

TERENO - CT Environmental Sensing

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Activities Since the Last Workshop in 2011...

Airborne Campaigns

- Planning of airborne and the associated ground measurements campaigns (3 Observatories: Rur, Ammer, Bode)
- Conduction of the airborne campaigns (May/June 2011)
- Processing of the ground and airborne data
- Model inversion to soil moisture (polarimetric SAR Data)

CT Environmental Sensing

- Meeting at the 29.11.2011
- Coordination of the acquired data distribution and exchange of ground meas.
- Discussion about common research interests and coordination of research interests
- Planning and coordination of airborne campaigns in spring 2012

Satellite Data Acquisition

- TerraSAR-X and TanDEM-X data collection
- Rapid Eye Data collection



Common Airborne Campaigns within TERENO

Year	Observatory	Optic	SAR	Radiometry	In Situ
May 2008	Rur	---	E-SAR L-band	PLMR EMIRAD-2 HUT-2D	Soil Moisture
May- June 2011	Rur	---	F-SAR L-band	PLMR	Soil Moisture Vegetation Roughness
	Bode	Hyper- spectral	F-SAR L-band	---	Soil Moisture Vegetation Roughness
	Ammer	Thermal Infrared	F-SAR L-band	---	Soil Moisture



Overview of TERENO Campaign 2011

DLR's SAR Sensor: F-SAR

- Frequency L-band
- Fully polarimetric
- Spatial Resolution (r/a): 2mx0.6
- Date: KW 21-22 (23.05.-03.06.2011)

TERENO Observatories

- Ammer – KIT
- Bode – UFZ/WESS
- Rur – FZJ

Ground Measurements

...were conducted by the research institutes of the observatories. DLR supported activities at Ammer and Bode catchment.

Catchment	Date	Data acquisition @ local time	No. of scenes
Rur	30/05/2011	09:35-12:26	13
Bode	31/05/2011	09:12-10:41	8
Ammer	07/06/2011	10:26-11:33	6

Catchment	Date	Ground measurements exchange
Rur	30/05/2011	Soil moisture (SoilNet cluster, mobile probes)
Bode	31/05/2011	Soil moisture (mobile probes, GPR), vegetation height, phenology, biomass, VWC, LAI
Ammer	07/06/2011	Soil moisture (mobile probes)

