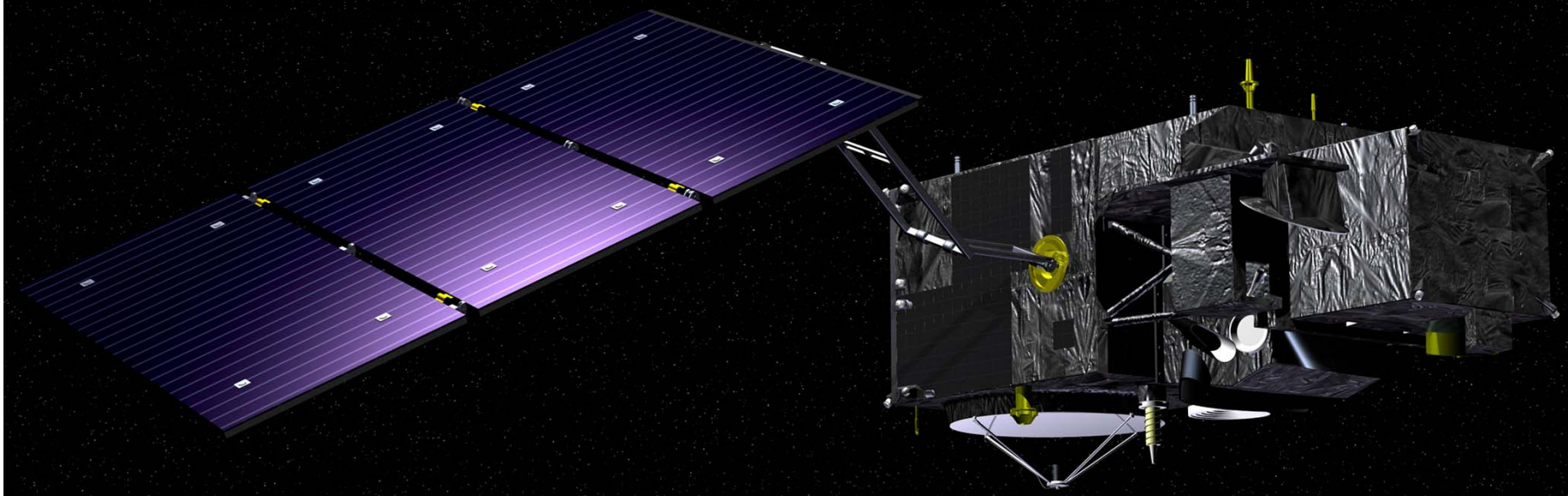
G/S algorithm review process – *a proposal*



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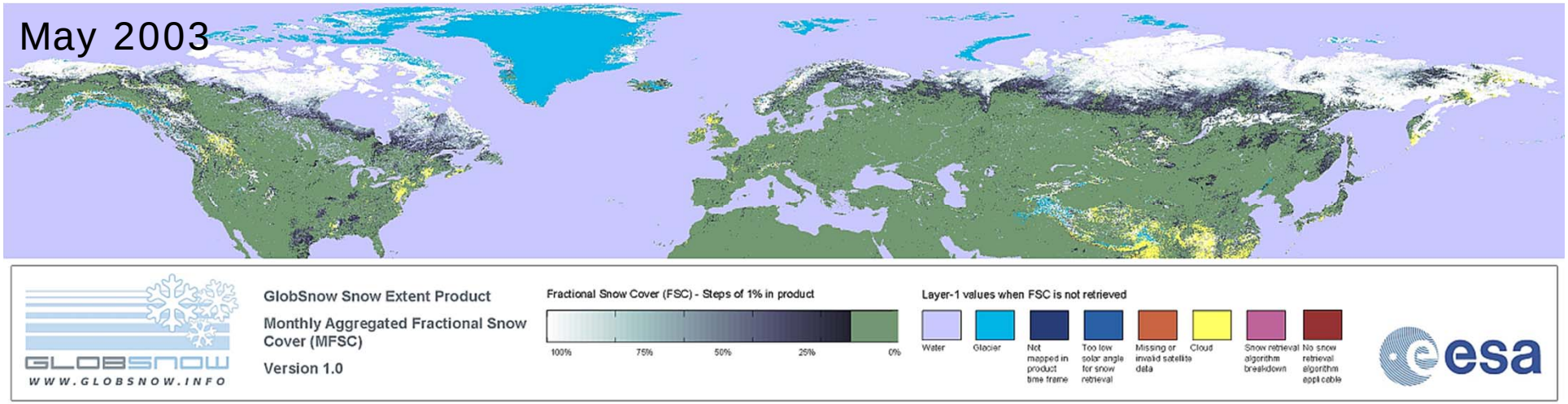
Why an algorithm review process in ESA EO programme?



