IMPORTANCE OF SATELLITE DATA (FOR REANALYSIS AND BEYOND)

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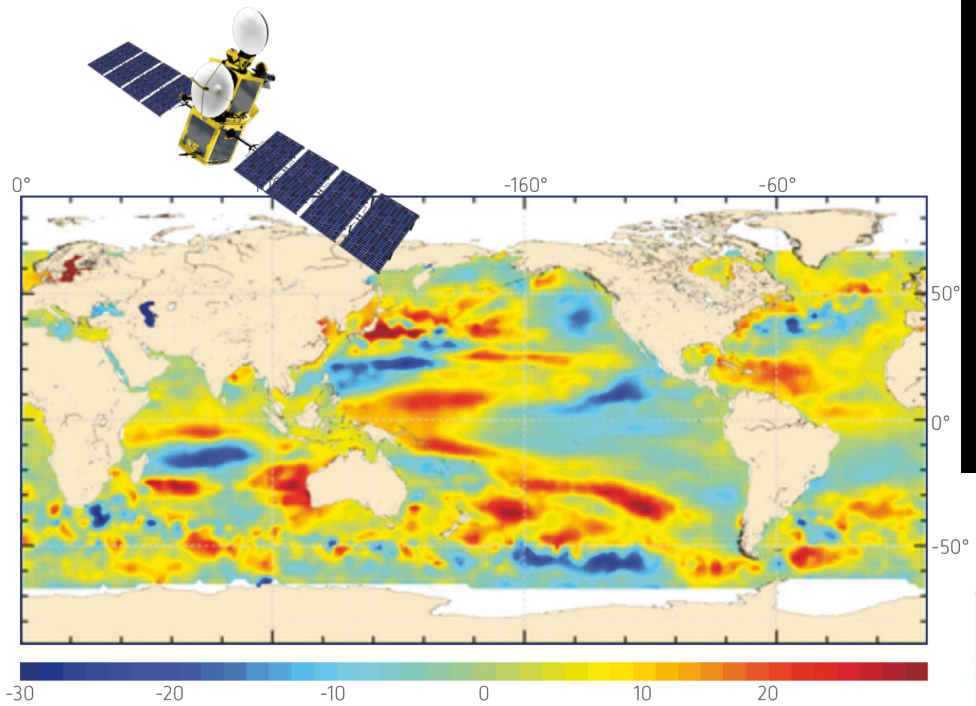
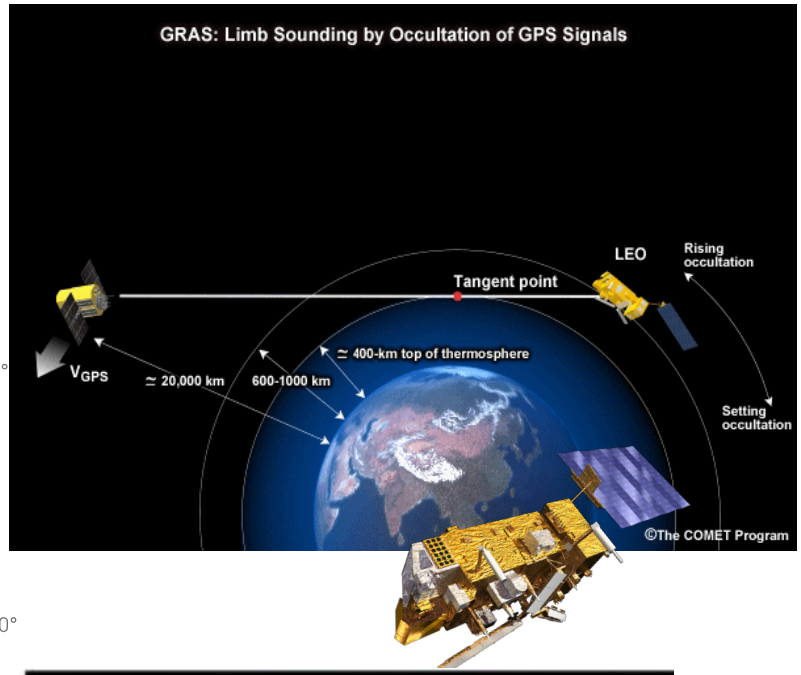
Why satellite data for climate monitoring?