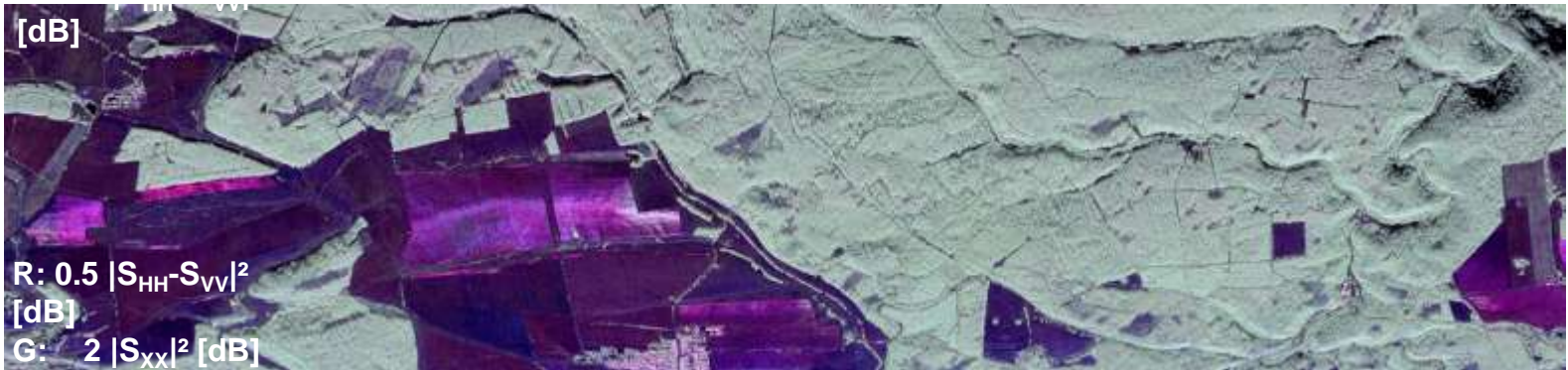


Airborne SAR Acquisitions within TERENO 2011 Campaign

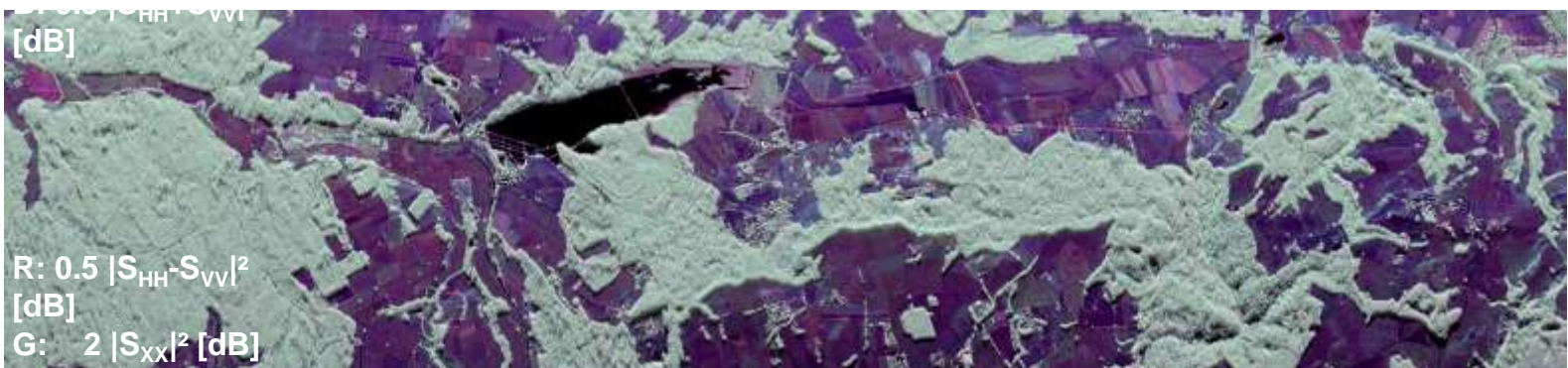
Rur



Bode



Ammer





Test Site – Rur Watershed

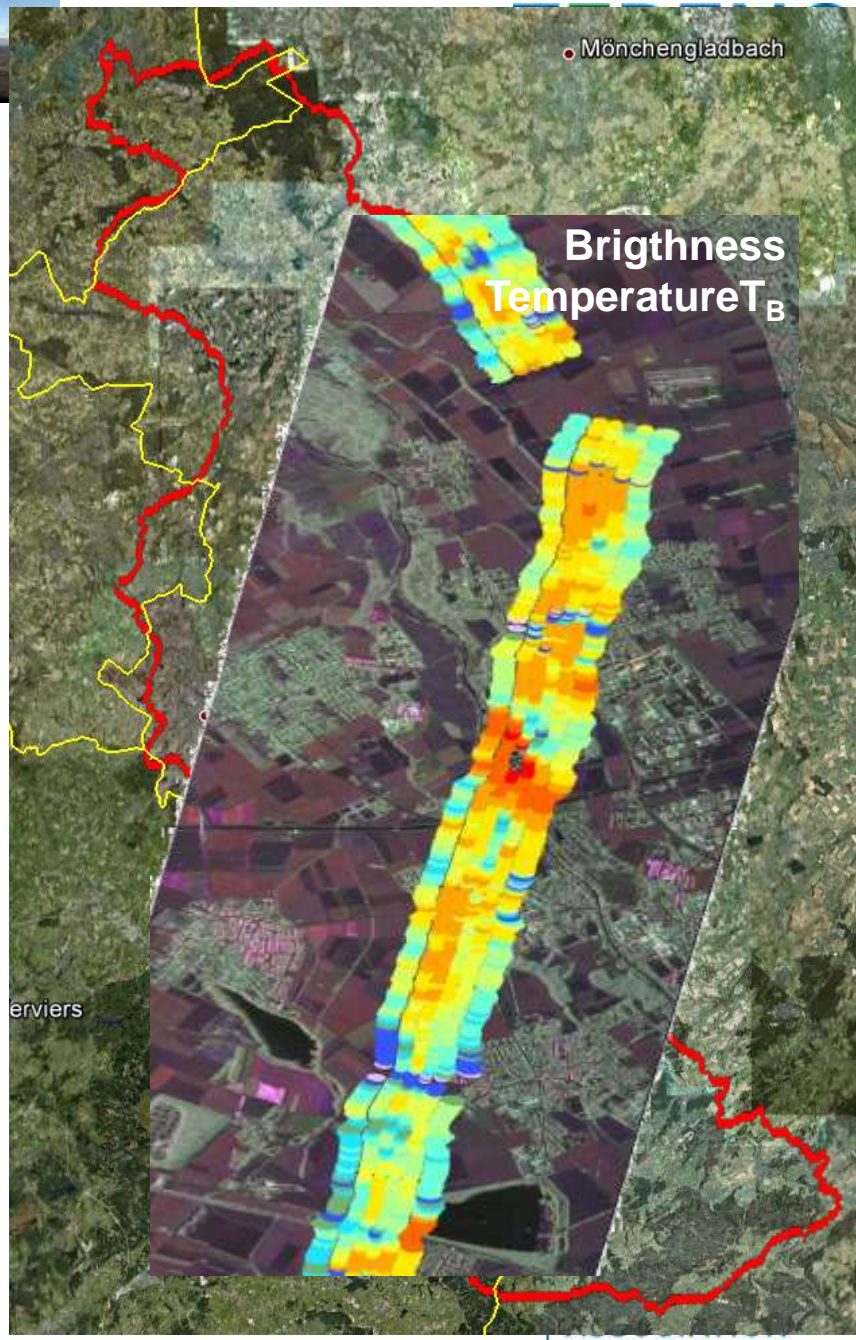
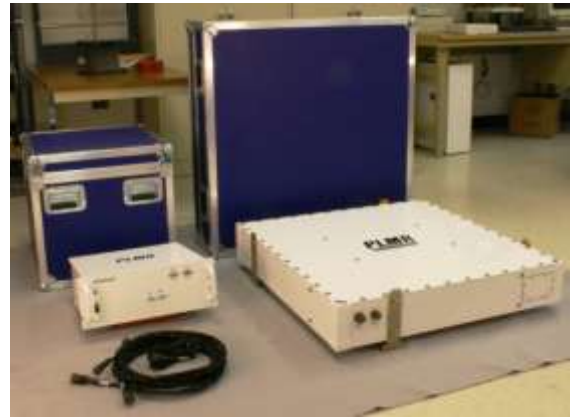
- Triangular Flight configuration
- Active/passive experiment
- ~ 160 km of data acquisition
- Field measurements by FZJ:
 - Soil moisture,
 - Vegetation,
 - SoilNet:
 - grassland (Rollesbroich),
 - forest (Wüstebach)
- Mobile TDR/FDR probes (Merzenhausen)





PMLR Campaign 2011 (FZJ)

