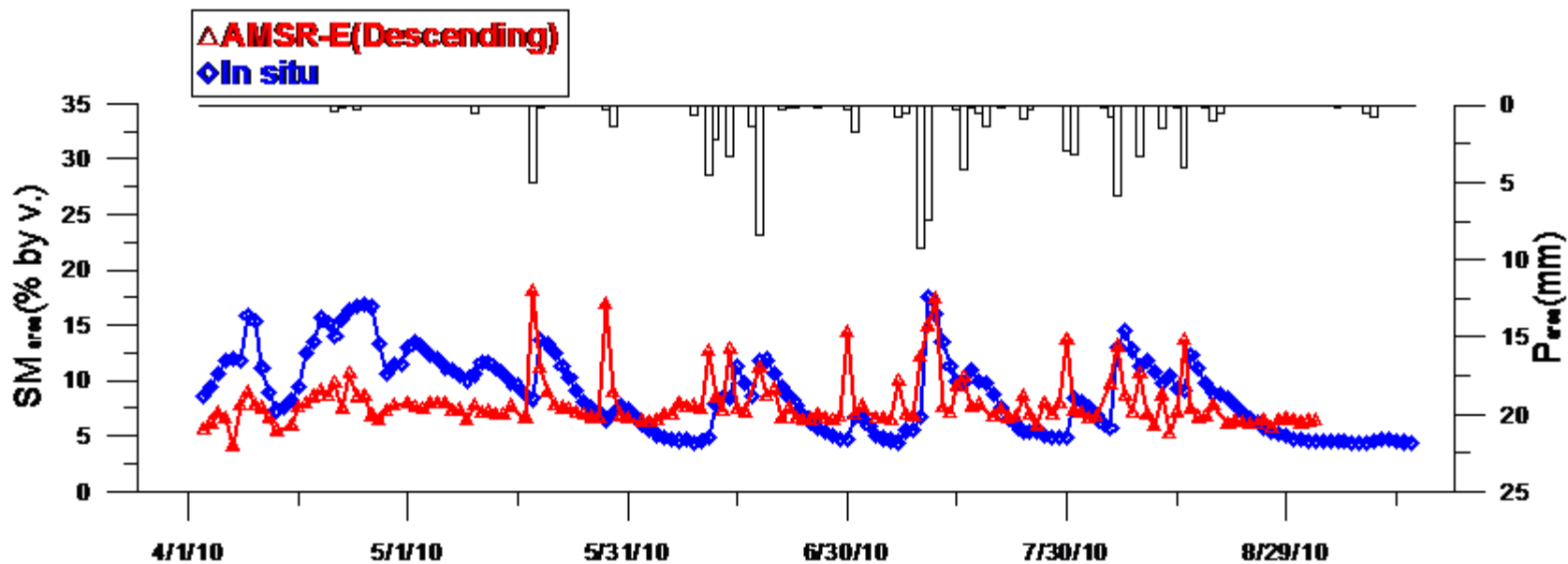
AWS and ASSH



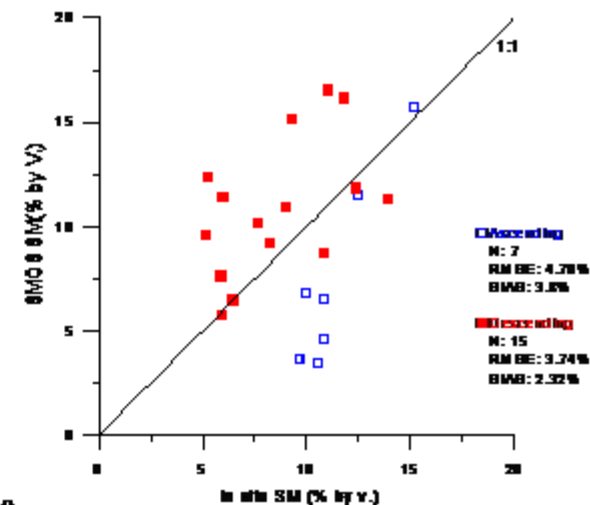
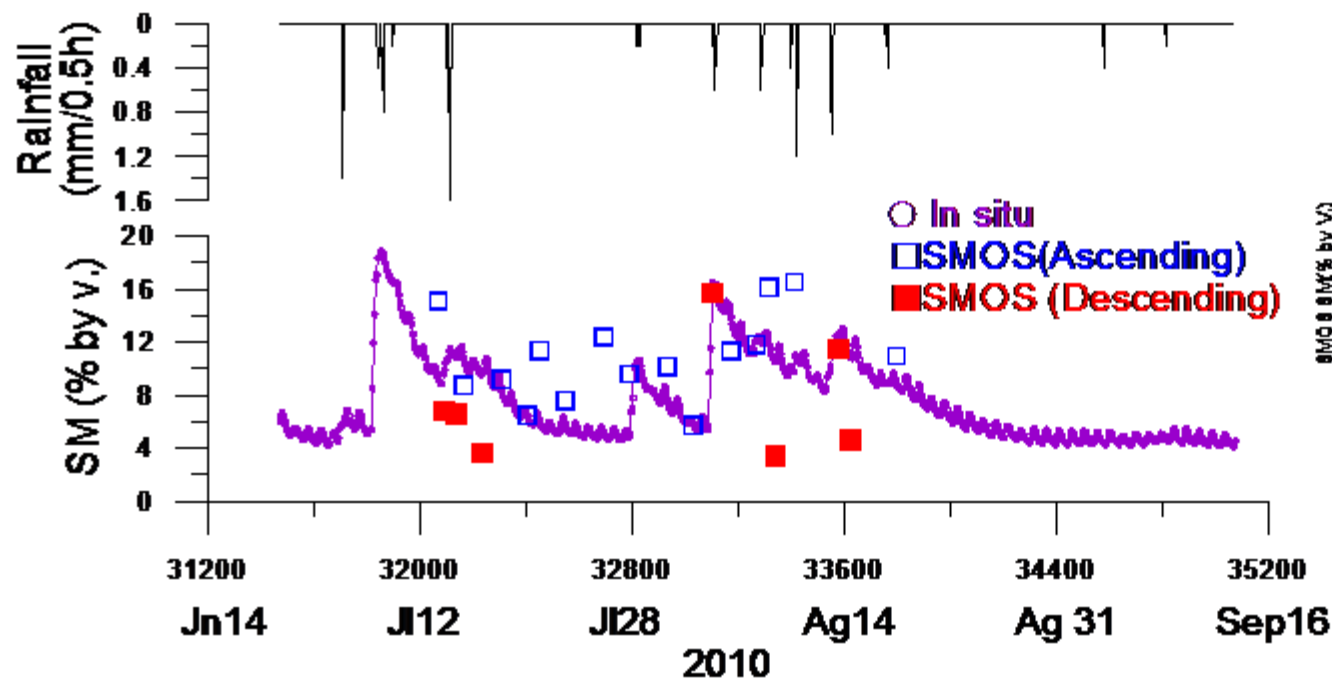
Monitoring results of soil moisture (SM) and precipitation (P_{area}) in the study area in the Mongolian plateau since 2001 (SM_{area}: daily area-averaged soil moisture at 3 and 10 cm depths)



Monitoring results of plant cover, plant biomass, and plant water content in MGS in 2008