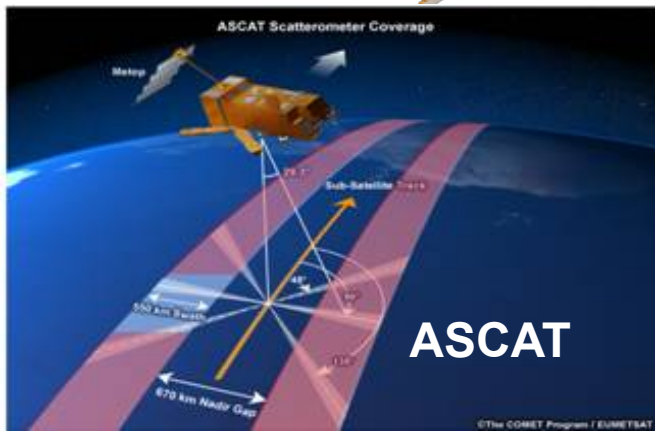
- Global coverage
- Global consistency, sometimes also temporal consistency
- High spatial and temporal sampling
- Temporal coverage just reaches climate scales (~40 years)
- Provides measurements not possible from ground
- High accuracy (for many systems)
- Provides essential inputs to modelling (weather and climate)
- Well organised international collaboration

Some missions are optimised for climate monitoring …



Trends (mm/year I.B. : applied / wet tropo. :RADIOMETER-derived, seasonal signal removed)





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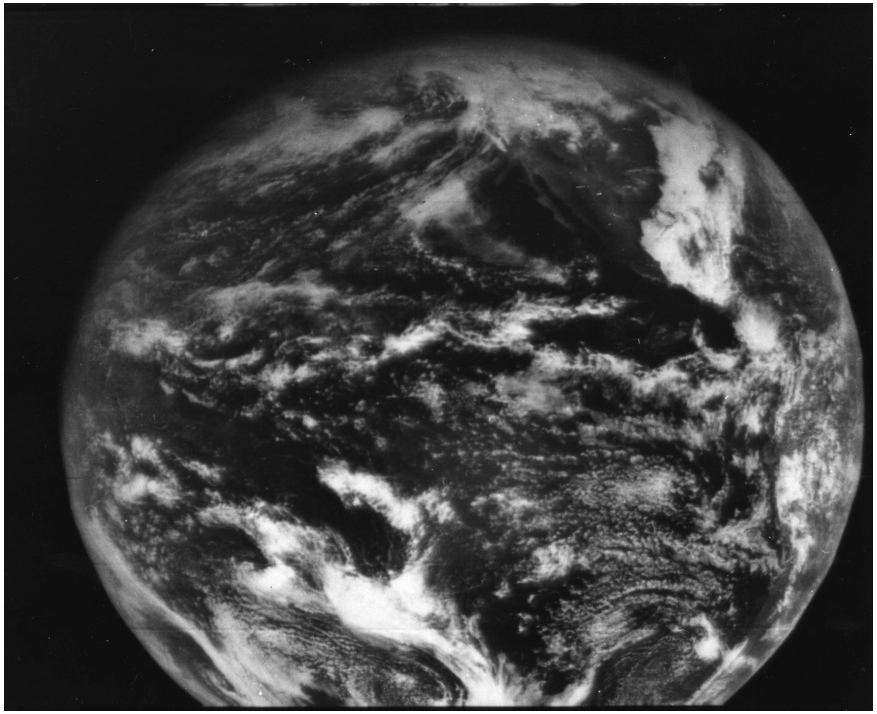
Some are not …. Very early observation capability



ATS-1 visible image (11 December 1966)