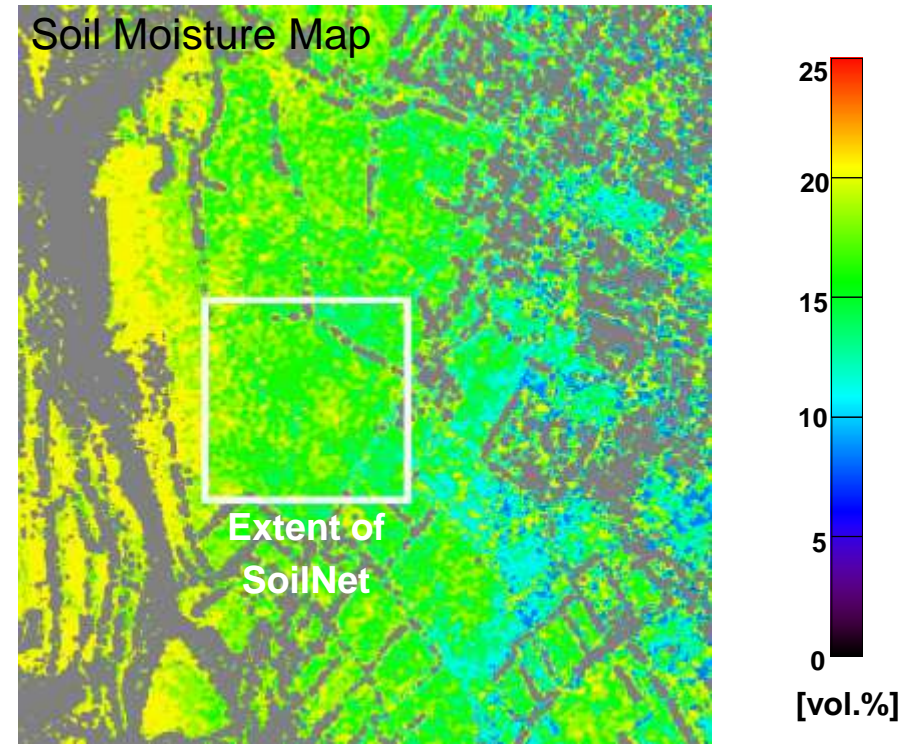
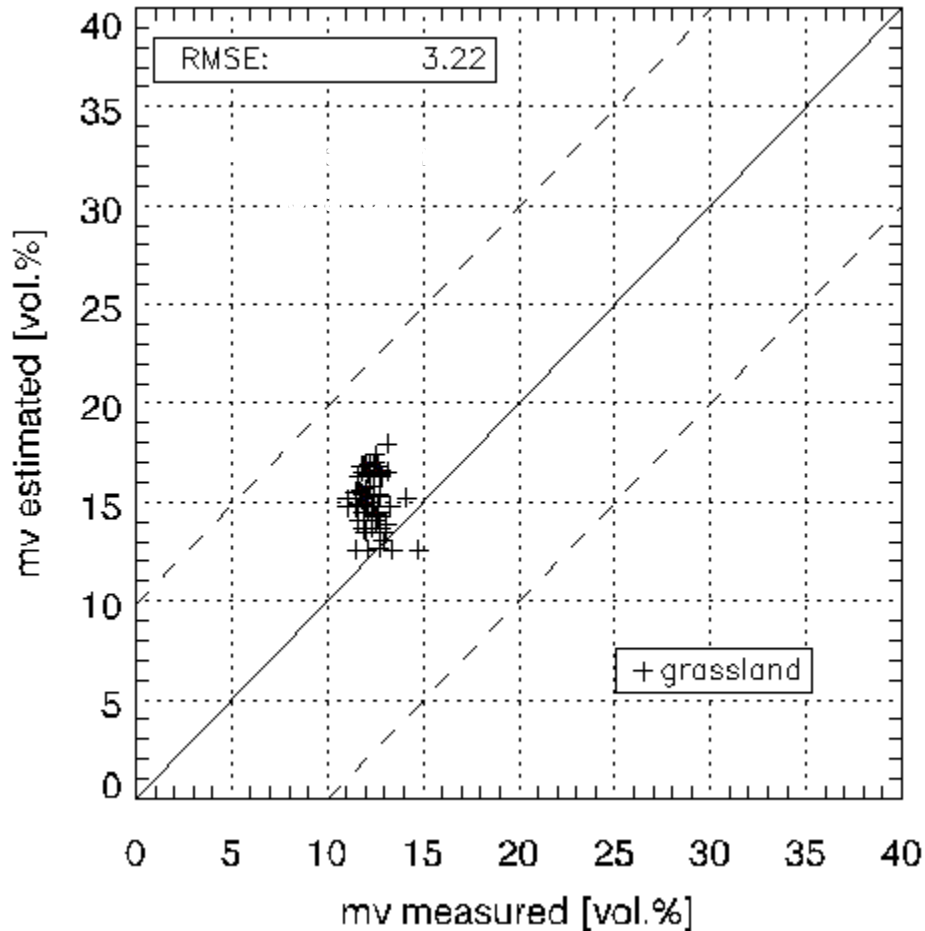
- Flight tracks coordinated with F-SAR
- 4 different altitudes:
 - 1200m AGL, 1000m AGL, 700m AGL
 - 300m AGL





Validation of SAR-Derived Soil Moisture (DLR)

- Validation with SoilNet cluster in Rollesbroich



Results submitted to IGARSS 2012

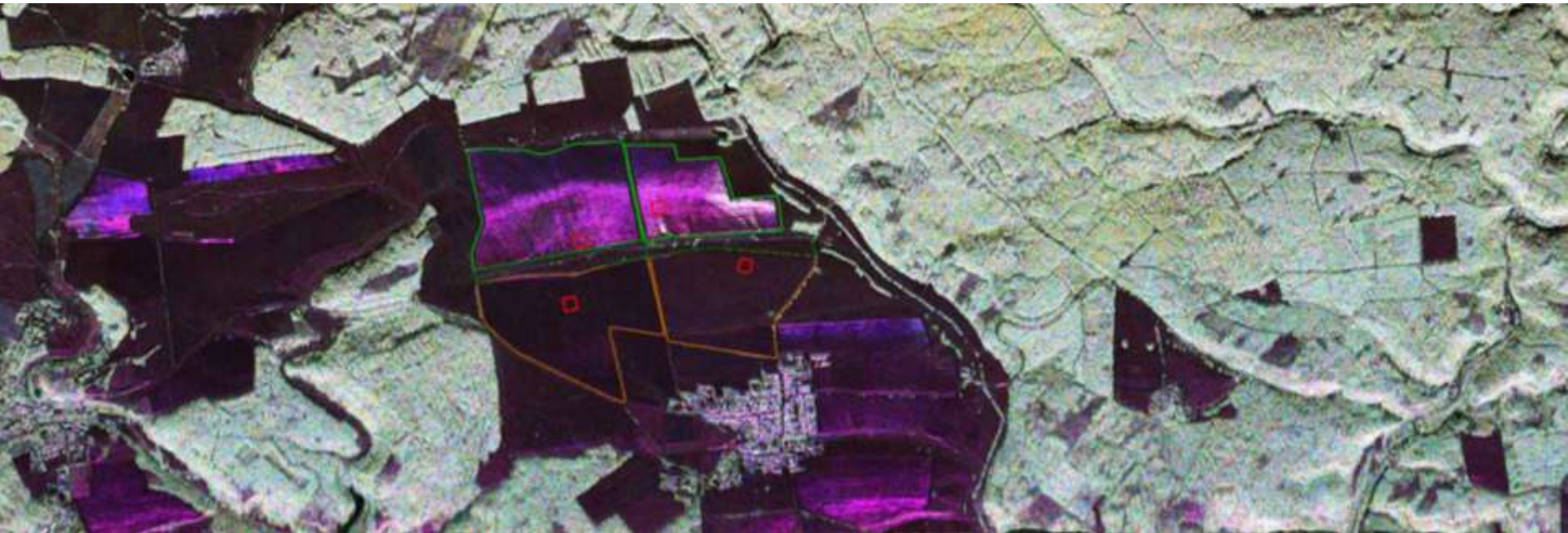
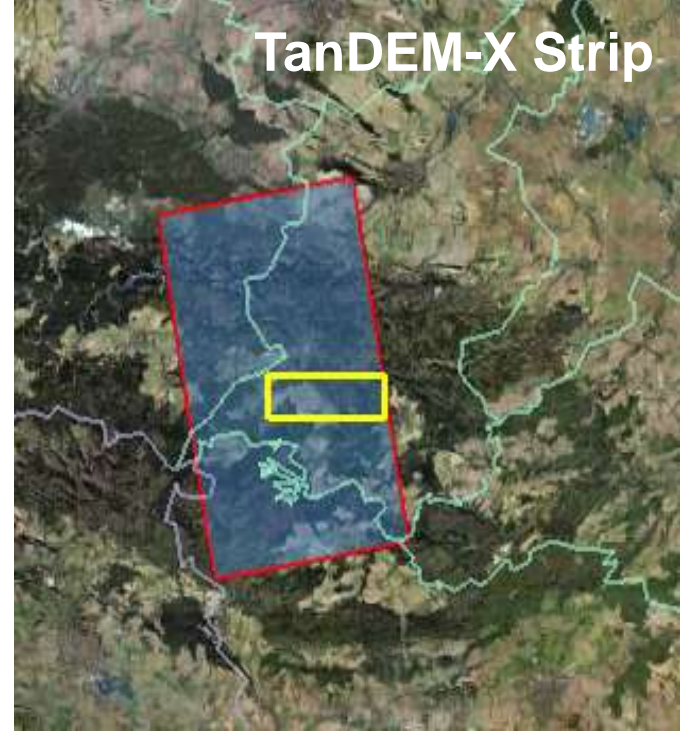
Please see poster of Miguel Kohling and Thomas Jagdhuber