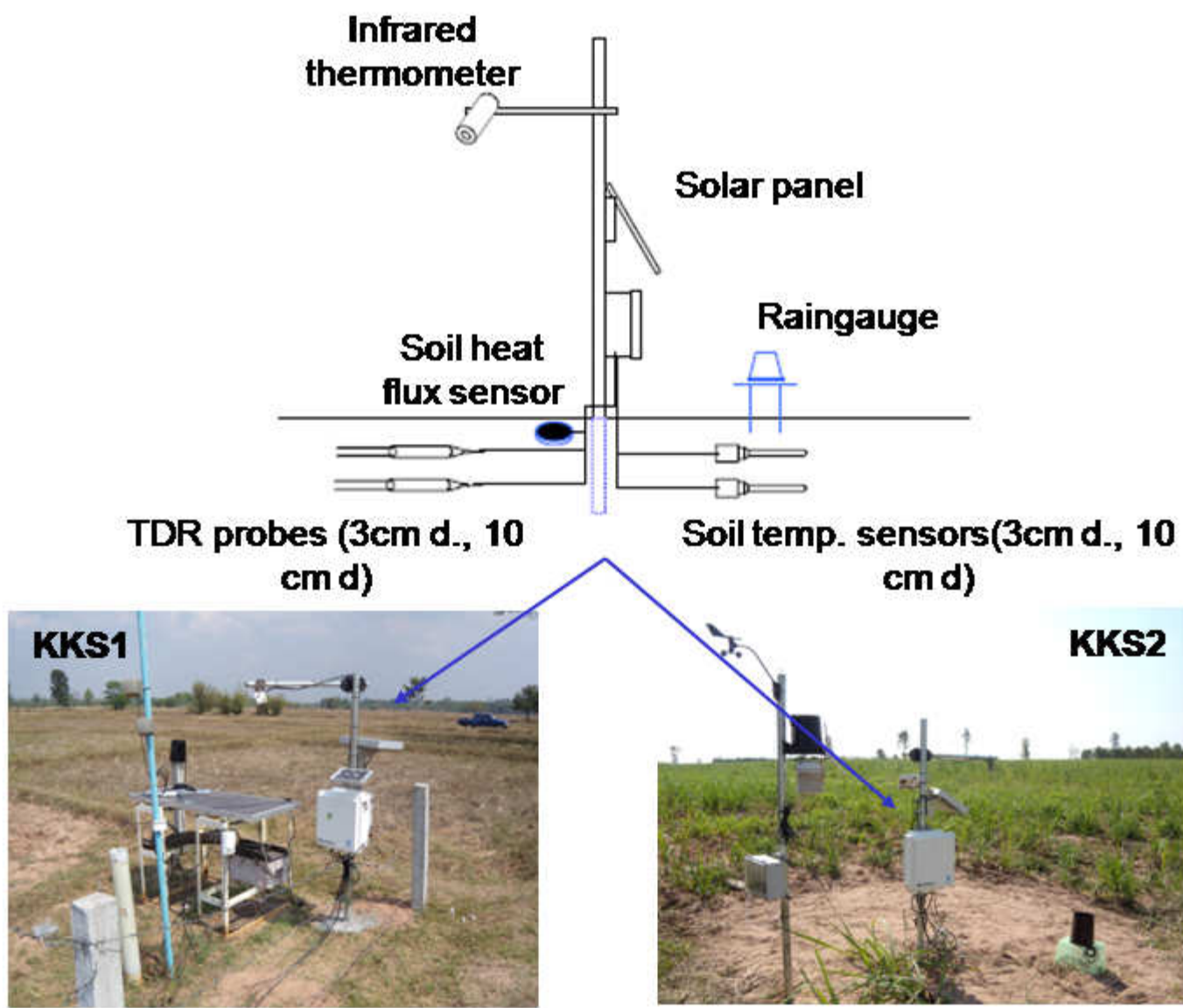
Validation results of AMSR-E descending soil moisture estimation
 (by Koike ver.5.34) in the study area of the Mongolian Plateau in
 2010 (in situ: daily area averaged SM at 3 cm d.)