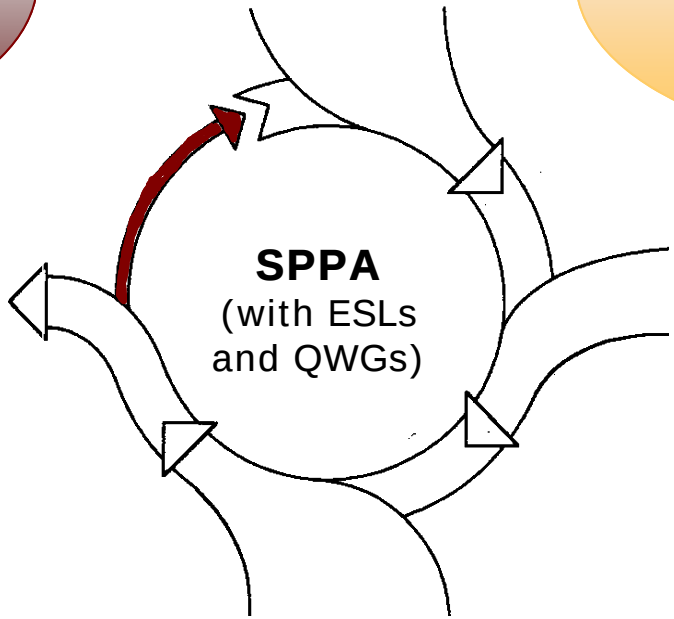
How does SPPA work…

Mission Feedback
- *Science community input*
- *Comparison with independent products*
- *Evolution of protocols (QA4EO)*

Satellite Data from Calibrated Sensors

Calibration Strategy
- *Pre-launch (Phase A-D)*
- *Satellite Commissioning (Phase E1)*
- *Operations (Phase E2)*
- *Post-Operations (Phase F)*

Improved Products and Algorithms
- *Reprocessing resulting from improved calibration and algorithms*
- *Interface to collaborative algorithms*



In-Situ Data
- *Collection of data against well-defined requirements*
- *Inter-calibration of in-situ systems*
- *Data collection following community accepted protocols (QA4EO)*
- *Maintenance of Cal/Val information and data portals*

Tools
- *Cal/Val tools*
- *Diagnostic data-sets (DDS)*
- *Algorithm breadboards*
- *Radiative Transfer Models*

Product and Algorithm Validation
- *Algorithm development and Validation*
- *Operational QC on products*
- *Match-up, long-loop evaluation, Satellite-Satellite*

Typical EO G/S algorithm evolution:

Step 1: Algorithm development and prototyping of processor

- Lead by scientists (in the frame of the Quality Working Groups -QWGs)
- Provision of key documentation (ATBD, IODD, etc.)
- Limited processing of data and validation

Step 2: Development of operational processor (the "IPF")

- Lead by S/W industry
- Provision of the operational processor and updated documentation
- Limited (very limited) scientific involvement

Step 3: Reprocessing (and forward processing for operational missions)

- Lead by S/W and H/W industry
- Scientific (QWG) involvement through validation

Overall, this **implementation takes 2 to 5 years**

- Costly process
- Scientifically out-dated data made available to the users
- Often the system/input is out of sync with the calibration and sci. evolution

but, ESA currently has…

Access to a vibrant, mature and competitive EO research communities

Strong institutional support (in addition to the ESA G/S) for algorithm development and processing:

- *ESA/DUE, ESA/STSE, ESA/CCI*
- *GSC, GMES Services (and future collaborative centres)*
- *Eumetsat SAFs*
- *National programmes and collaborative centres*
- *etc.*