TanDEM-X Strip

Test site – Bode Watershed

- SAR flight strip: 10 x 3 km
- Field measurements by UFZ/WESS/DLR:
 - Soil moisture (FDR, Geoelectric)
 - Soil roughness (Laser scanning)
 - Vegetation (height, phenology, biomass, VWC, LAI)

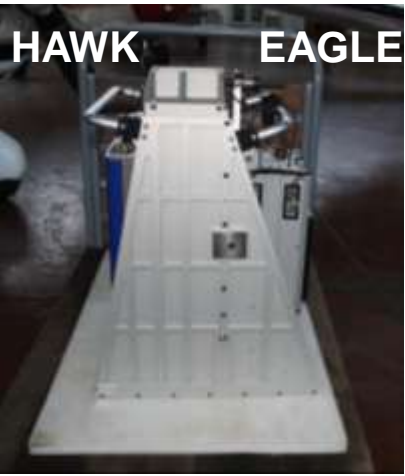




Schäfertal,
2m, 26.06.2011

Hyperspectral Sensor – UFZ/WESS

- AISA-DUAL (AISA-HAWK & AISA-EAGLE)



biodiversity observations



groundwater observation wells



VAMOS „positiv“

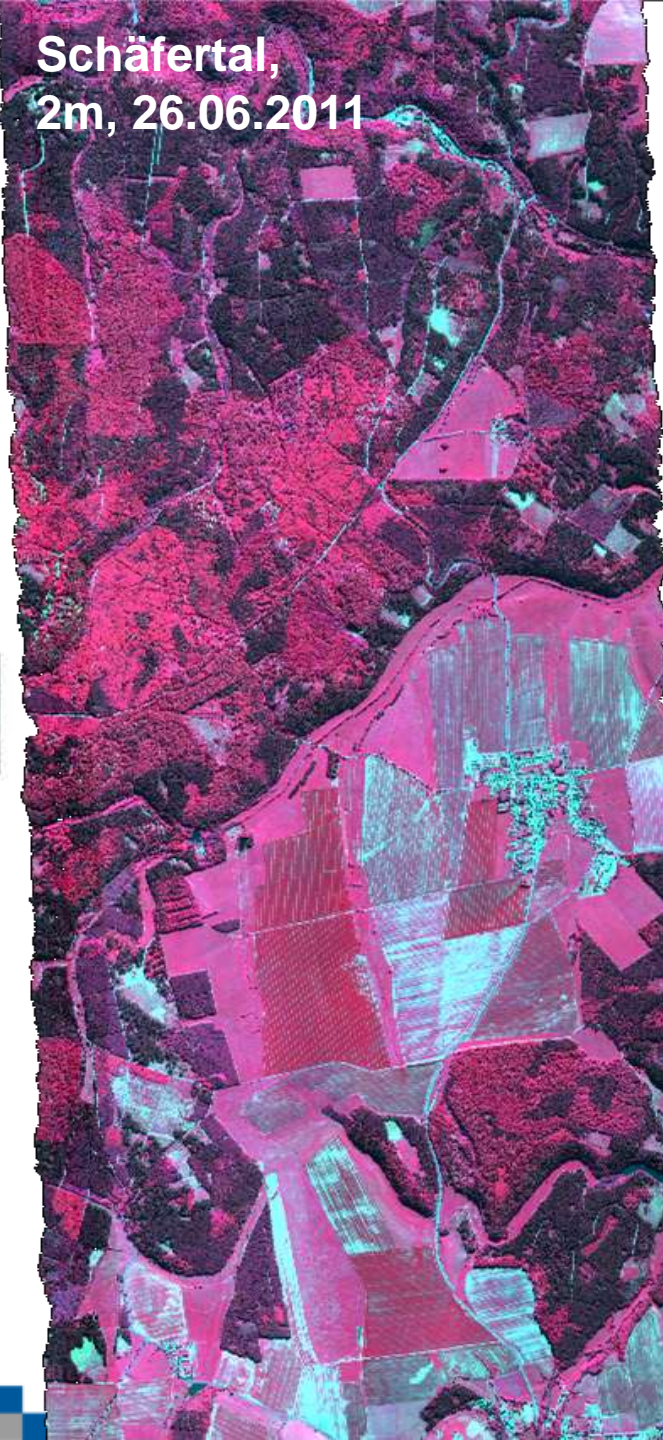
VAMOS and SoilCan lysimeter



wireless soil moisture sensor network (2012)



