Soil Moisture content

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Soil Moisture content

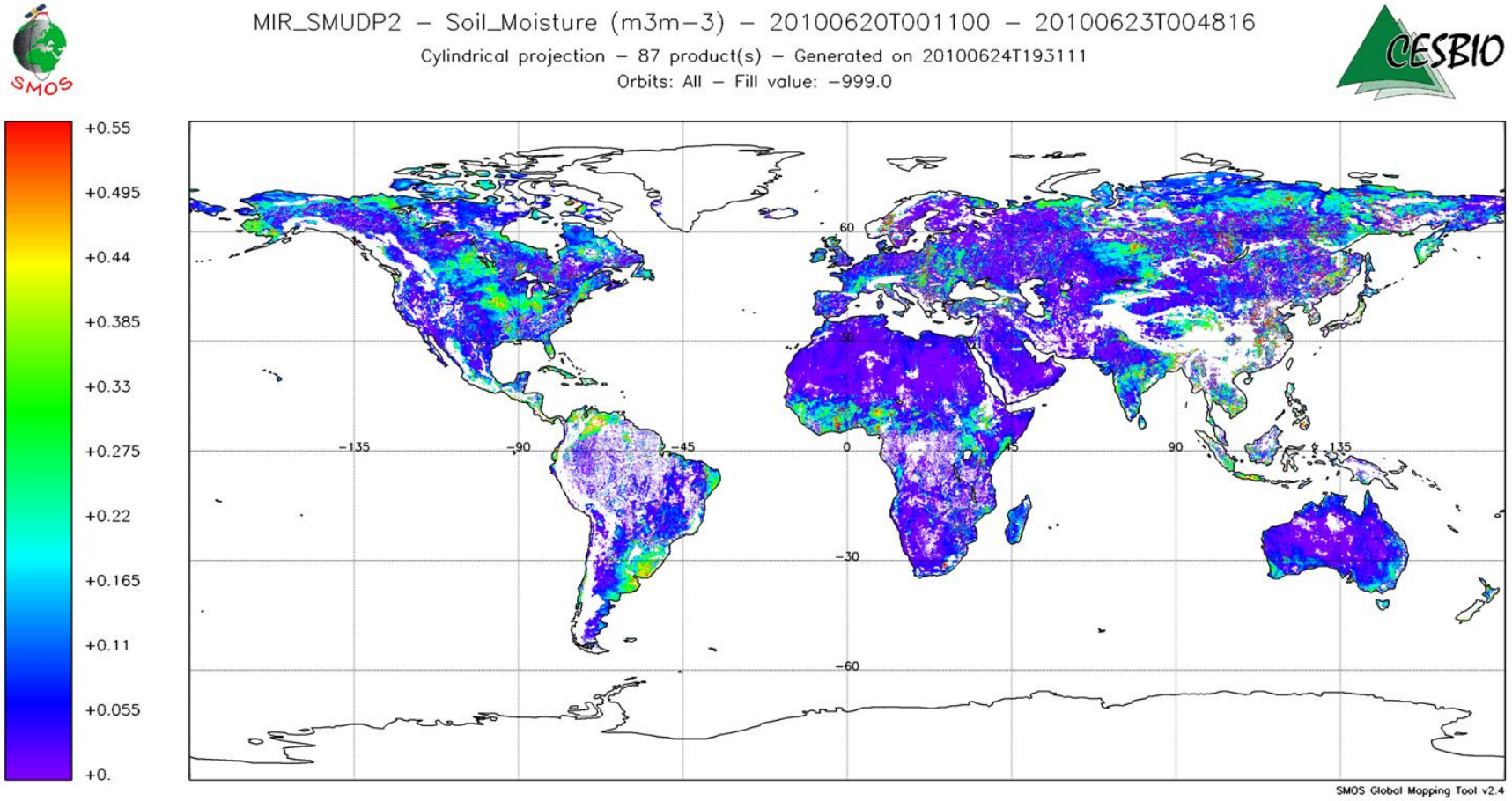
Essential Climate Variable

Soil moisture is a key variable in controlling the exchange of water and heat energy between the land surface and the atmosphere through evaporation and plant transpiration

Earth Observation: operational products (free)