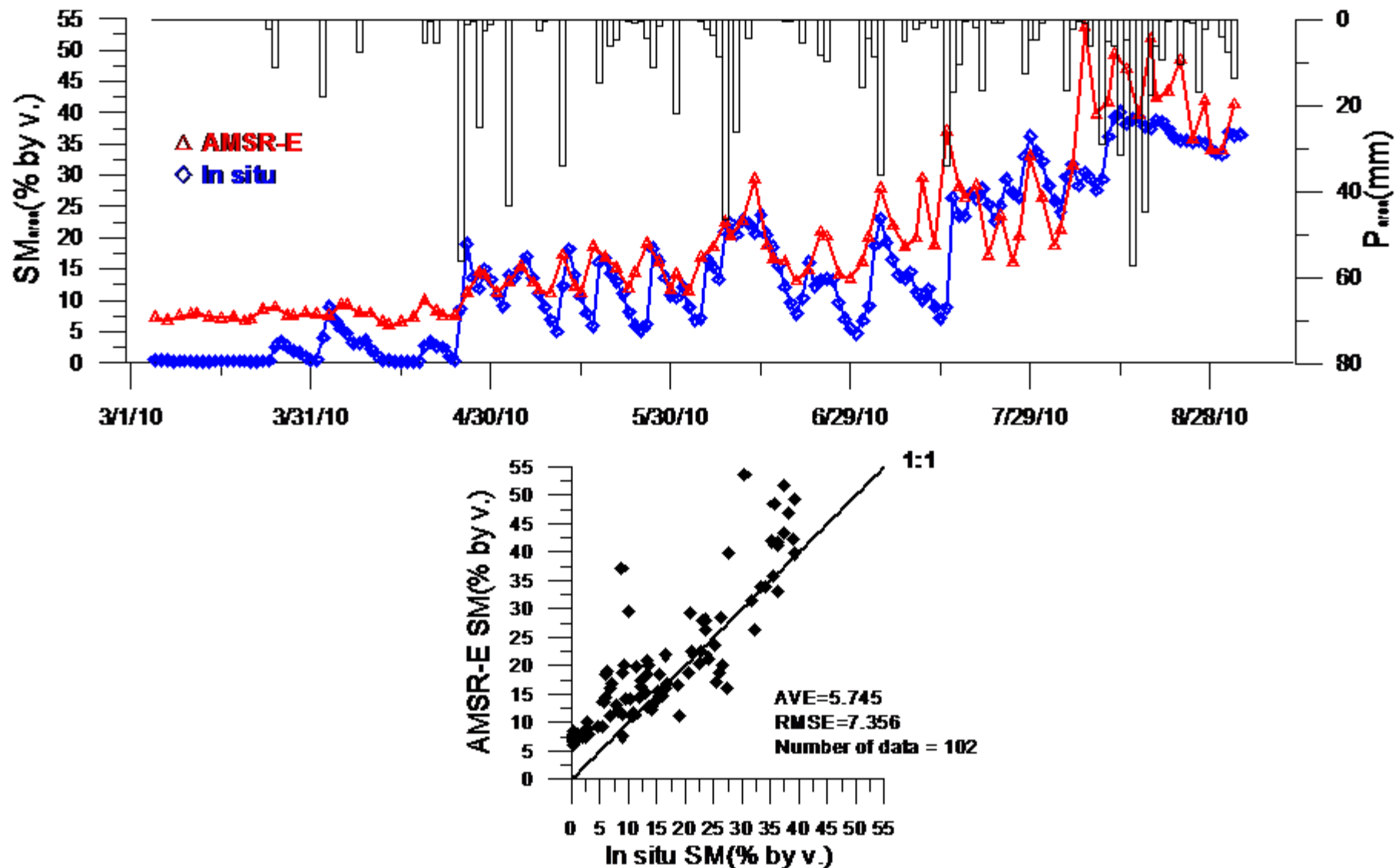
Validation results of SMOS L2 soil moisture products provided in October in 2010 (in situ: daily area averaged SM at 3 cm d.)



