A Web Mapping Service for 30 years of Satellite Derived Soil Moisture

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OUTLINE

• Background
• Global Soil Moisture data set
  – Characteristics
  – Validation activities
• Web Mapping Service
• Summary
We developed a 30 year dataset of surface soil moisture based on historical microwave observations. We would like to share this dataset with the research community.

How?
Atmospheric Data Access for the Geospatial User Community (ADAGUC) Project:
To make remote sensing data more accessible for the geospatial user community.

~30 year of satellite data available
GLOBAL SOIL MOISTURE DATA SET: CHARACTERISTICS

- Soil moisture dataset is derived from the The Land Parameter Retrieval Model (LPRM)\textsuperscript{1,2,3}
- Describes surface soil moisture (~ 1-2 cm)
- \(~\text{daily coverage}\)
- \(~\text{0.25 degree resolution}\)

Limitations:
- Soil moisture quality is a function of vegetation density
- High frequency soil moisture retrievals are more sensitive to vegetation density
- No values when the vegetation cover is too dense
- Microwave observations are sensitive to Radio Frequency Interference (RFI, i.e. radar systems close to airports etc.)
- No values when the soil is frozen and/or snow is on the ground

1. Owe et al., \textit{IEEE} 2001; 3 De Jeu and Owe, IJRS 2003 2. Owe et al., \textit{JGR} 2008
GLOBAL SOIL MOISTURE DATA SET: CHARACTERISTICS


SSM/I, July 2004 (Ku-band) (1987-Now)

TRMM, July 2004 (X-band) (1997-Now)

AMSR-E, July 2004 (C-band) (2002-Now)

SM in m$^3$m$^{-3}$
Validation studies with in situ soil moisture data

Forested Regions
The Netherlands, Germany

Agricultural regions
USA, Russia, Luxembourg, Germany, France

Semi Arid Regions
Spain, Turkmenistan, Mongolia, Australia

Evaluation with other RS and modeled soil moisture products

Soil Moisture can obtained in regions with a sparse to moderate vegetation cover
(vegetation optical depth < 0.6)
with an uncertainty of:
0.04-0.06 m³ m⁻³

1Rebel et al., in prep; 2Owe et al., JGR 2008;
3De Jeu and Owe, IJRS 2003; 4Weerts et al., CAHMDA 2008;
5Draper et al., MODSIM 2007; 6Wagner et al., HG 2007;
7Rudiger et al., submitted to JHM; 8De Jeu et al., submitted to S.Geophys.;
GLOBAL SOIL MOISTURE DATA SET: VALIDATION

Time series of different Soil Moisture products for the REMEDHUS field site in Spain (taken from Wagner et al, HG, 2007)

Soil Moisture Dynamics in Oklahoma, USA (taken from Owe et al, JGR, 2008)
Comparison between satellite soil moisture and precipitation (contour lines) of the previous 24 hours over Australia (taken from Draper et al., 2007)
Correlation coefficient $R$ between ERS and AMSR-E surface soil moisture.
WEBMAPPING SERVICE

Core gridded soil moisture data on server in ADAGUC Product Standard:

• HDF5 Format (version 1.8)

• Metadata complies with the ISO 19115:2003 standard

• Regular grid

ADAGUC will use GDAL library

➢ Standard library for geo-based file conversions and used in OGC compliant services (e.g. UMN Mapserver)
WEBMAPPING SERVICE

Webmapping service facilities

Data selection
• Time
• Region
• Type

Data download
• HDF
• NetCDF
• GRD
• GeoTIFF
• KML

Near Realtime Data Access
WEBMAPPING SERVICE

When available:

This summer a pilot of the webmapping service on: http://www.geo.vu.nl/~jeur/lprm

And later on http://adaguc.knmi.nl/

Official launch (including other datasets): End 2008

Final ADAGUC workshop 4-5 December 2008, VU University Amsterdam, NL
Summary

• A historical dataset of satellite retrieved soil moisture is presented

• Satellite soil moisture coincides with field observations and is comparable to modeled soil moisture at global scale

• This summer the dataset will be available for the user community on a Webmapping Service

• By the end of this year ADAGUC will provide a portal for numerous datasets