

VALIDATION OF SOIL MOISTURE AND TEMPERATURE (SENTINEL-1, SENTINEL-3, NOAA-AVHRR)

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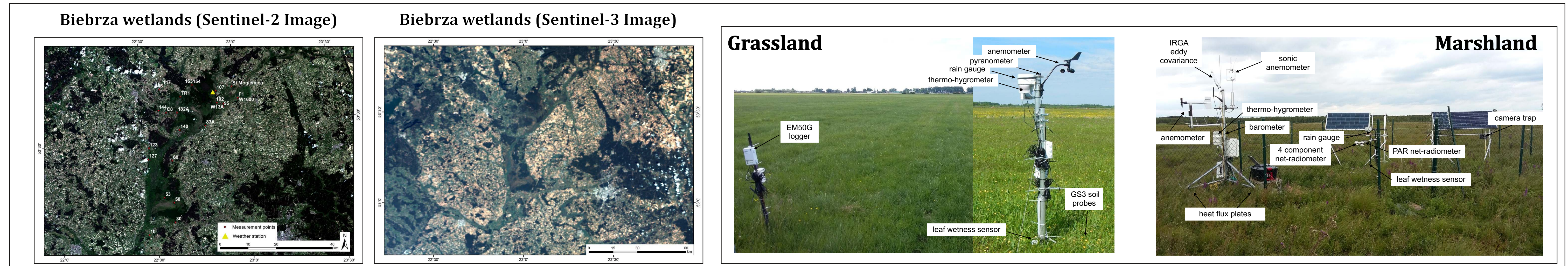
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Surface temperature from Sentinel-3 and NOAA-AVHRR was analysed over agriculture fields and wetlands in Poland. Sentinel-1 data was used for soil moisture retrieval to give the distribution of different components as a function of surface temperature. The temperatures from Sentinel-3 and NOAA-AVHRR were validated using in-situ measurements for different ranges of soil moisture and latent heat derived from Eddy Covariance. The temperature was used to calculate Sensible Heat, that was further validated by means of Eddy Covariance measurements. The temperature validation was separately performed for wet and dry conditions discriminated using ground measurements.