Visible channel of ATS-1 18 November 1967

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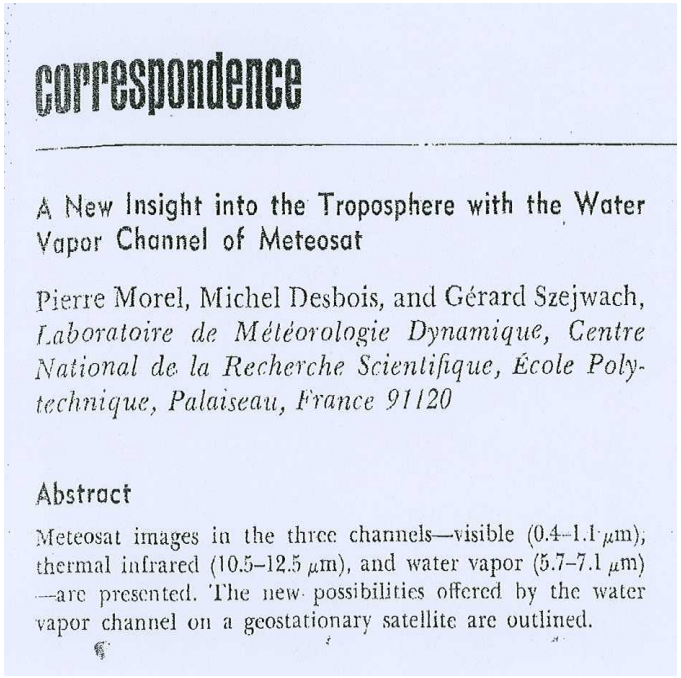
Data Rescue and Preservation – Meteosat-1

WV channel, Meteosat 1

4th February 1979, 15 images
Every hour from 08:30 UTC until 23:30 UTC *(missing images at 18:30 UTC)*



correspondence

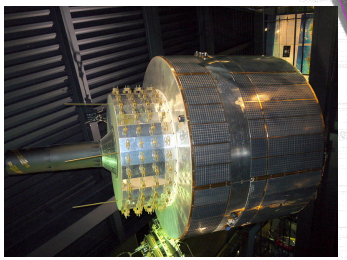
A New Insight into the Troposphere with the Water Vapor Channel of Meteosat

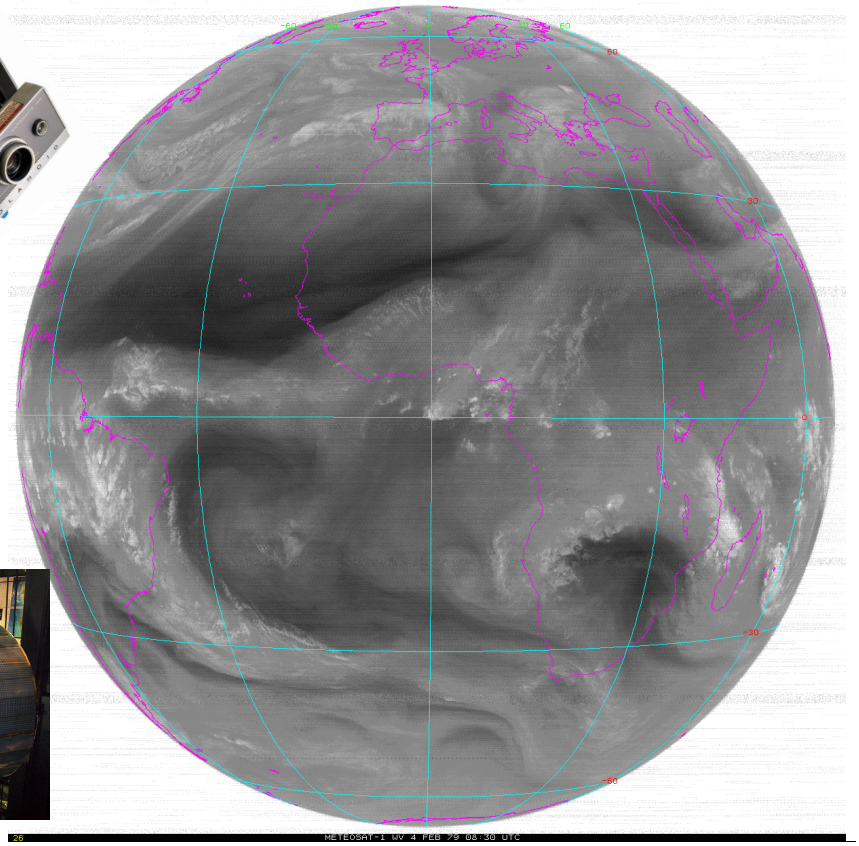
Pierre Morel, Michel Desbois, and Gérard Szejwach,
Laboratoire de Météorologie Dynamique, Centre National de la Recherche Scientifique, École Polytechnique, Palaiseau, France 91120

Abstract

Meteosat images in the three channels—visible (0.4–1.1 μm), thermal infrared (10.5–12.5 μm), and water vapor (5.7–7.1 μm)—are presented. The new possibilities offered by the water vapor channel on a geostationary satellite are outlined.