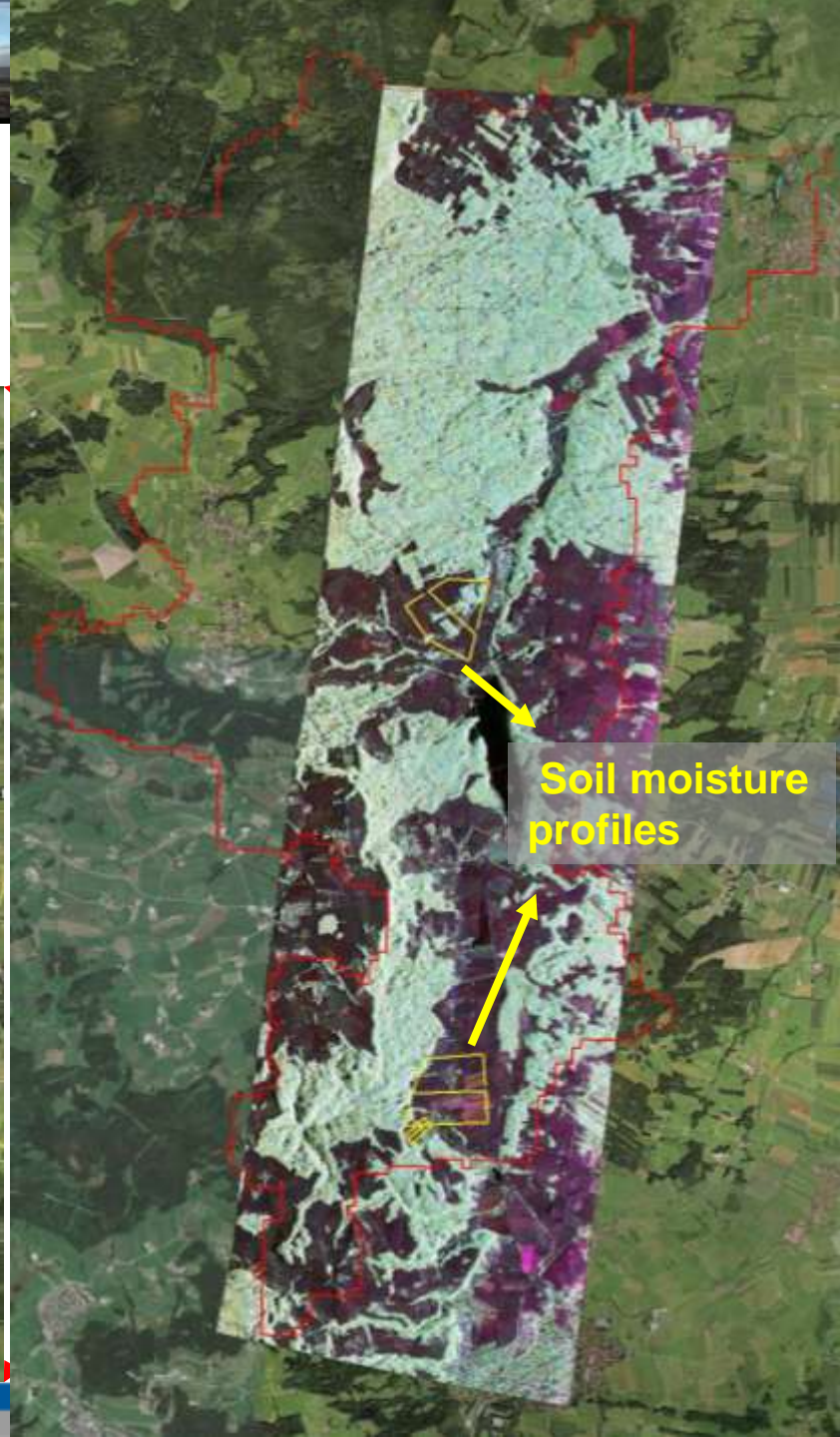
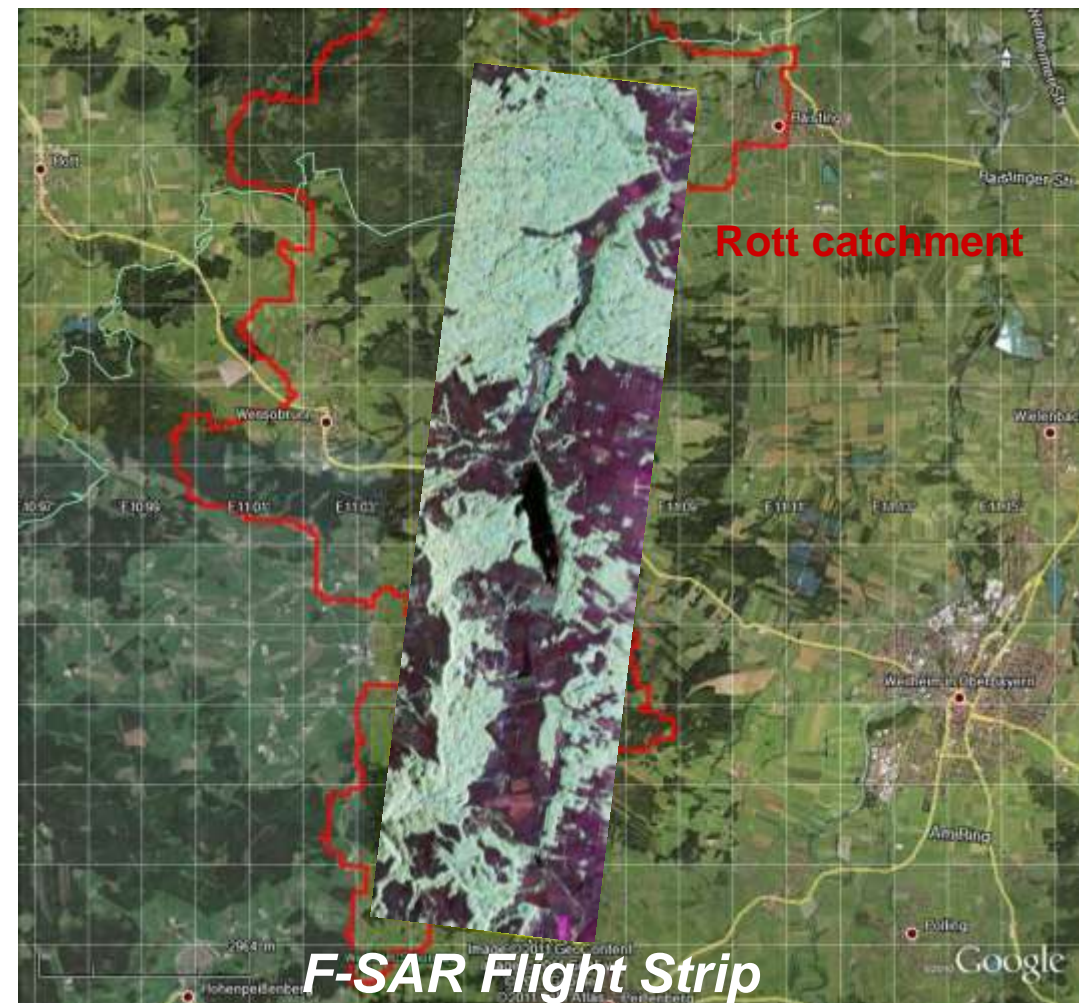
meteorological station





Test site – Ammer/Rott Watershed

- Flight strip of F-SAR: 11 x 3 km
- Field measurements by KIT/DLR:
Soil moisture (mobile FDR/TDR probes)