IN-SITU MEASUREMENTS

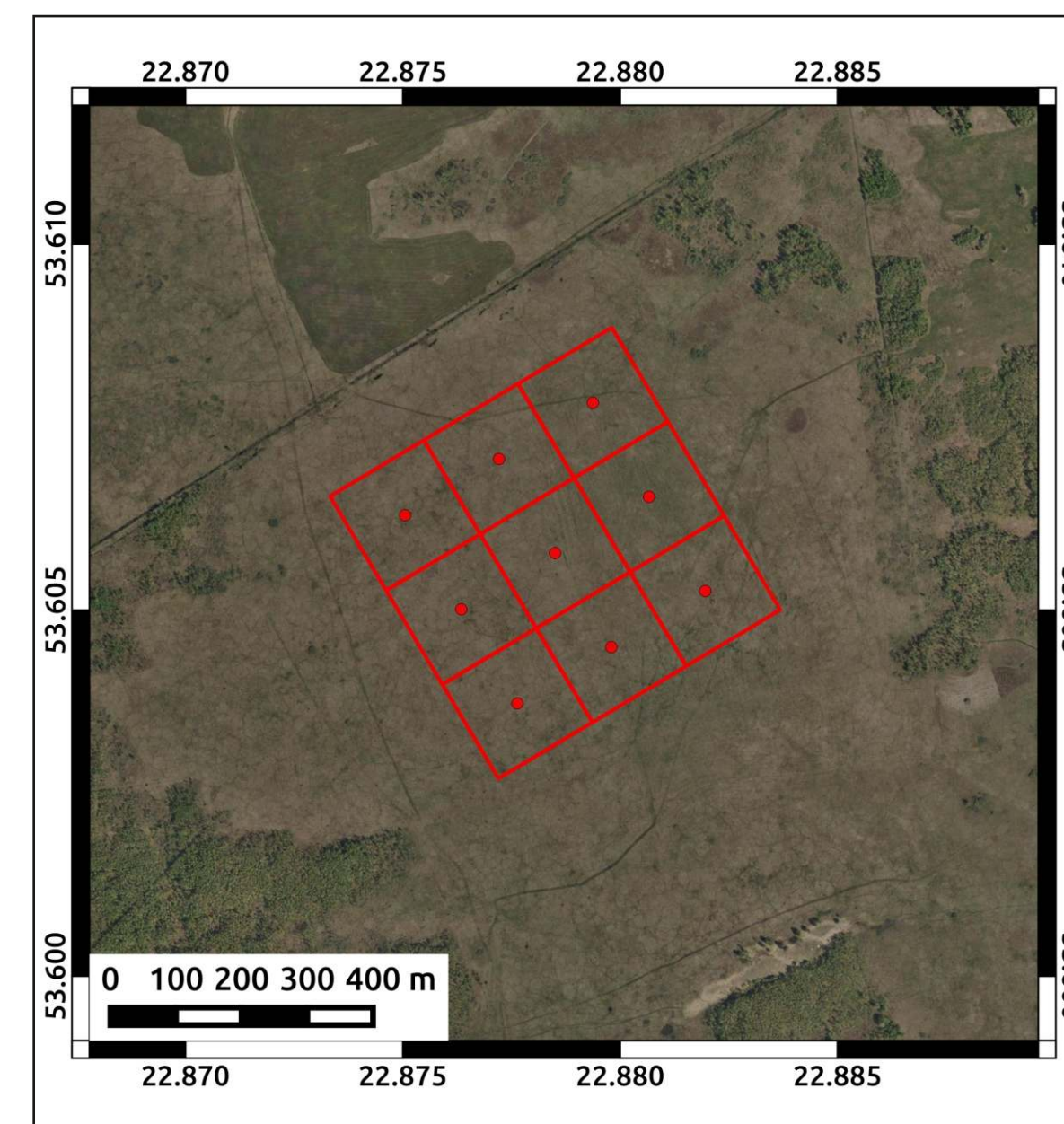


The main aim of the Biebrza Sentinel-1 (S-1) project is to establish two sites for S-1 soil moisture product validation. The secondary goal is to develop an advanced