

On the importance of accessible datasets for the evaluation of satellite snow products – an ESA perspective

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Brief introduction to Cal/Val

Examples of sensor performance/data evaluation

Needs for snow product inter-comparisons



Cal/Val is essential to quantify the data quality for both scientific and operational missions through the lifetime of an EO mission

- This involves specialised and direct investments in manpower and infrastructure (aircraft/balloon/ships/groundbased), and in the coordination of specialised efforts (measurements, protocols, documentation, archives)
- Relies heavily on existing network in-situ data (for example WMO/ GTS, AERONET, NDACC, etc.), access to satellite datasets, and voluntary scientific efforts and contributions (not part of the mission)

EO missions, and their products use, have been more successful because of well planned mission Cal/Val (throughout the mission lifetime)



Satellite data validation can be broken down into two distinct processes to meet products and service needs:

- 1. Monitoring/(re)calibration of the fundamental measurement (the <u>Cal</u> in Cal/Val)
 - Radiances, radar pulse timing, brightness temperatures, etc.
 - Using desert/ocean targets, transponders, radiometers, etc.
- 2. Validation/intercomparison of derived geophysical parameters (the <u>Val</u> in Cal/Val)
 - Statistical intercomparisons using large amounts of network data, for example total ozone measurements, buoys, etc.
 - Targeted process studies/measurements mimicking satellite sensors, for example use of SST radiometers, AQ sunphotometers or spectrometers for aerosols, etc.

Example: Sea Surface Temperature (SST)

- Global services providing daily SST maps from satellites:
 - *MyOcean (right) -*<u>http://www.myocean.eu</u>
 - *MEDSPIRATION (below) http:// cersat.ifremer.fr/thematic-portals/ projects/medspiration*



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Example AVHRR and SEVIRI performance during a month (3/2013) (ref. OSTIA monitoring, GHRSST project)



Envisat/AATSR validation using highquality radiometer comparisons



High quality, calibrated, cheap, radiometer mimicking satellite measurements (<u>http://www.isar.org.uk</u>)

Follows well defined calibration and measurement protocols traceable to SI

Deployed as self-contained packages on ferries (joint ESA nd UK national funding)





Pride of Bilbao (Bay of Biscay and English Channel)

ISAR-AATSR intercomparison (1 week of match-up data, Nov. 2011)





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B. Bojkov - SnowPEX ISSPI-1, College Park, MD, 21-23 July 2014

http://www.isar.org.uk





So, for SST we need...





4. Documentation, community agreed "best practises", at all stages of the Cal/Val processes as coordinated through the GHRSST – www.ghrsst.org

Maximum Snow Extent: 1-7 March 2010





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In-situ snow datasets



In-situ datasets are critical for EO product validation but require :

- Standard Operational Procedures (SOPs) across networks and measurements
- Standardisation of reporting, • characterisation, and documentation
- Easy and timely access to the "standardised" datasets
- Temporal and geographical representativity
- Geographical coverage of measurements

The above points should readily be addressed and coordinated by the WMO/GCW



In-situ snow datasets (ii)



- Short-term priority for EO validation by in-situ datasets however should specifically address:
 - 1. Establish in-situ/EO intercomparison/validation protocols
 - 2. Define (globally) representative reference sites
 - 3. The "point to area" representativity issue, especially in complex areas (mountains, mixed areas, etc.)

Now that you mention it, Québec is a potentially data-rich SnowPEx validation region! Hydro-Quebec have expressed willingness to contribute data to SnowPEx



from Ross Brown's presentation yesterday

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Satellite reference scenes



Hi-resolution resolution datasets i.e. Landsat, Spot 5/6, etc., preferred for direct inter-comparisons

Need consistent L1 version (re)processing of hi-resolution satellite data reference scenes globally

- At a minimum over reference sites/regions identified in the workshop
- Orthorectified with common public DEM
- Readily accessible archive
- Possibly need to reconcile the existing archive (for example the ESA and USGS Landsat archives)

Is there a need for improving cloud screening procedures, use of common DEM, common auxiliary data (land masks, land, la



Identified Landsat data (2000–2014) for SE Evaluation in SnowPEX







About 400 Landsat scenes were so far identified for SE evaluation (data are available at ENVEO, SYKE and Rutgers University):

- For many locations only 1 clear sky scene with snowy conditions is available for that period
- Only for a few regions (e.g. Alps, northern Scandinavia) a well spatial and temporal coverage of reference data could be identified
- Additional reference data is needed for the U.S. and Asia – some images were shown yesterday that would be great additions for the SnowPEX inter-comparisons

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Summary



Developing "best practice" for preparing reference data and inter-comparison/validation of SE/SWE product is critical in the short-term - for the long-term

Identify validation test areas, representative of different observation environments/surfaces classes (for example Quebec/Labrador), is essential to have a common baseline for comparisons

Need easy, timely, version consistent, and documented access to reference and in-situ data (at a minimum for the globally define test areas)

Standardisation of in-situ SOPs and data reporting is required

We need proactive coordination by WMO/GCW on in-situ standardisation efforts, timely data access, geographical gap-filling, etc.

Thank you...



and for those of you interested:

1st Arctic Product Validation and Evolution WS, Ottawa, 12-13 November, Canada

http://calvalportal.ceos.org/
events/apve-workshop