- **AQUA (AMSR-E):** global scale; 56 km spatial res.; revisit: 1 day;
- **METOP (ASCAT):** global scale; 50 km spatial res.; revisit: 1-2 days;
- **SMOS (MIRAS):** global scale; 30-50 km spatial res.; revisit: 2-3 days;
- **SMAP:** global scale; 10-40 km spatial resolution; revisit: 1-2 days;

SMOS: First map of global soil moisture



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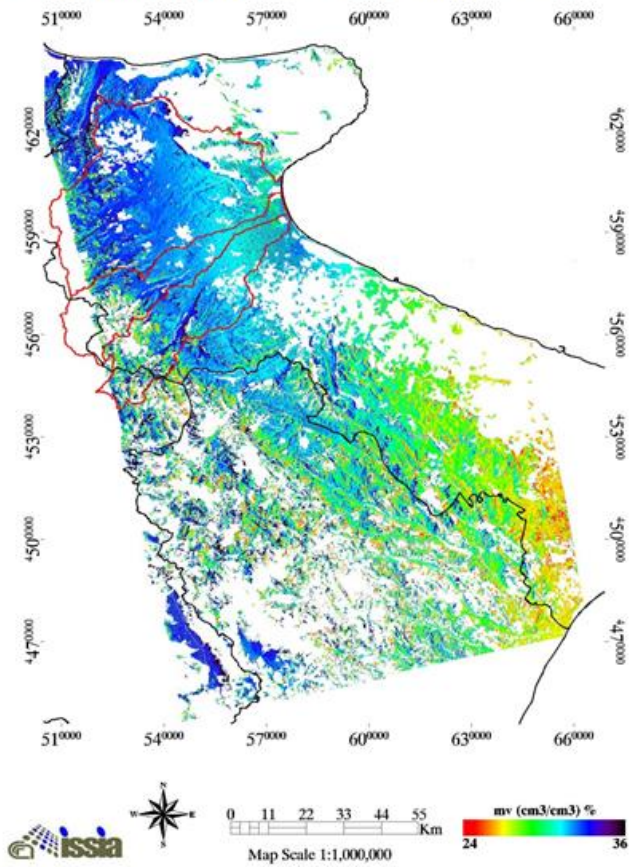
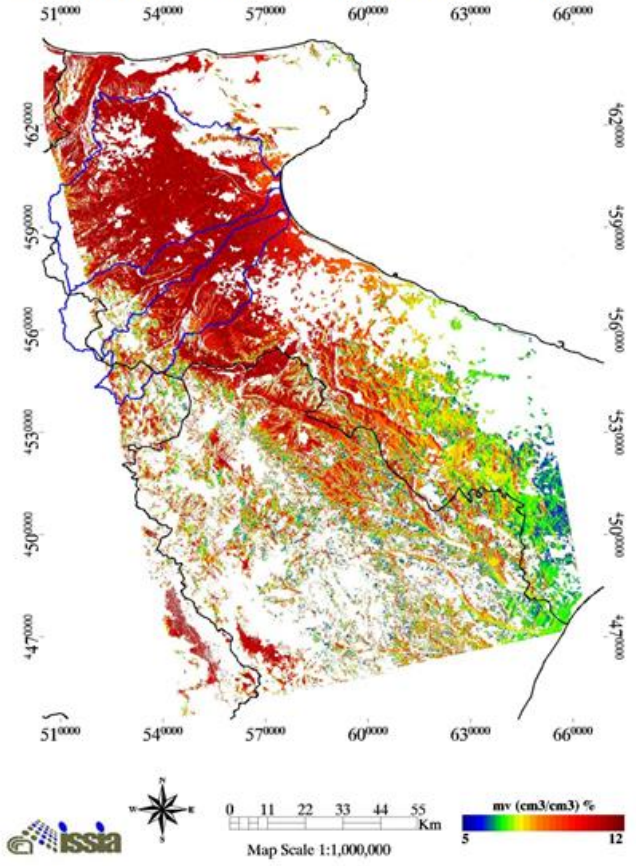
High resolution soil moisture products: still in a pre-operational/research phase