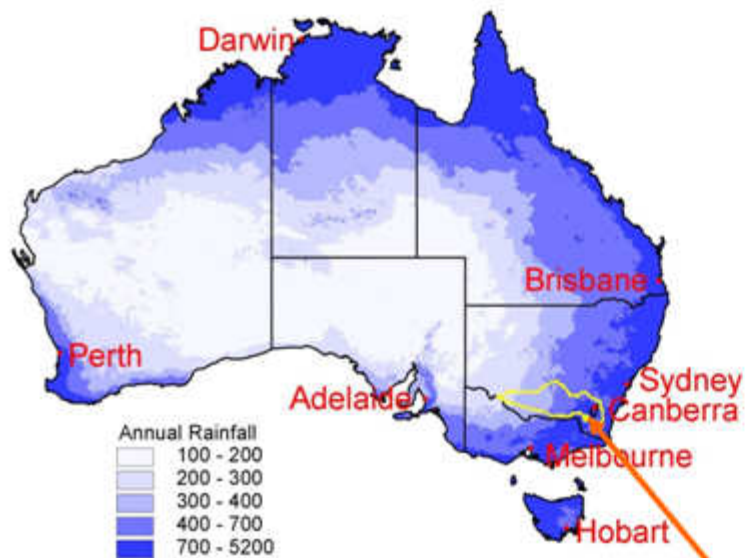
Thai validation site (KKS:  50 km x 50km) in Khon Kaen in east Thailand



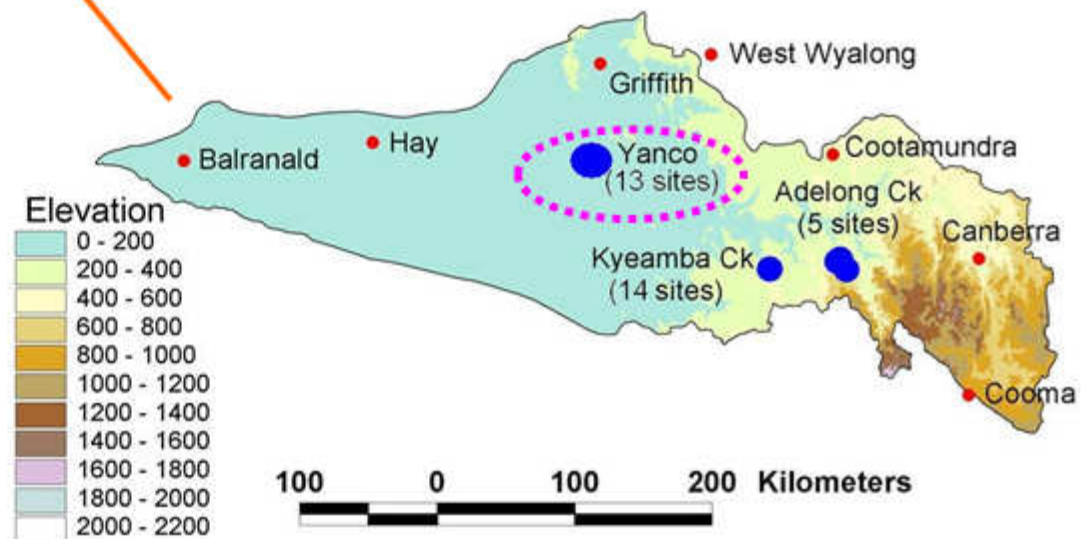
Automatic Stations for Soil Hydrology – Thai (ASSH-T)



Validation results AMSR-E descending soil moisture estimation (by Koike ver.5.34) in the Thai site (P: rainfall, SM_{area} : daily area-averaged soil moisture of KK1 and KK2)

