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Discussion: Your priorities for the SM product in climate data service

The Workshop Participants

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Presentations

- We intend to publish them on line so you can access them after today

- If you have unpublished sensitive results – please inform us – (Felix Ortag, CC Wouter) and we will just publish the title slide.

Aim of discussion

- Identify your priorities for product improvements and underlying reasoning behind request
- Confirm that “hot list” of issues is complete
- Identify potential solutions to enable product improvement

- Prioritise Issues according to consensus (MoSCoW)

Priority	Description
MUST-HAVE	Essential for operational capability; MUST have this.
SHOULD-HAVE	Important, but may be fully met in later releases; SHOULD have this if at all possible.
COULD-HAVE	Non-essential, nice-to-have feature; COULD have this if it does not affect anything else.
WONT-HAVE	WON'T have this time but WOULD like this in the future.

What are your priorities for Soil Moisture Climate Data Services – and why??

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What did users like?

Long time series!

Well error-characterised

Direct observation of soil water

Largely independent from models and forcing

What should be improved?

→ More recent data
→ Changing characteristics over time
→ Spatial and temporal data gaps

→ Reducing errors

→ No observation of root zone
→ Layer depth not exactly defined

→ Dependency of absolute values on LSM

…. And how to address this?

…. Tell us what you've liked

…. And what else should be improved ?

What are **your** priorities

Hot list .. Is it complete

- Higher Spatial Resolution
- Higher temporal resolution (sub daily?)
- Filling Data Gaps
- Improving Product Accuracy
- Improving Blending Methods
- Improved Temporal Consistency
- Shorter Latency between data acquisition and product availability
- Independence of LSM’s
- Creation of Subsidy Variables Freeze Thaw/VOD
- Creation of Root Zone Soil Moisture Product

GCOS 200 (2016) priorities

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Table 25. Terrestrial ECV product requirements

Terrestrial ECV product requirements								
ECV	Products	Frequency	Resolution	Required measurement uncertainty	Stability (per decade unless otherwise specified)	Standards/ References	Entity (see Part II, section 2.2)[103]	
							Satellite	In Situ
Soil moisture	Surface soil moisture	Daily	1–25 km	0.04 m^3/m^3	0.01 m^3/m^3/year	WMO (2008(b))	WGClimate	ISMN
	Freeze/thaw	Daily	1–25 km	90 %	TBD		WGClimate	ISMN
	Surface inundation	Daily	1–25 km	90 %	TBD			ISMN
	Root-zone soil moisture	Daily	1–25 km	0.04 m^3/m^3	0.01 m^3/m^3/year			ISMN

GCOS identifies:

- Higher spatial resolution
- Subsidy Variables to better characterise quality of Surface Soil Moisture
  - Freeze Thaw
  - Surface Inundation
  - Root Zone Soil Moisture
  - VOD (?)

- Absolute measure of soil moisture.

Hot list – Priorities

ISSUE	PRIORITY
Higher Spatial Resolution	C
Filling Data Gaps	M/S/C/W
Improving Product Accuracy	M/S/C/W
Improving Blending Methods	M/S/C/W
Improving Temporal Consistency	M/S/C/W
Shorter Latency	M/S/C/W
Independence of LSM's	M/S/C/W
Creation of Root Zone Soil Moisture Product	S/C
Creation of Subsidy Variables Freeze Thaw/VOD	M/S/C/W
Higher Temporal Resolution – sub daily resolution	M/S/C/W
Better Communication of product characteristics to users	M

Must Should Could Wont

Areas to be addressed: Issues Identified (1)

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- **Higher Spatial Resolution** – to serve more regional applications – i.e. desert areas (Middle East)

- What is feasible for the future (RdJ) – twds 100m product – but not suitable for climate product – possible 1 to 10km
- (WW) – Second Generation Met Sats will provide 6 to 7km products – but unlikey to reach higher than 1km resolution.
- (JCC) – consider the aim of the product (ECV climate modelling) – 25km is a reasonable resolution

- **Filling Data Gaps** – difficulties with intermittent data – do gaps less than a few days really matter? – interpolation – could be good – but how is it done? (RdJ) can't make up data – can't compensate for frozen areas etc where observations can't be made.

Areas to be addressed: Issues Identified (1a)

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- **Improved Product Accuracy**:
  - Improve Modelling of Vegetation Effects
  - Improve Subsurface Scattering Effects
  - Better Quantification of actual Soil depths sampled by different microwave frequencies
  - Improved Characterisation of sub daily behaviour of soil and canopy moisture
  - Application of De-noising methods
  - Improve characterisation of product in Space and Time
  - Improve communication on product characteristics to Users
  - Provide Error Estimates at the level of observation
  - Better physical understanding of observation
  - Better suite of tools to help users understand/interpret errors or characterisation of the product

Areas to be addressed: Issues Identified (2)

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- **Improve Blending Methods**
  - Optimal Trade off between increased temporal/spatial coverage and maintaining acceptable data quality
  - Assess Errors and Merge datasets at different temporal scales
  - Alternative Merging approaches:
    - Machine Learning
    - Data Assimilation Frameworks

- **Improve Temporal Consistency**
  - Assessing impacts of changing configuration of sensors
  - Assess impacts of changes in data quality
  - Assess impact of spatial or temporal coverage

Areas to be addressed: Issues Identified (3)

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- **Shorter Latency between data acquisition and product availability**
  - Monitoring Services – data available after a few days
  - Operational Forecasting (i.e. flood) require NRT availability (how ever you wish to define NRT)
- **Independence of LSM's**
  - Currently Scale Against GLDAS
- **Creation of Root Zone Soil Moisture Product**
  - Better linking soil moisture variability to ecosystem and agricultural drought dynamics or hydrological modelling
  - Understanding that the product will not be model independent
  - Assimilation – yes – but overarching over different ECV's (JCC), also for gap filling (CA)
  - (CR) why bother.. Without very good soil information. Too many assumptions about the soil – no horizon information

How to Address Issues

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- **Higher Spatial Resolution**

- **Filling Data Gaps**
  - Use of additional Sensors – L band

- **Improving Product Accuracy**
  - Denoising
  - Improve Merging
  - Improve Characterisation - Inhomogeneity testing and correction

- **Improving Blending Methods**

Please retain: What are major strenghts and weaknesses?

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What did users like?	What should be improved?	What can be done?
Long time series!	→More recent data	→Copernicus Climate Change Service (C3S) soil moisture
	→Changing characteristics over time	→Inhomogeneity testing and correction
	→Spatial and temporal data gaps	→Use of additional sensors, use of L-band data
Well error-characterised	→Reducing errors	→Denoising, improved merging
Direct observation of soil water	→No observation of root zone →Layer depth not exactly defined	→Assimilation into LSM, Soil Water index
Largely independent from models and forcing	→Dependency of absolute values on LSM	→Using L-band observations as scaling reference