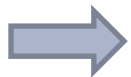
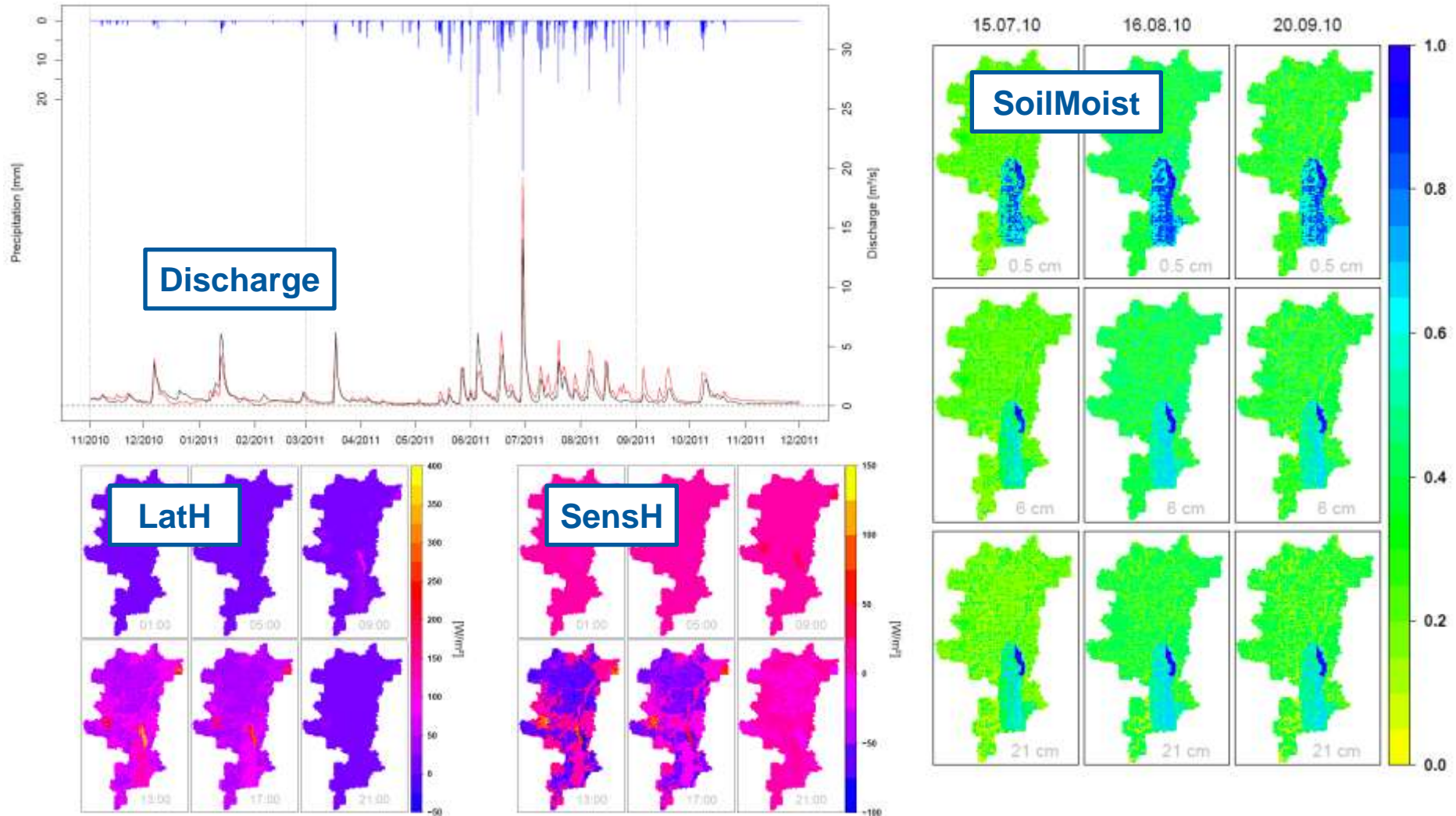
Activities of KIT, Alpine/Prealpine Observatory

- Airborne measurements of aerosol size distributions and spatial distribution
- Relevant for cloud microphysics and precipitation
- Additional instrumentation
 - Energy balance (upwelling and downwelling radiation UV > IR)
 - Latent and sensitive heat flux
 - NDVI
 - Soil temperature
- From February 2012: regular flights between Zugspitze and Augsburg (starting from airfield Ohlstadt)





Modeling Results (GeoTop) (KIT)



Aim: Spatial intercomparison with SAR and in-situ data



Next Steps for the 2011 Campaigns

- Processing of TERENO 2011 data:
 - F-SAR until January 2012
 - AISA-DUAL until January 2012
 - PLMR2 until Spring 2012
- Provision/exchange of the collected and acquired data
- Forward modeling and inversion of bio/geo-physical environmental
- Validation of derived parameter
- Hopefully – integration into small scale integrative models!



TERENO-NO DEMMIN: Evaluation of changes in moisture status on vegetation development and land use (DLR Neustrelitz, GFZ, TU Berlin)

Characteristic of region:

Agricultural used lowland (partly high groundwater level) with high variability in soil type and large field parcels, expected reduction in precipitation

Instrumentation:

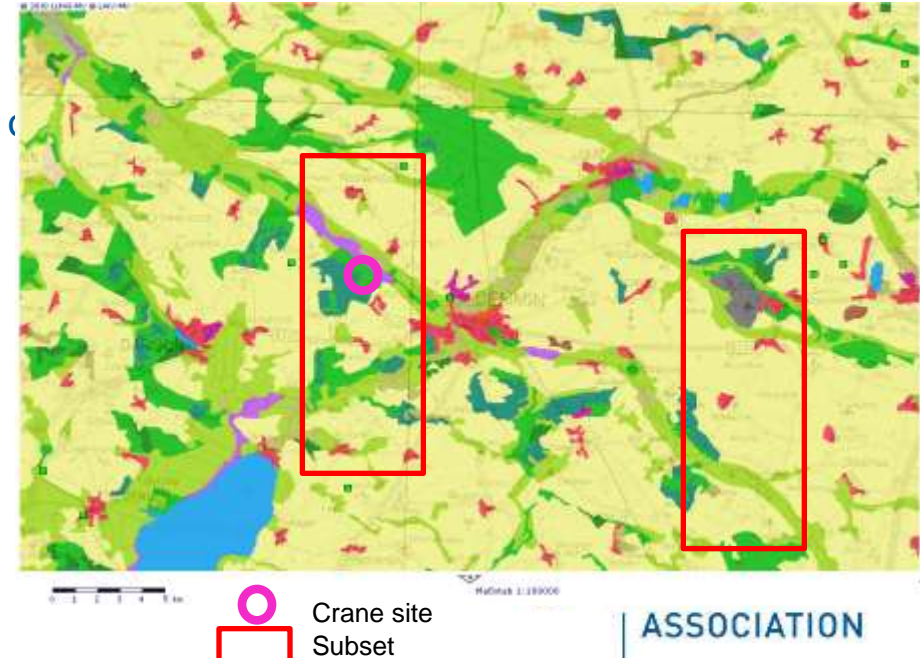
Agrometeorological stations (32 → 50) on all typical soil and land use units
Corresponding and closer meshed soil moisture net (in preparation)
Crane and tower (in prep.) for ground based remote sensing (spectrometry of crop types and trees; radiometry, long term thermography and multispectral analyses of crop types)

