Achievements of CCI Soil Moisture Project: What data are produced and how are they used?

Wolfgang Wagner & CCI Project Team
Maize field in Upper Austria end of August 2015
Data Set Releases

- Merging active and passive microwave Level 2 soil moisture data sets
  - ASCAT Level 2 data provided by H-SAF
  - Passive data processing supported by NASA

- Release v02.1 in 2014
  - 3 datasets: Merged active, merged passive, and combined active-passive data
  - Longer time period: 1978/11-2013/12

- New release cycle
  - February: Internal for project team
  - August: Early release for key users
  - December: Public release
ESA-CCI SM & ERA-Interim/Land vs. in-situ measurements 2014 (based on daily data)

Graphics courtesy of Clement Albergel

In-situ    ESA-CCI-SM    ERA-Interim/Land

uscrn.muleshoe_19_s 33.95570 −102.77400

COSMOS 38.43160 −120.96590
2014 State of the Climate: Highlights

Author: Adapted from State of the Climate in 2014

Tuesday, July 14, 2015
Users

- Already over 1800 users
Top 20 User Countries:

- United States
- India
- China
- United Kingdom
- Germany
- Netherlands
- France
- Spain
- Italy
- Australia
- Canada
- Austria
- Iran
- Japan
- Brazil
- Switzerland
- South Africa
- Argentina
- Russia

ECV SM Version 0.1

ECV SM Version 0.1 & 02.1

ECV SM Version 02.1

0 50 100 150 200 250 300 350 400
Scale of Interest

Global scale: $\approx 32\%$

Regional scale: $\approx 46\%$

Local scale: $\approx 17\%$

Application of soil moisture data

Undefined: $\approx 5\%$
Organisation Type

- Data are still being used practically entirely for R&D
- But increasing use of the data by public bodies, non-profit organisations and private companies suggests the high potential of the data in real-world applications
Impact on Scientific Literature

- Our papers are receiving a good number of citations by papers such as (random selection):
  - Löw et al. (2013) Potential and limitations of multidecadal satellite soil moisture observations for selected climate model evaluation studies
  - Hirschi et al. (2014) Using remotely sensed soil moisture for land–atmosphere coupling diagnostics: The role of surface vs. root-zone soil moisture variability
  - Szczypta et al. (2014) Suitability of modelled and remotely sensed essential climate variables for monitoring Euro-Mediterranean droughts
  - Draper et al. (2015) The impact of near-surface soil moisture assimilation at subseasonal, seasonal, and inter-annual time scales
  - Carrão et al. (2015) An empirical standardized soil moisture index for agricultural drought assessment from remotely sensed data
  - Rahmani et al. (2015) Multiyear monitoring of soil moisture over Iran through satellite and reanalysis soil moisture products
  - Asoka (2015) Prediction of vegetation anomalies to improve food security and water management in India
  - Su et al. (2015) Spatiotemporal variations of soil moisture in the Tarim River basin, China
Recent Scientific Achievements

- Many of our recent scientific achievements have been made in cooperation with other R&D project or within our CCI Visiting Scientist Programme

  Error Characterization

  Merging Strategy

  Inclusion of SMOS

  Data Assimilation

  Estimation of Rainfall

  Spatial Representativeness
Signal to Noise Ratio (SNR)

SNR expressed in dB is estimated via triple collocation
Merging based on Weights

Old (top) versus new (bottom) merging scheme. The new merging schemes weights each data set according to its SNR.
Integration of SMOS

- strong similarities between SMOS LPRM (baseline CCI algorithm) and SMOS Level 3 soil moisture\(^1\)
- strong similarities between SMOS and AMSR over the expected regions\(^2,3,4\)

Correlation SMOS L 3-SMOS LPRM

Correlation SMOS LPRM – AMSR LPRM

\(^1\)Van der Schalie et al., JAG, 2015, \(^2\)Rodriguez-Fernandez et al., in prep, \(^3\)Al Yaari et al., RSE, in review, \(^4\)Van der Schalie et al., in prep
Outlook

- Public release of v02.2 in December 2014

- Improvements of ECV production system
  - Transcription from IDL to Python
  - Implementation on EODC platform (access to supercomputer)
  - New algorithms and data sources as progress permits

- ISSI International Team “Adding value to soil moisture information for climate studies”
  - Led by William Lahoz, NILU
  - 2nd Meeting, 9-13 November 2015, Bern, Switzerland

- 3rd Soil Moisture Validation and Application Workshop
  - Planned for week 22-25 February 2016 in Miami together with the SMAP team