Seasonal SMOSAR m_v products at 120 m pixel size

Temporal m_v mean over 16 ASAR WS acquired from Nov. 2010 to Feb. 2011



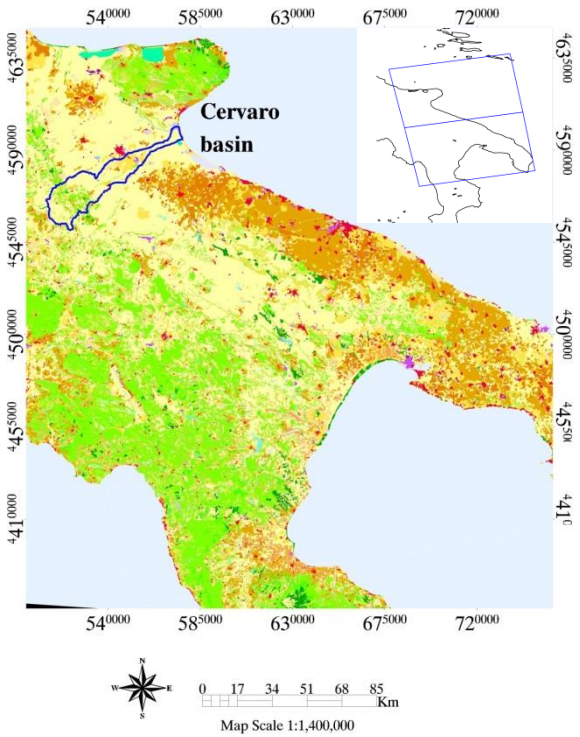
Temporal m_v std over 16 ASAR WS acquired from Nov. 2010 to Feb. 2011



Balenzano et al., EJRS, 2013

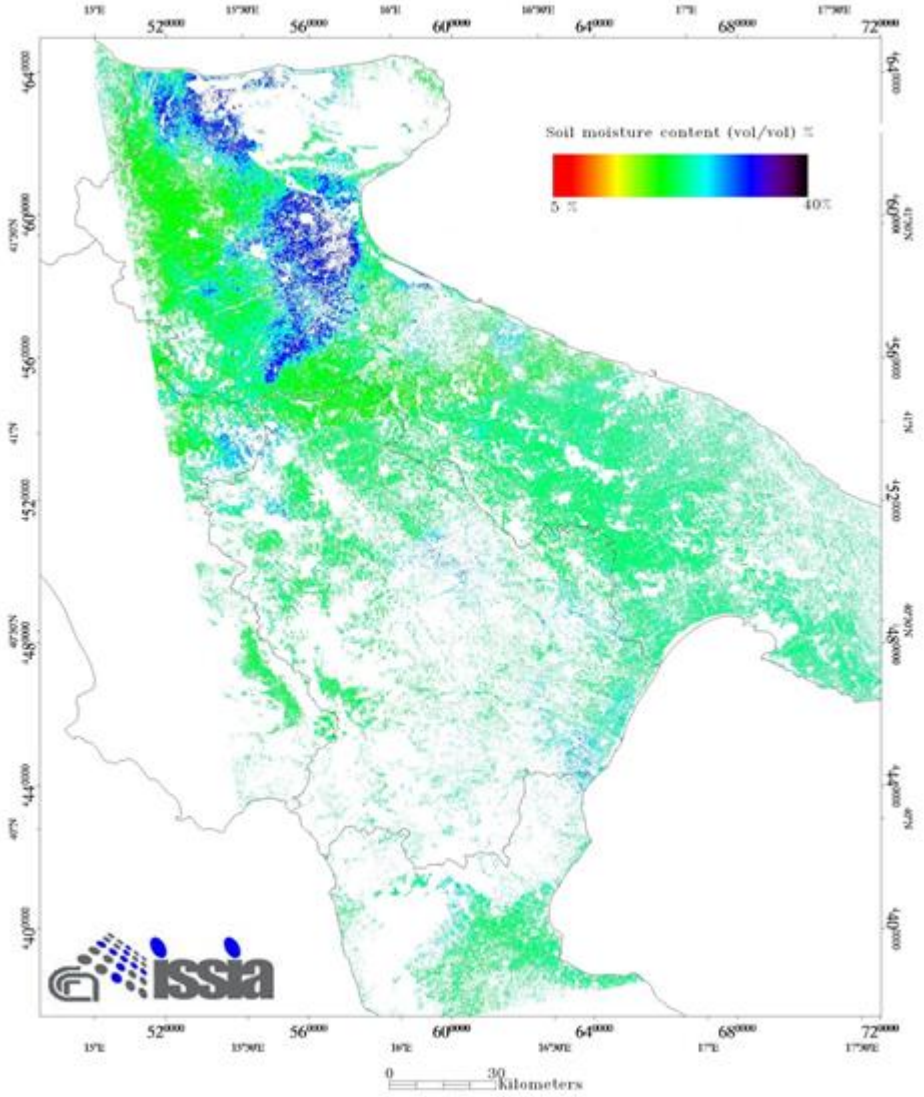
Sentinel-1 mission (2 satellites)

