SMOS

1.5 years down the road

Yann CNES - Cesbio

And the SMOS team

SMOS Workshop 2011

Monash Australia
Why measuring Soil moisture?

**Scientific Objectives:** Improve our understanding of the land component of the global hydrologic cycle, of the spatial and temporal evolution of the water storage, and of the soil atmosphere interactions so as to improve global water resources management - globally.
SM Rationale

- Role of Soil moisture in surface atmosphere interactions:
  - storage of water (surface and root zone), water uptake by vegetation (root zone), fluxes at the interface (evaporation), influence on run-off

- Implies relevance for
  - Weather Forecasts
  - Climatic studies
  - Water resources
  - Crop management
  - Forecast of extreme events
Why do we want to measure sea surface salinity with the SMOS mission?

Scientific objectives: to increase the knowledge on the ocean component of the global water cycle, large scale circulation, and ocean’s role on the climate system.

From J Font et al 2008
Salinity links the climatic variations of the global water cycle and ocean circulation

- Salinity is required to determine seawater density, which in turn governs ocean circulation.
- Salinity variations are governed by freshwater fluxes due to precipitation, evaporation, runoff and the freezing and melting of ice.

Air-Sea Water Flux accounts for
- 86% of global evaporation
- 78% of global precipitation

Importance
- Climate prediction
- El Niño forecasts
- Global Water budget

From J Font et al 2007
Sea surface salinity: a climate tracer

Sea Surface salinity trends for Pacific and Atlantic

Gordon & Guilivi, *Oceanography*, 2008

- +0.03 psu/an
- -0.03 psu/an

Pacific / Atlantic interactions
- increased convection
- poleward transport of high salinities
- Fresh water export high salinities
- warm

N. Reul
• Passive microwaves
• L Band
• Antenna size → Two concepts
  – Aquarius/SMAP
  – SMOS
• Each integration time, (2.4 s) a full scene is acquired (dual or full pol)
• Average resolution 43 km, global coverage
• A given point of the surface is thus seen with several angles
• Maximum time (equator) between two acquisitions 3 days

**SMOS FOV; 755 km, 3x6, 33°, 0.875λ,**

P. Waldteufel, 2003
Data Acquisition

[Image of a map and graph with data points and labels]

[Text: Data Acquisition]
A few dates

- November 2\(^{nd}\) SMOS launch
- November 17 SODAP
- Start of data flow a few days after (piecewise) $\rightarrow$ calibration tests
- End of January 2010 start to full data acquisition (1 week DP - 1 week FP etc)
- Cal val Activities still on going (see 2\(^{nd}\) presentation)
- Mid May 2010 end of commissionning phase
- Since $\rightarrow$ routine operations
- September data available to all
- Start of reprocessing October
- Dissemination issues
- Reprocessing issues
Drift $T_B @ 42^\circ = -0.33 \text{K/yr}$

Mean = 210.40 K, Std = 2.73 K

mean = 209 K, Tdev = 0.15 K

mean = 188 K, Tdev = 0.7 K
THE problem

RFI
Issue of RFI → Europe
But Progresses are made!
And Australia is (almost) clean
Soil Moisture 3 Days Synthesis
August 14/15/16 2010

YHK February 2011
Monitoring land
Temporal behaviour
An Example Floods in Australia

Australian Rainfall Analysis (mm)
December 2009
Product of the National Climate Centre
An Example Floods in Australia

Australian Rainfall Analysis (mm)
December 2010
Product of the National Climate Centre

http://www.bom.gov.au
© Commonwealth of Australia 2011, Australian Bureau of Meteorology
Issued: 06/01/2011
An Example Floods in Australia

Australian Rainfall Anomalies
December 2010
Product of the National Climate Centre

http://www.bom.gov.au
© Commonwealth of Australia 2011, Australian Bureau of Meteorology

Issued: 06/01/2011
An Example Floods in Australia
An Example Floods in Australia
An Example Floods in Australia
Sea Surface salinity et al...
August 2010 SMOS Level 3 Data @ 1°x1°
Zoom on South Tropical Pacific
Moyennes mensuelles à 1° de résolution spatiale

In Situ Data 1°x1° averaged Aug 2010

SMOS Data 1°x1° averaged Aug 2010

Erreur SMOS: 0.3 psu

N. Reul
Amazon Film
Summary

- SMOS Successfully launched and in operation
- Provides very good data → earlier and better than expected
- Soil moisture retrievals are looking very good even though still preliminary and still in Cal Val
- Salinity maps are produced!
- But still several hurdles and issues to be solved
- Aquarius, SMAP, SMOS FO and SMOS NEXT!

- See also