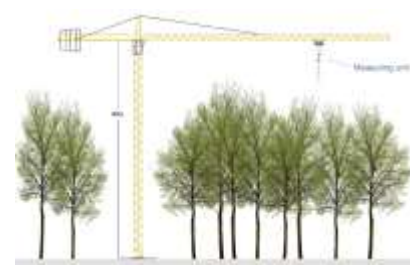
Remote sensing data:

- ❖ Multispectral RapidEye-Data of whole testsite, several dates during vegetation period
- ❖ Hyperspectral, radar and thermal airborne data (subsets in campaigns)
- ❖ Hyperspectral images and fieldspectrometer data from ground and crane
- ❖ Satellite radar data (in prep.)
- ❖ Corresponding ground truth data of soil and vegetation status (starting from 2012)

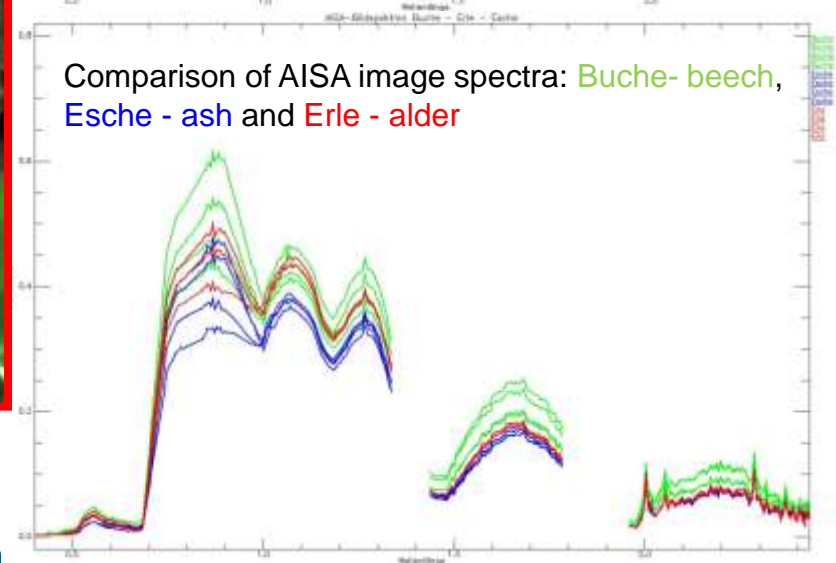
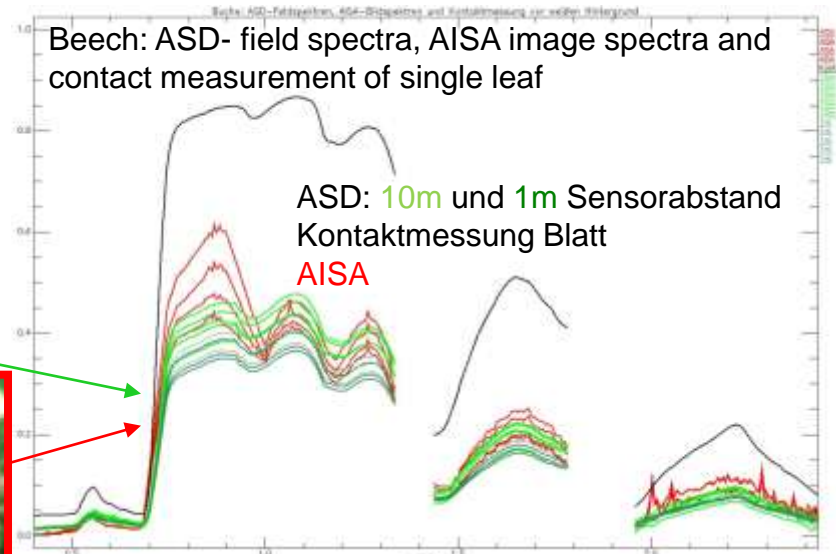
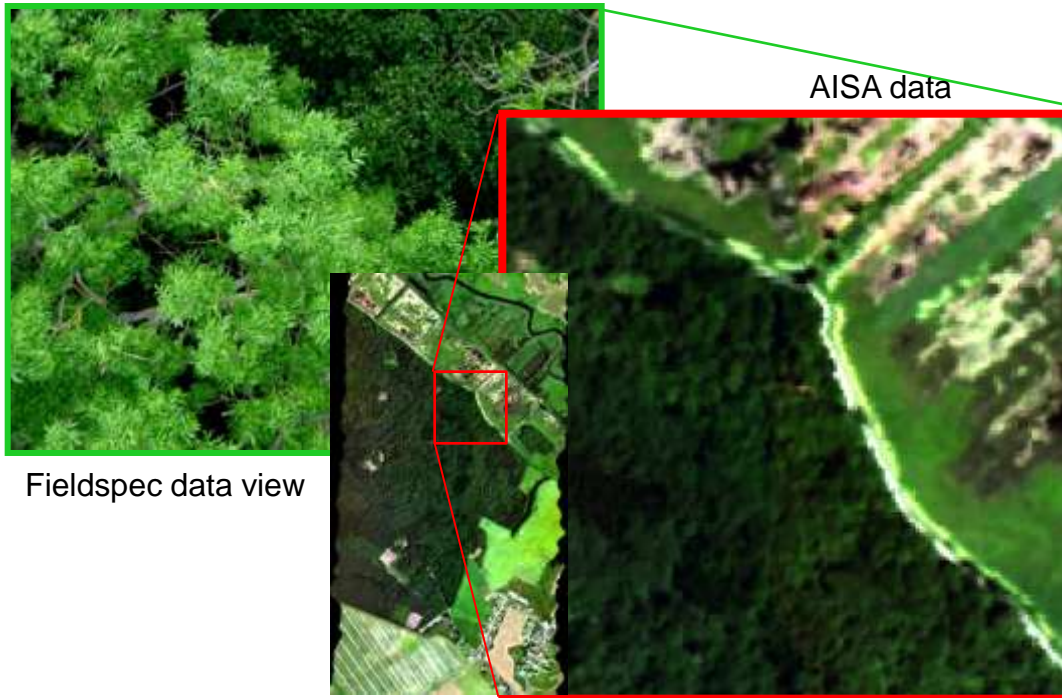
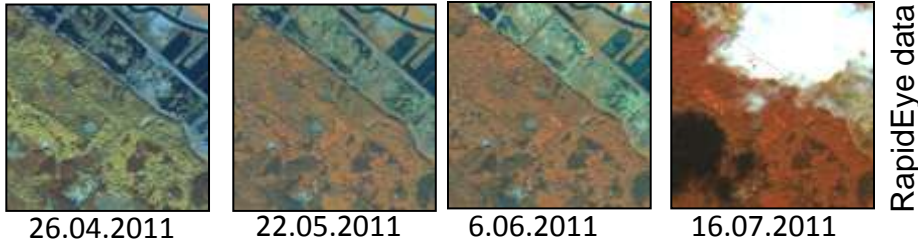
Expected results:

- ❖ clarification of the relationships of moisture status and spectral signal
- ❖ Usage of spectral information for modeling of evapo-ration in regional scale (in time and space variability)





TERENO-NO DEMMIN: Fieldspectrometry from crane and hyperspectral airborne images - first data



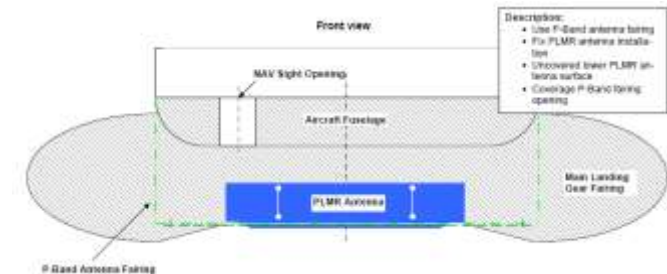
Field of view ASD: 14 cm diameter at 1m distance sensor-target
1,4 m diameter at 10 m distance sensor-target
Pixel size AISA-Eagle+Hawk (airborne sensor): 3m x 3 m



Flight Campaigns Planned for 2012

First Multisensor Platform Campaign

- Instruments on airborne platforms:
 - DLR-DO228: F-SAR, PLMR, DigiTHERM
 - DLR- CESSNA: HYSPEX
 - Ultralight: KIT-Instrument
- Test sites:
 - Rur, Bode, Ammer, (Demmin)
- Time schedule:
 - 16. April - 27. May 2012 (KW16 - KW21)
 - 2.-15. July 2012 (KW27-KW28)
- Inclusion of the Uecker catchment in TERNO 2012 campaign (Decision until 03/2012)





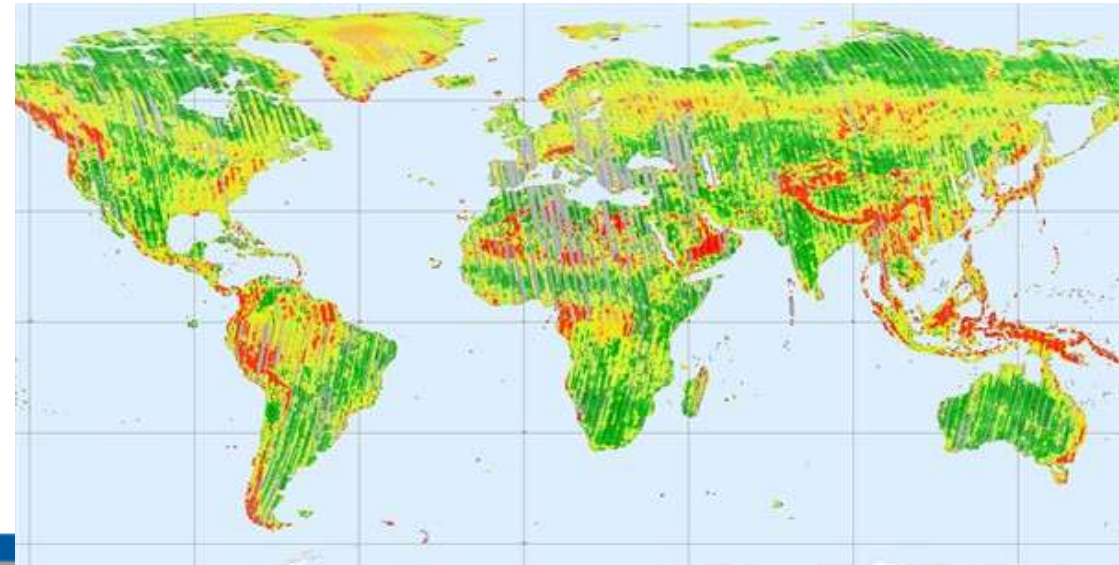
Satellite Data – First Complete TanDEM-X Coverage

Iceland



More about @ <http://www.dlr.de>

TanDEM-X Coverage
(red > one acquisition)





TerraSAR-X Science Acquisitions

<i>Time</i>	<i>Observatory</i>	<i>Polarization</i>	<i>Acquisition Status</i>
30-04-2010	Ammer	Quad-Pol (HH/HV/VH/VV)	Processed
11-05-2010	Ammer	Quad-Pol (HH/HV/VH/VV)	Processed
11-04-2010	Bode	Quad-Pol (HH/HV/VH/VV)	Processed
23-04-2010	Bode	Quad-Pol (HH/HV/VH/VV)	Processed
03-05-2010	Bode	Quad-Pol (HH/HV/VH/VV)	Processed
18-04-2010	Rur	Quad-Pol (HH/HV/VH/VV)	Processed
29-04-2010	Rur	Quad-Pol (HH/HV/VH/VV)	Processed
10-05-2010	Rur	Quad-Pol (HH/HV/VH/VV)	Processed
17-04-2010	Uecker	Quad-Pol (HH/HV/VH/VV)	Processed
28-04-2010	Uecker	Quad-Pol (HH/HV/VH/VV)	Processed
09-05-2010	Uecker	Quad-Pol (HH/HV/VH/VV)	Processed



TanDEM-X Science Acquisitions

<i>Time</i>	<i>Observatory</i>	<i>Polarization</i>	<i>Acquisition Status</i>
07-10-2011	Ammer	Single-Pol (HH)	Processed
06-07-2011	Bode	Single-Pol (HH)	Processed
27-04-2011	Rur	Dual-Pol (HH/VV)	Processed
08-05-2011	Rur	Dual-Pol (HH/VV)	Processed
24-07-2011	Rur	Dual-Pol (HH/VV)	Processed
12-04-2011	Uecker	Dual-Pol (HH/VV)	Processed
04-05-2011	Uecker	Dual-Pol (HH/VV)	Processed
15-05-2011	Uecker	Dual-Pol (HH/VV)	Processed



Other Actions within the CT in 2012

Presentations of results at the following conference:

1. Tereno Session at EGU - April 2012
Session Chair: Heye Bogena (FZJ)
2. Tereno Session at IGARSS – July 2012
Session Chairs: Carsten Montzka (FZJ) und Marion Pause (WESS)



Backup Slides