model describing exchange of water, energy and carbon between wetlands and the atmosphere using in-situ and satellite measurements. Project of ESA Contract No. 4000118762/16/I-NB

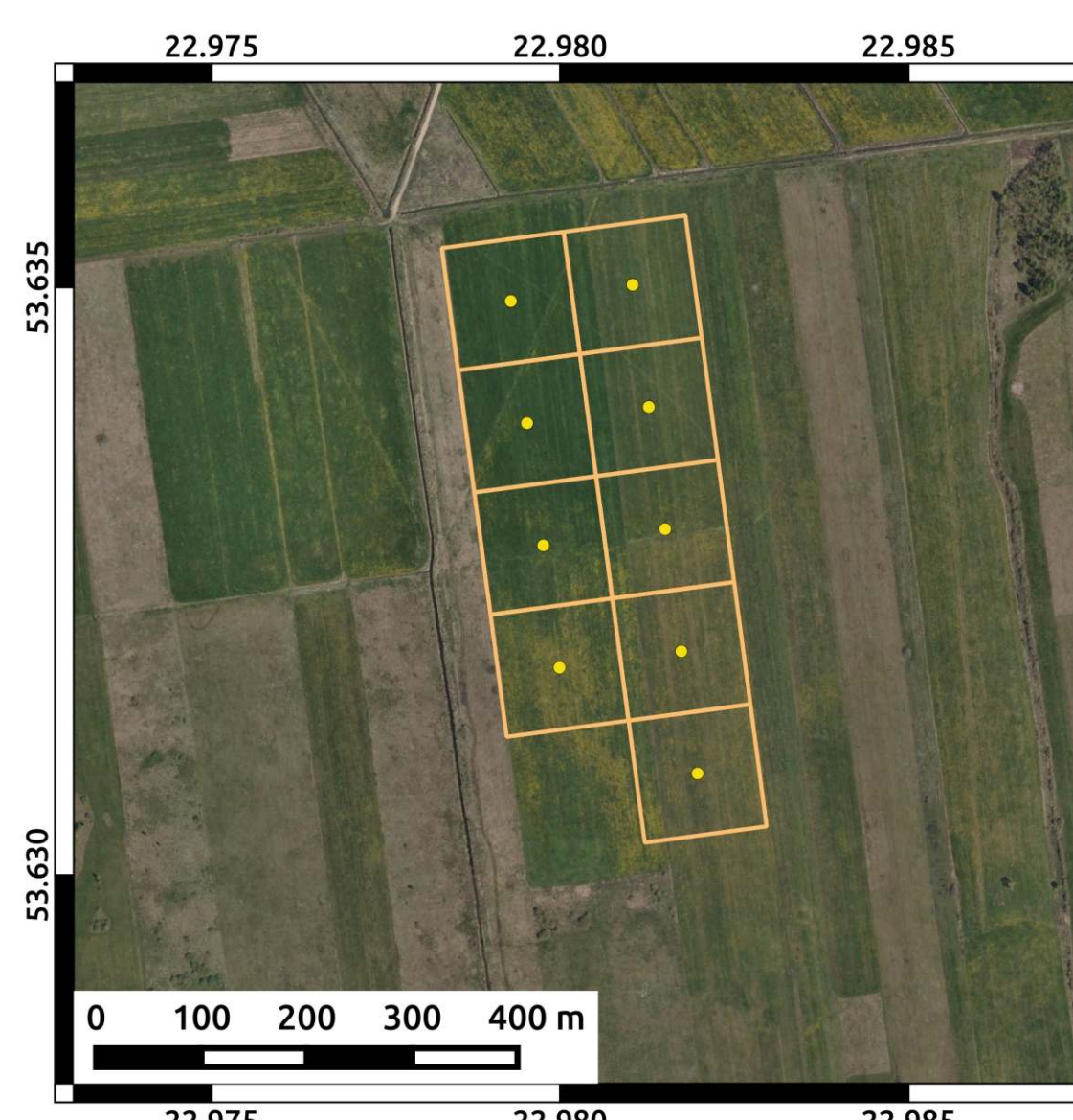
Why Biebrza?