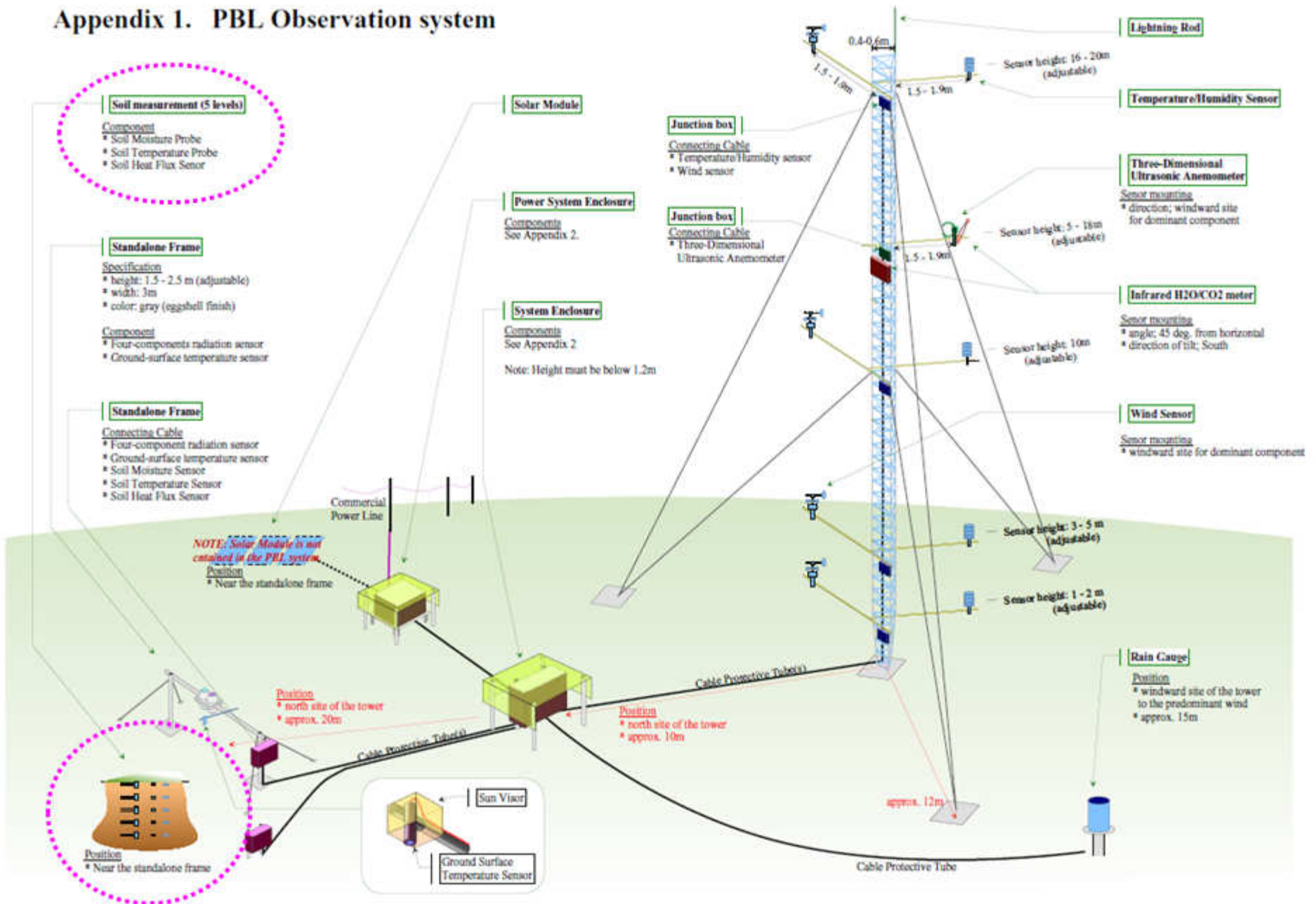


Murrumbidgee Basin Field Monitoring Sites



New validation site (also for SMOS and SMAP validation site) in Murrumbidgee basin in east Australia

Appendix 1. PBL Observation system



Flux tower in new validation site of the Murrumbidgee basin

Summary

- Introduction of validation sites of GCOM-W
- Long term data of in situ monitoring of soil moisture in the Mongol site since 2000
- Successful validation of AMSR-E SM estimation and SMOS L2 soil moisture products
- Continuing in situ monitoring of soil moisture and validation (AMSR2, SMOS, and PALSAR 2 of ALOS 2: lunch in 2012)
- Installation of soil moisture instruments and a JAXA PBL flux tower in the Australia validation site
- Discussion on how to provide the in situ data of our validation sites to SMAP community