Bulletin of the AMS, 1978





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A few quotes on Meteosat in 1985

- **`Meteosat is a UFO (Uncalibrated Flying Object)‘**
  - Prof. Hartmut Grassl, inter alia former Director of WCRP in Geneva and Director at Max-Planck Institute for Meteorology in Hamburg
- **`Meteosat was never meant to be quantitative. It is like a camera!!!`**
  - Image Engineer (Mr. Michel) of Matra Aerospace at a meeting in Toulouse in 1985.
- **`Give me winds from Meteosat! Without your winds the ECMWF analysis will be blind over the sub-tropical oceans‘**
  - Anthony Hollingsworth, Head of Research at ECMWF, in June 1985.

Entering the Value Chain Upstream: Reanalyses

Global reanalyses:

- Satellite data are used in reanalyses of the modern observing period (~30-50 years);
- Over 95% of the 40 million observations processed daily in the current weather forecast are provided by satellites;
- Try to extend to the past with more rescued satellite data, potential back to the 1960s;
- EUMETSAT satellite data records provide a significant contribution to the reanalyses;
- European Research projects during the last 7 years make a distinct contribution to the reanalysis.

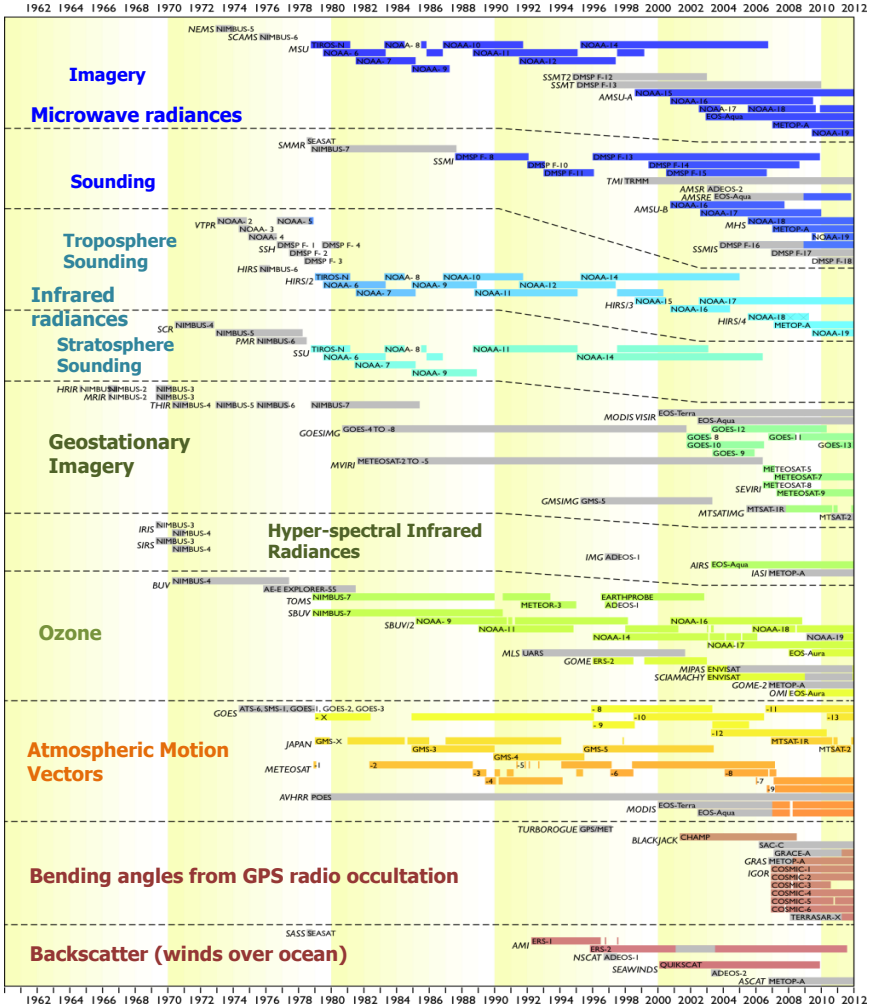

Figure courtesy of Paul Poli

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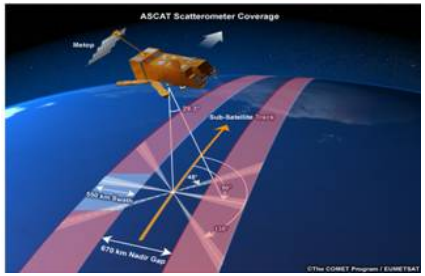
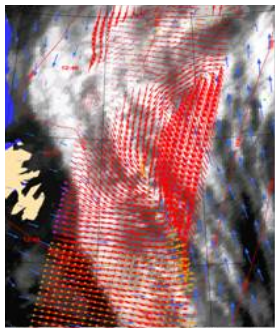
Metop-A ASCAT Data Record