Possible product:
resolution: 100m; revisit 6 days



Mattia et al., IGARSS, 2015

Soil moisture map derived from IW S-1A acquired on October 27th, 2014



GAP analysis: high resolution products lack validation facilities

The GEOSS Water Strategy: From Observations to Decisions (GEO, 2013), ftp://ftp.earthobservations.org/TEMP/Water/GEOSS_WSR_Full_Report.pdf

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Satellite Soil Moisture Validation and Application Workshop, http://www.soil-moisture-workshop-2013.com/

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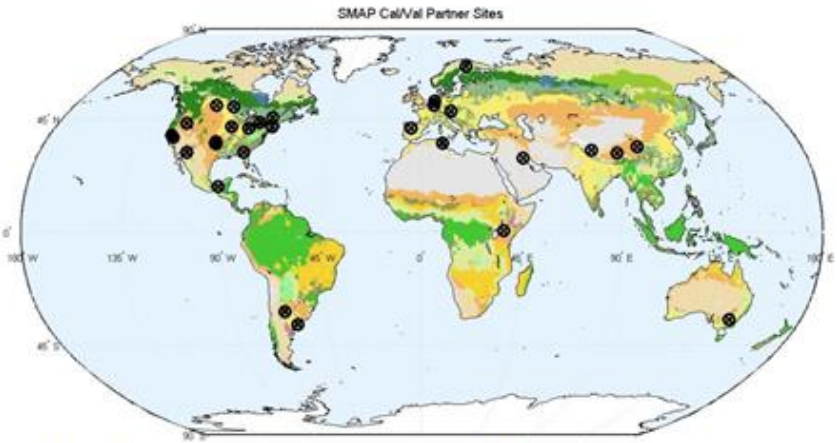
The International Soil Moisture Network (Dorigo et al., HESS, 2011)

Recommendations:

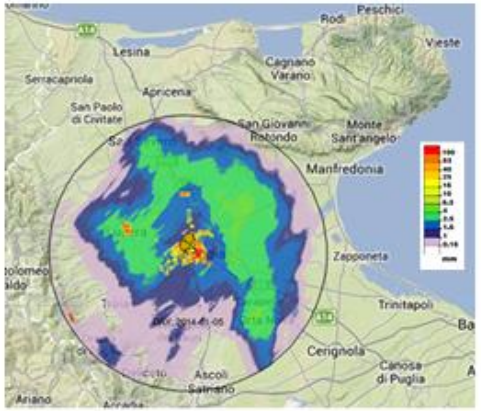
- In-situ observational networks should be strengthened
  - ✓ increase ground networks designed for validating soil moisture (m_v) products (**critical gap: validation of m_v products at high spatial resolution, e.g. 3.0-0.1 km**)



http://smap.jpl.nasa.gov/science/Validation/solicitations/

Segezia: hydrologic network at high spatial resolution (e.g. 100-500m)

- Segezia experimental farm (41°22'16"N, 15°29'30"E) of approx. 4km^2 located in the Cervaro basin (Puglia region, Southern Italy)
- main crops: cereals (durum wheat, barley, oat), pasture, olives
- soil texture: sandy clay loam
- area covered by an X-band meteorological radar



X-band meteorological radar with a coverage radius of 30 km and spatial resolution of 60 m

Hydrologic network installed in Feb. 2014:

- 11 soil moisture stations
- 1 meteo station

Balenzano et al., IGARSS, 2014

Conclusions

- Soil moisture cross cutting various SBAs, e.g. Food security & agriculture; water resources management; biodiversity & ecosystems;
- Priorities for operational soil moisture monitoring: cross-validation of products
- Recommendations: need to develop & validate high resolution (e.g. 100-500m) soil moisture products
- Future work: network of facilities for soil moisture validation at high resolution