It is one of the largest peat bog habitats for a number of endangered species of fauna (birds) and flora in Europe. In 1993 the Biebrza National Park was established covering area of 600 km². It is also protected under RAMSAR convention, NATURA 2000, IBA (Important Bird Habitat). The rivers flows over flat area (~ 0.02 % slope) and floods every spring after the snowmelt. The retention capacity of peats covering Biebrza basin is as high as the largest lake in Poland. Therefore, it plays a major role in flood prevention.

MARSHLAND AND GRASSLAND SITES OF SOIL MOISTURE VALIDATION AND HEAT FLUX



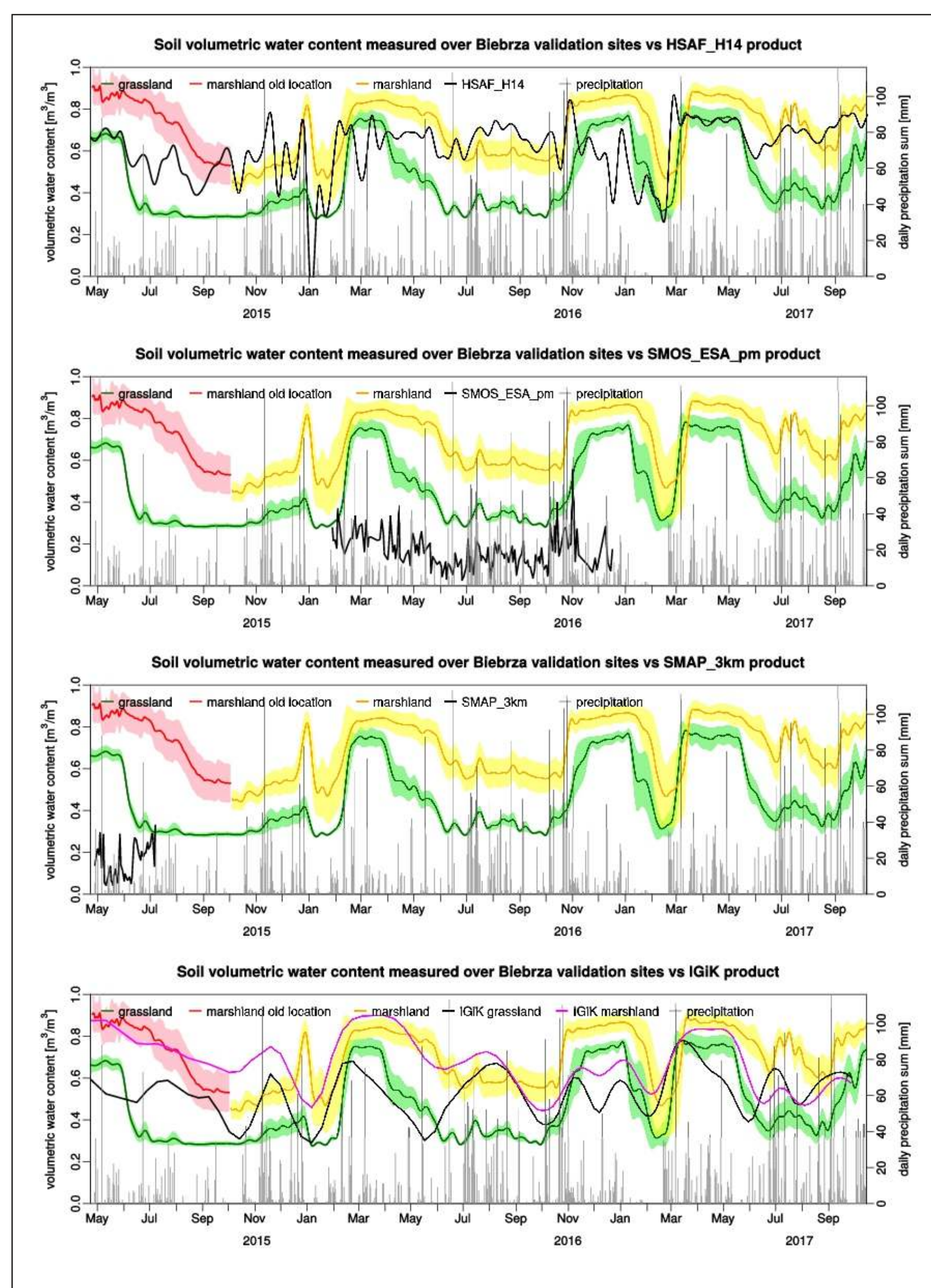
- Decagon EM50G data logger with GPRS and 5 input ports
- GS3 soil moisture, temperature and electrical conductivity probes calibrated to specific soil conditions
- CR-1000 data logger with 8 input ports
- Campbell 083E-L air temperature and relative humidity sensor
- Hukseflux NR01 4-component net radiation sensor to analyse short- and longwave downwelling and upwelling radiation
- Hukseflux HFP01SC-L heat flux plate to analyse energy fluxes within a soil
- Vaisala CS106 barometric pressure sensor
- Campbell 05103-L wind speed and direction turbine
- Decagon LWS leaf wetness sensor