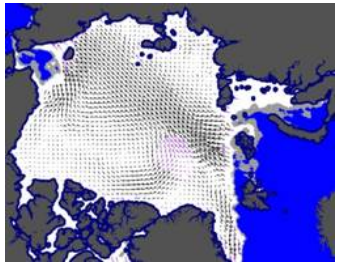
ASCAT
Soil moisture



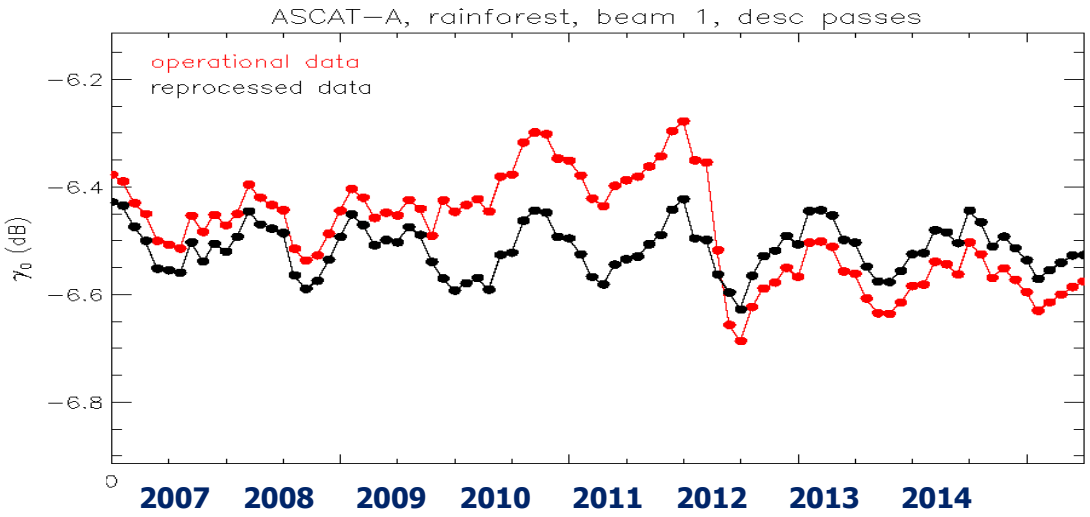
Ocean winds



Sea ice drift



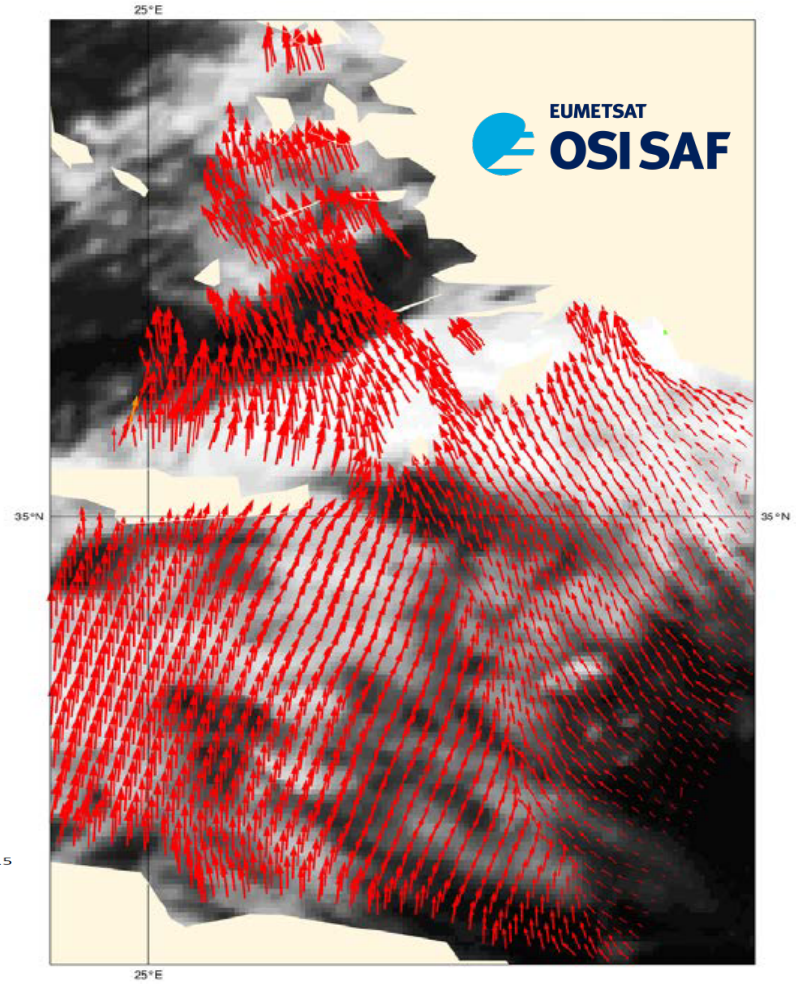
- Recalibration eliminates drifts and jumps in the time series;
- Reflects only natural variations of backscatter of the forest canopy.

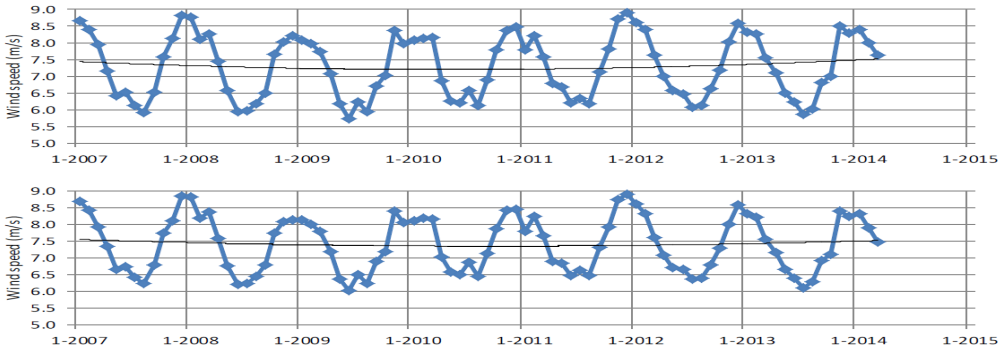


EUMETSAT Ocean and Sea Ice - SAF Ocean Winds

ASCAT Winds Data Record released in October 2016

- January 2007-March 2014
- Using reprocessed L1b data record, uniform calibration settings
- Single processing software
- 25km and 12.5km resolution swath grids
- ERS/1-2 based data record release in preparation





Average ASCAT wind speed (top) and collocated buoy wind speed (bottom) of 25km ASCAT winds. The plotted values are monthly averages.