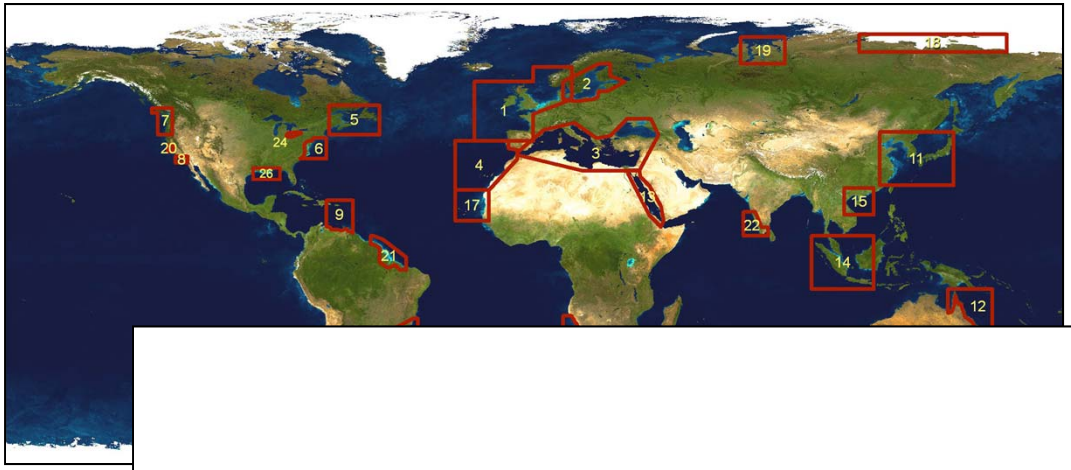
Increased processing capabilities as compared to the recent past:

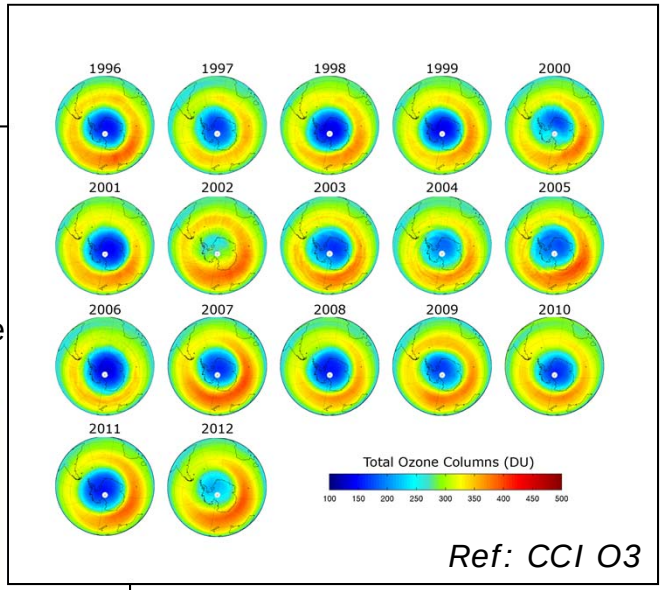
- *Brockmann's Calvalus, ACRI-ST, FUB-system, DWD/CM-SAF, etc.*

Changing environment:

- *Decreased EOEP-4 and LTDP resources,*
- *Reduced programmatic and national support*
- *Decommissioning of ERS/Envisat*
- *etc.*

but we need a formal algorithm review process…





Ref: CCI O3

Ocean Colour Climate Change Initiative (OC_CCI) - Phase One

ATBD v1 - Polymer atmospheric correction algorithm

Basic consideration wrt new algorithms

Demonstration products vs. Environmental Data Records vs. Climate Data Records

i.e. what is it the best for a given ESA sensor (or sensor family)?

Maturity of the algorithms/generated products

i.e. how mature is the algorithm/product/demonstration?