Eddy covariance system:

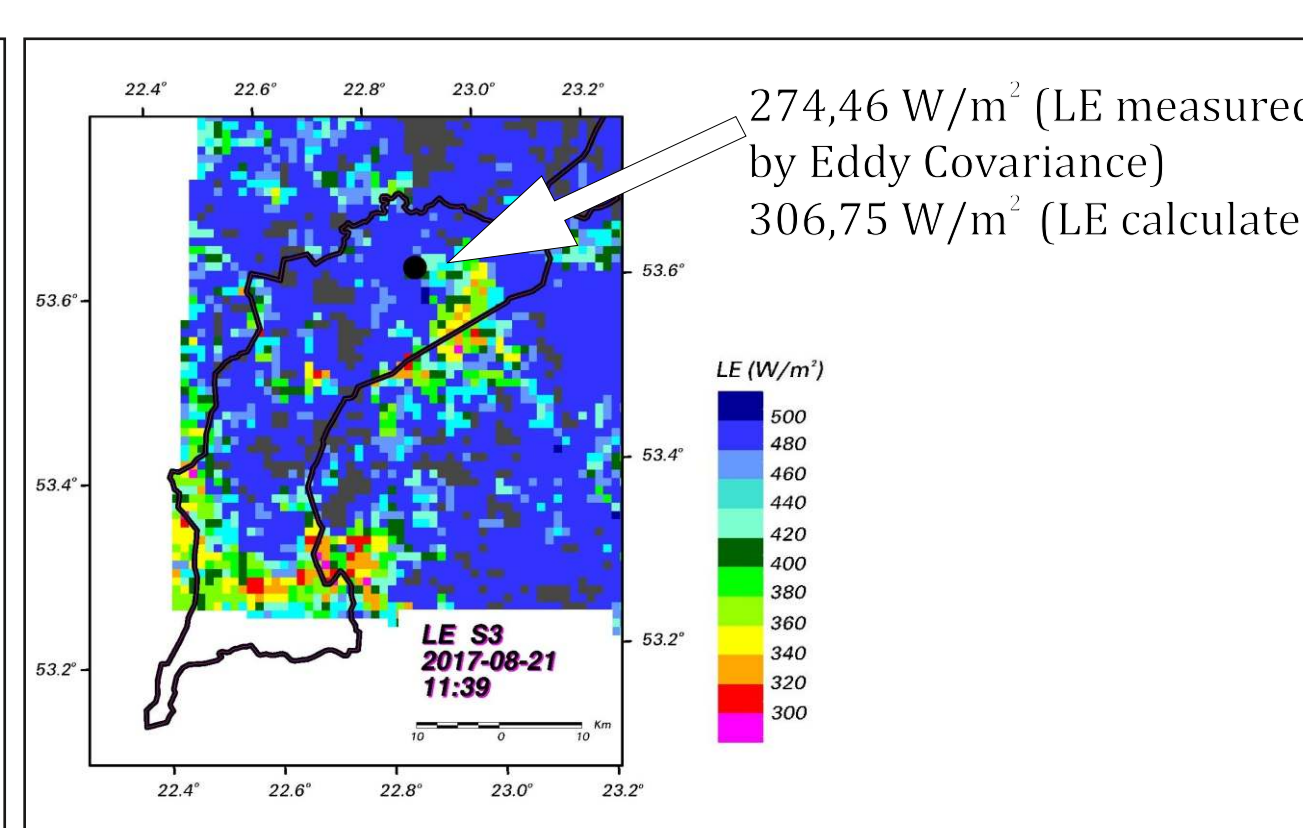
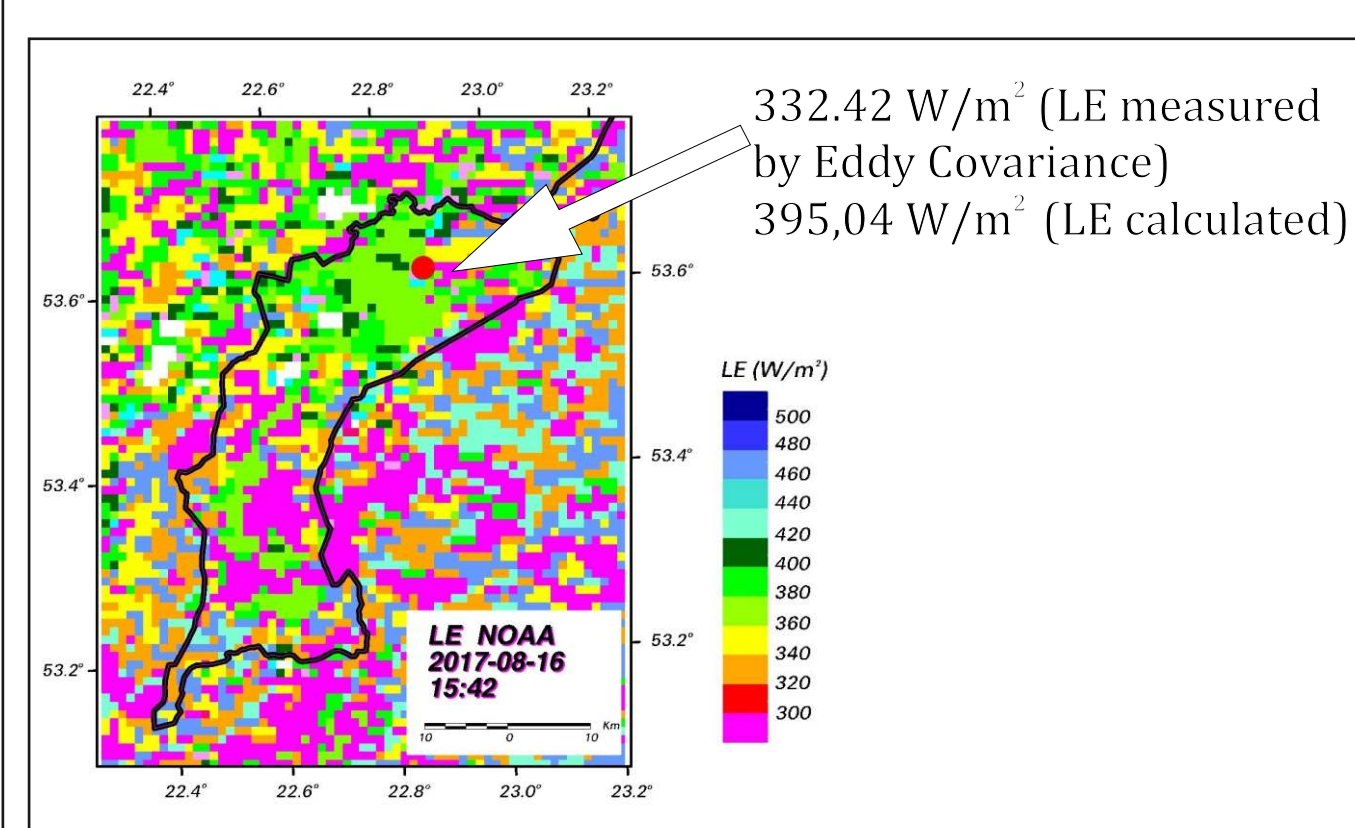
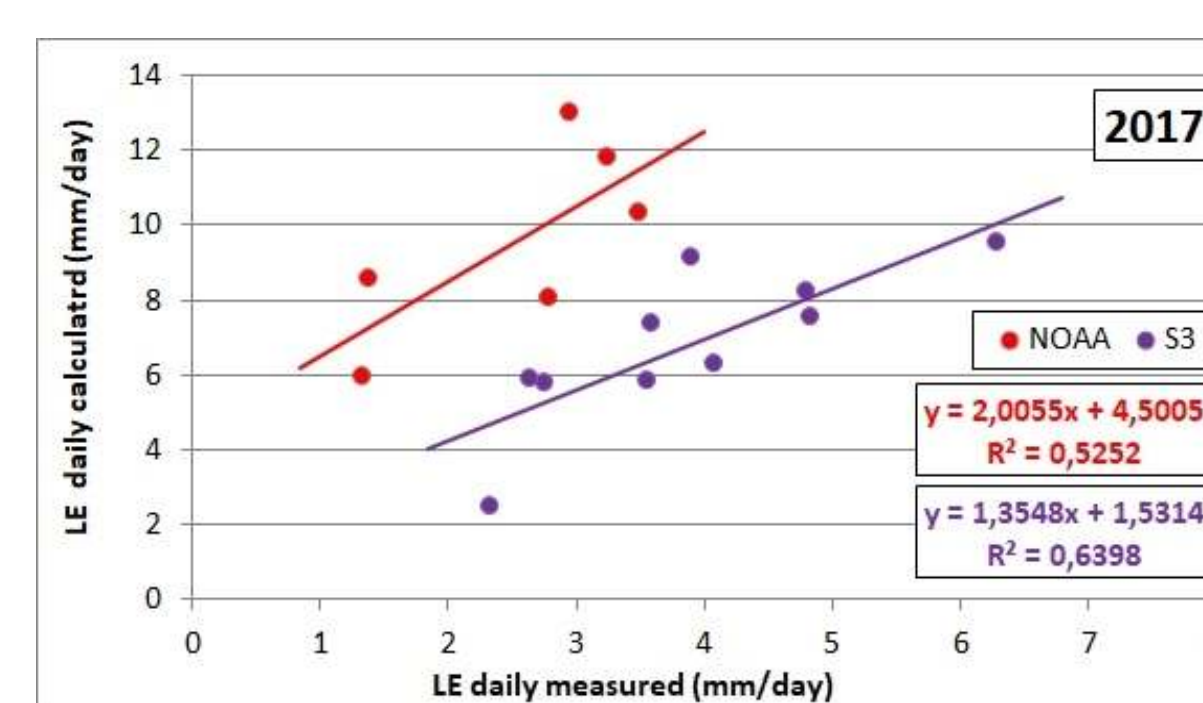
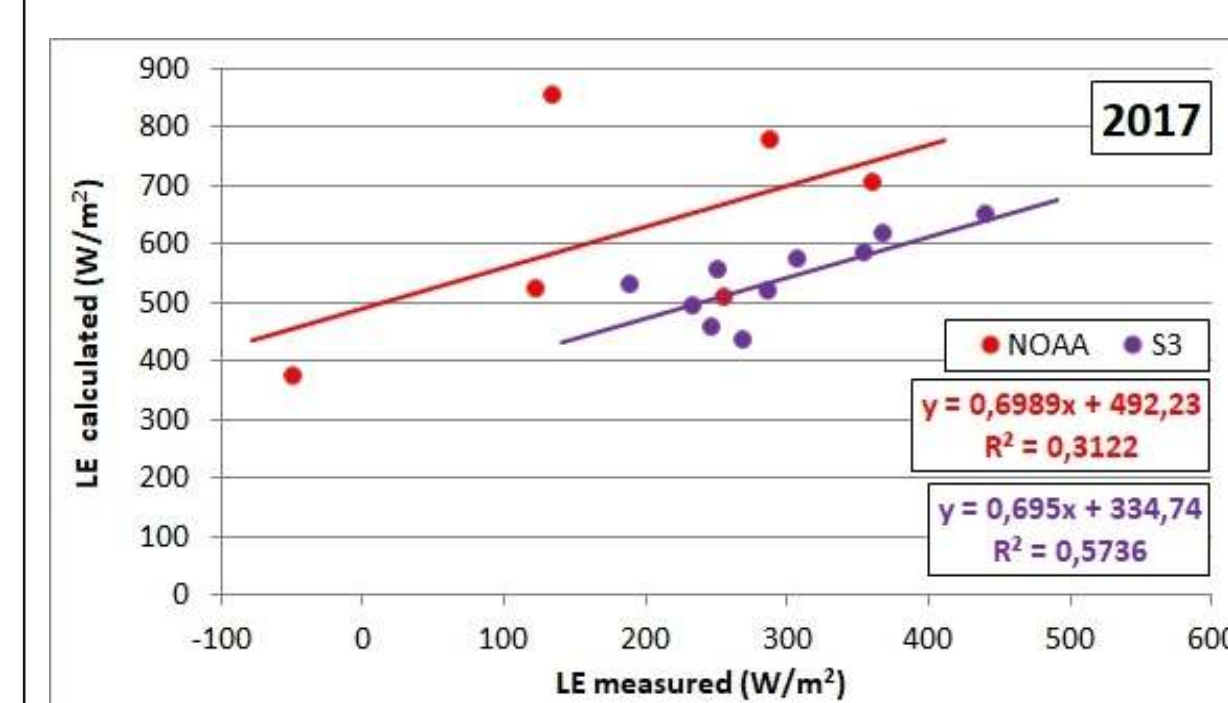
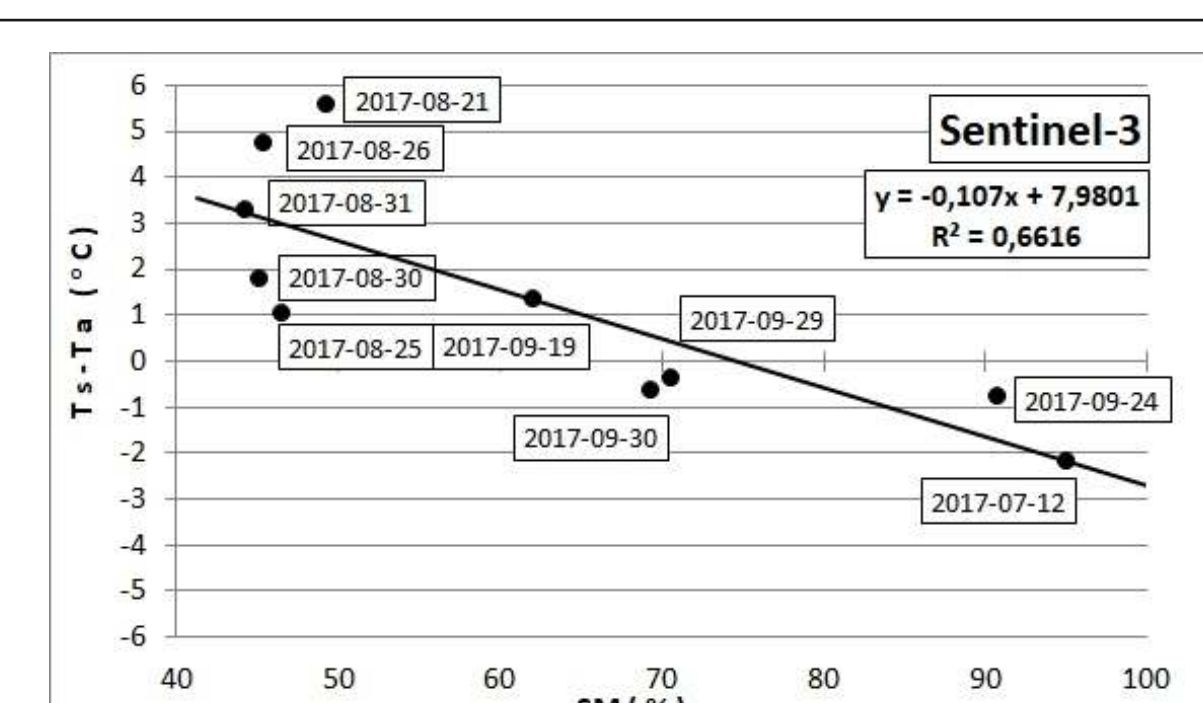
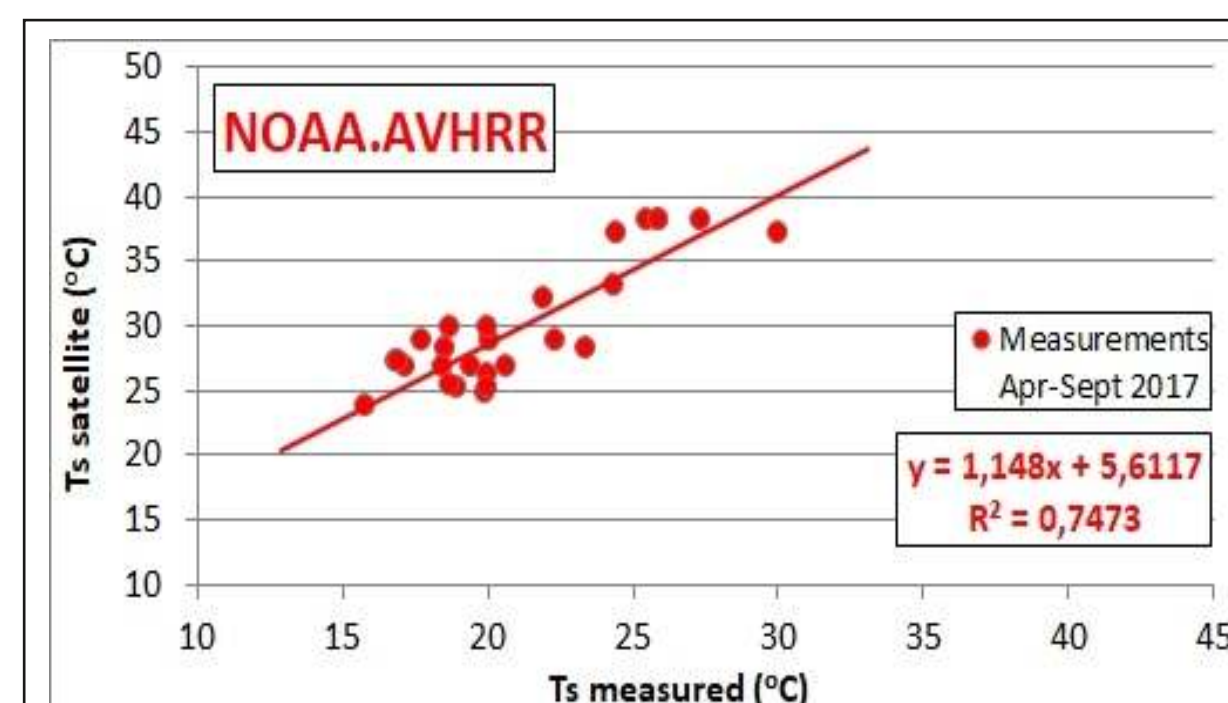
- Licor LI-7500A Eddy Covariance system
- Gill WindMaster 3d ultrasonic anemometer