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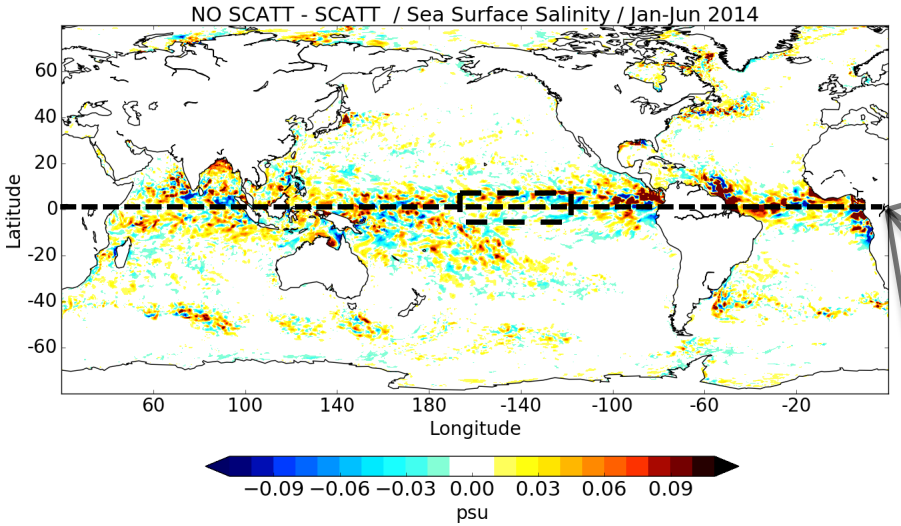
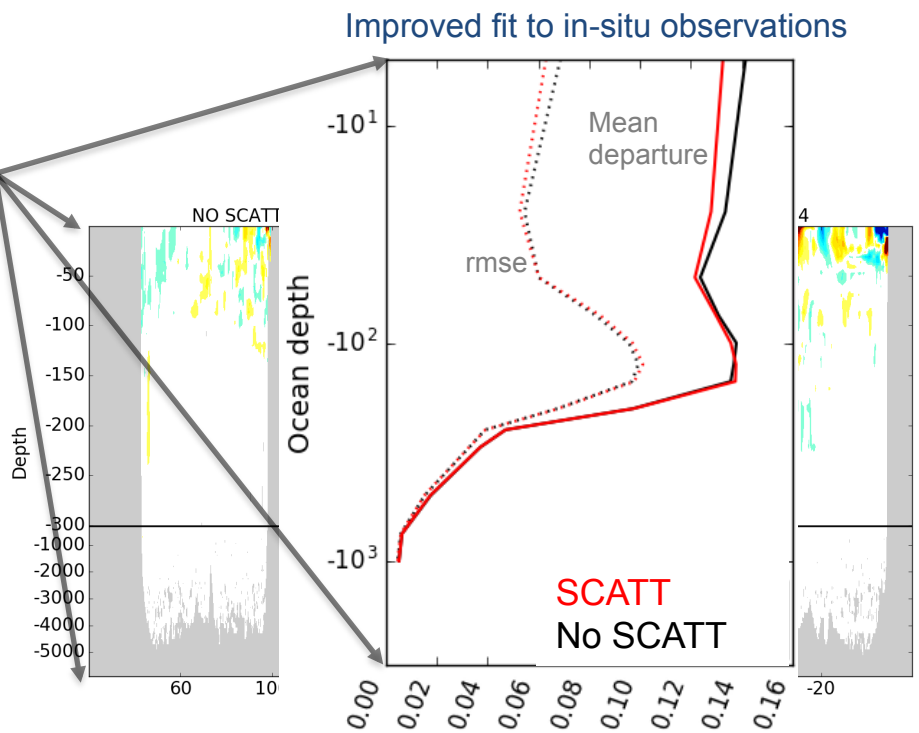
Coupled assimilation - Atmospheric winds impact salinity

Impact of scatterometer winds on ocean salinity





Courtesy of ECMWF

Conclusion

- Satellite data are an essential resource for climate monitoring including its use in reanalysis;
- Data Rescue is an important activity for satellite data as it has the potential to extend time series;
- The value of historic dramatically increased over the last decades from providing images to quantitative data for assimilation and retrieval;
- Modern satellite data such as ASCAT demonstrate values beyond their original purpose;
- We need to continue strengthen the use of the satellite data for climate science and services to further increase their value for the society.

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Thank you for your attention!

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