Is the algorithms for operational implementation and/or reprocessing *(both having dif. processing considerations)?*

Who are the users (who is setting the requirements)?

i.e. balance outside needs and development

but ESA staff are not necessarily the best judges/arbitrators for such decisions…

Review process – Step 1

Provision of data package to ESA / SPPA

- ***Who:*** *the algorithm development team*

- ***Documentation requirements:***
  - Algorithms documentation: ATBDs, PVR (incl. global quality, *validation and intercomparisons)*
  - *S/W and system documentations: (DPM, IODD)*
  - *Completed Bates Maturity Index*

- ***Open and accessible datasets:***
  - Data User Guide
  - Auxiliary data
  - Tools (read/visualisation tools)

Review process – Step 1b

Determination of data package completeness

- ***Who:*** *ESA (with the QWG?)*
- ***Basic question:*** *Suitability for G/S*
- ***Action:*** *Quick review of documentation and datasets (with a possible action on the data package provider)*
- ***Timeframe:*** *3-6 months in sync with QWG cycle (approx. 2 meetings)*
- ***Outcome:*** *Recommendation to proceed with external review of data package*

Review process – Step 2

External review process

- ***Who:*** *Recognised impartial expert/expert panel (or by the QWG)*
- ***What:*** *Detailed data package review*
- ***Timeframe:*** *Maximum 3 months process*
- ***Outcome:*** *Convening of review panel with the QWG to formulate a recommendation to ESA/SPPA*

Review process – Outcome

1. Incorporate a new algorithm into the ESA G/S for reprocessing and/or forward processing

   or

   A possible parallel existence of two algorithms until details worked out (prior to inclusion into G/S)

2. Involve new teams in the QWGs

3. With a continuous timeline until process starts over

Review Process - Open questions

What is the minimum required documentation for a review? ATBDs, DPM, IODD, PVR?

What type of review? A documentation review or/and data analysis (i.e. round-robin type data runs with same conditions)?

Should the external review include the QWGs or be an integral part of the QWG?

How should one phase-in the review outcome into the G/S?

Do we now have from CCI "Best Practise" for round-robins? For example is the OC scoring published?

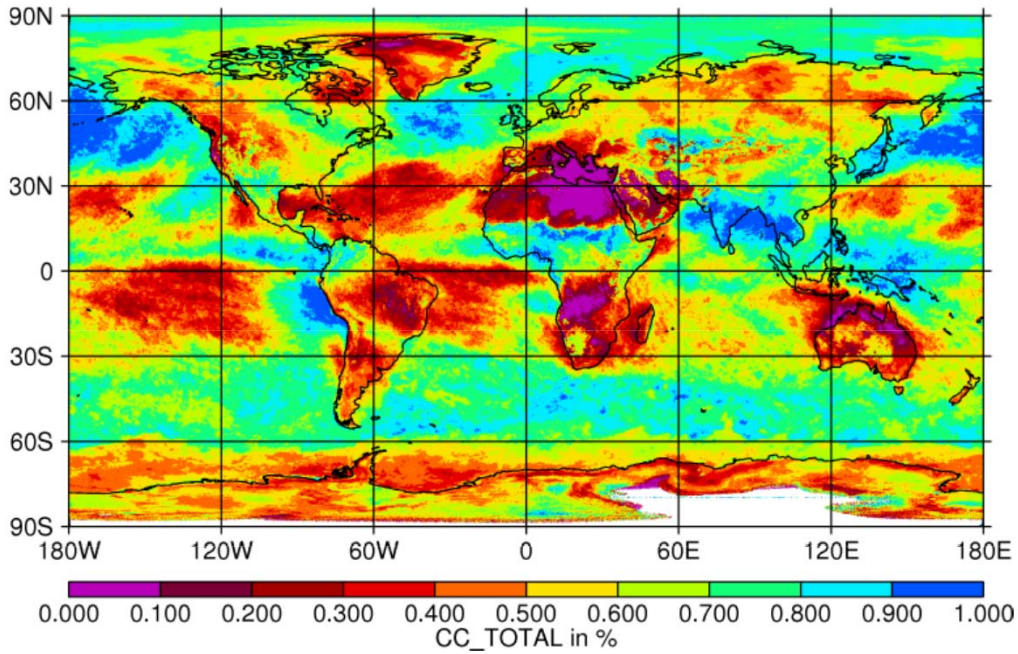


Figure 1: Monthly mean cloud cover derived from AVHRR onboard NOAA-18 for July 2009. The data were taken from recently reprocessed GAC-AVHRR dataset at CM SAF.

Thank you!

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