- Additional technical equipment:
- CFM100 Compact Flash Module expansion to Campbell CR1000 logger to store measurements
- CS-GPRS expansion to Campbell CR1000 logger
- GPRS antenna to Campbell CR1000 logger
- Solar panel for the Campbell CR1000 logger and Licor LI-7500A system
- Gel batteries for the Campbell CR1000 logger and Licor LI-7500A system
- TV-5320WMA100 GPRS camera
- ISFET (Ion Sensitive Field Effect Transistor) probe to analyse soil pH (1 piece)

VALIDATION OF SENTINEL-1 SOIL MOISTURE PRODUCT



$$H = \frac{[\rho C_p (T_s - T_a)]}{r_a} \quad \rho - \text{air density (g cm}^{-3}\text{)}, C - \text{specific heat of air at content pressure (cal g}^{-1}\text{C}^{-1}\text{)}, T - \text{temperature surface and air, } r_a - \text{air resistance (s cm}^{-1}\text{)}$$

$$LE = R_N - H - G \quad LE - \text{latent heat flux (W/m}^2\text{)}, R_N - \text{net radiation (W/m}^2\text{)}, G - \text{soil heat flux (W/m}^2\text{)}$$



VALIDATION OF SENTINEL-3 SL_2_LST PRODUCT

AGRICULTURE SITE

Wielkopolska cropland (Sentinel-2 Image)

