

# **Review of Project Objectives**

Folkert Boersma – KNMI (Co-ordinator) Jan-Peter Muller – UCL (Co-ordinator, Land)



5. WP4 Harmonised ECV retrievals & records – QA4ECV Kick-off meeting, 6-7 February 2014, De Bilt



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j.muller@ucl.ac.uk

# **For land**: data providers often use different instruments and different algorithms to produce the same parameter Case: Albedo for a single location





N.B. All EO albedos agree with each other BUT disagree with tower measurements. This is unusual but not uncommon



#### For Atmosphere Data providers use same instrument but different algorithms Case: NO<sub>2</sub>







### Introduction and motivation

#### User perspective:

I need good new data ... and quickly. A new data product could be very good, but if it is not being conveniently served and described, it is not good for me... So I am going to use whatever I have and know already.



10/21/2011

#### Leptoukh QA4EO'11

This is where QA4ECV Work Package 4 comes in





### Mission statement QA4ECV

- QA4ECV will show how trustable assessments of satellite data quality can <u>facilitate users</u> in judging fitness-for-<u>purpose</u> of the ECV Climate Data Record.
- QA4ECV will provide quality assured long-term Climate Data Records of several ECVs relevant for policy and climate change assessments.

ESA CCI Aerosol Cloud CMUG Fire GHG Glaciers Ice Sheets Land Cover Ocean Colour Ozone Sea Ice Sea Level S



#### ESA Climate Change Initiative

Wed, 2010-09-01 11:03

Climate change is arguably the greatest challenge facing mankind in the twenty-first century. Its importance has been recognised in re reports from the IPCC and from UNFCCC, and the overwhelming economic consequences are set out in the Stem Report.

#### GCOS Essential Climate Variables

The 50 GCOS Essential Climate Variables (ECVs) (2010) are required to support the work of the UNFCCC and the IPCC. All ECVs are technically and economically feasible for systematic observation. It is these variables for which international exchange is required for both current and historical observations. Additional variables required for research purposes are not included in this table. It is emphasized that the ordering within the table is simply for convenience and is not an indicator of relative priority.

Domain	GCOS Essential Climate Variables
	Surface:[1] Air temperature, Wind speed and direction, Water vapour, Pressure, Precipitation, Surface radiation budget.
Atmospheric (over land, sea	Upper-air:[2] Temperature, Wind speed and direction, Water vapour, Cloud properties, Earth radiation budget (including solar irradiance)



## Why QA4ECV is necessary



## Detailed objectives of QA4ECV



- 1. Rigorous QA methodologies for satellite ECV products
  - QA framework applicable to many ECVs
  - SW tools for 'do-it-yourself' QA
  - SI standards as in QA4EO (through NPL)
- 2. Multi-decadal satellite-derived global ECV records
  - 3 Terrestrial and 3 Atmospheric ECVs w/ global coverage
  - Not yet covered by ESA or EUMETSAT activities; 20-30 yr
- 3. Traceable QA applied to ECV retrievals and products
  - QA4ECV approach applied to independent reference data, ECV retrievals, and final products

#### 4. Information on quality and fit-for-purpose nature of datasets



- QA Office to audit ECV records against GCOS, WMO crit.
- Assess impact of ECV records for applications



### QA4ECV project objectives



including the interfaces with external data and users.

#### Step 1: Develop a Quality Assurance System



- Users obtain a one-stop-shop for all QA info
- The QA4ECV Office provides independent verification of ECV QA



Step 2: Generate multi-decadal ECV records

#### Land ECVs

- Spectral albedo, LAI & FAPAR
- Surface and vegetation state
- Indicators for land use change, biosphere activity
- Measured since 1980s
- Evaluate carbon cycle & water cycle in climate models

#### **Atmosphere ECVs**

- NO<sub>2</sub>, HCHO & CO
- Air pollutants
- Drive ozone and aerosol formation
- Measured since 1995/2000
- Evaluate atm. chemistry modules in climate models
- Provide info on effectiveness of policies, trends in fires etc.



V sets do exist to some extent, but they are not necessarily nerent and not quality assured.



### Policy control with OMI NO<sub>2</sub> measurements



Step 3: Apply the QA System to ECVs







#### Step 4: Interact with the users

From the beginning ... by involving users and suppliers in the design of the QA4ECV Office / workshops



Throughout the project... by interaction with users on the functionalities ('do it yourself' QA) and its applicability across (other) ECVs



### Contribution of QA4ECV to GMES Climate Service

**FP7-SPACE-2013-1:** "...contribute toward the (pre-) operational capacities ... of GMES, by augmenting the number of currently available quality-assured long term ECV records and by providing methodologies suitable for reliable assessments of the climate quality of ECV products."

- A clear tested blueprint for an implementable pre-operational Quality Assurance (QA) service to underpin future European-wide multi-ECV Climate Services.
- A fully automated validation system enabling independent stakeholder assessment of QA of Atmosphere ECV products from different producers.



A set of tools for the production, auditing and use of quality information for ECV records

## The ECVs to be generated

- Spectral albedo Radiation budgets, AOT, LAI, FAPAR 1.
- 2. LAI

Radiation budgets, CO<sub>2</sub>, soil moisture

3. FAPAR

Radiation budgets, CO<sub>2</sub>, soil moisture

2010 Implementation Plan for GCOS:

... parties are called to 'develop and implement coordinated and complementary strategies for long-term measurements of ... ozone and precursor species' (NO<sub>2</sub>, SO<sub>2</sub>, HCHO, and CO) 'Development of long-term datasets based on the currently available measurements from the past 15 to 20 years' (GCOS-154, section 3.1.11, page 42).

 $O_3$  (T+S), AOT, AAI, albedo 4.  $NO_{2}$ 5. HCHO O<sub>3</sub> (T), AOT, AAI, surface T, albedo, LAI 6. CO  $O_3(T)$ , AOT, AAI, surface T





# Contribution of QA4ECV to GMES Climate Service

**FP7-SPACE-2013-1:** "will ... focus R&D needs for the build up of <u>climate change monitoring services</u>"

- QA4ECV's multi-decadal ECVs provide information for monitoring climate change not yet covered by ESA CCI and EUMETSAT activities
- LAND: <u>global</u> changes in the state of vegetation (LAI, FAPAR) & <u>global</u> changes in Earth's energy budget (albedo)
- ATMOSPHERE: global data on reactive gases (NO<sub>2</sub>, HCHO, CO). QA4ECV analyses of retrospective data records provide information on the effectiveness of policies





### Anticipated users of QA4ECV products

Data users from Land community

- Researchers
- Authorities (forest management, urban planning)
- Policy makers (assessment of trends, history)

Data users from Atmosphere community

- Researchers
- Authorities (Public health, climate)
- Policy makers (trends, chemistry-climate feedbacks)

QA system users (ECV developers and users) **WP1** provides formal links with other ECV projects, within the EUMETSAT SAF Network and ESA CCI to ensure that the system developed in QA4ECV has wider applicability.





### Anticipated users of QA4ECV products

#### Our own project

- Interface between albedo and atmosphere retrievals
- Climate modellers to assess fitness-for-purpose of Land ECVs for climate research and modelling
- Chemistry-climate modellers to assess fitness-for-purpose of Atmosphere ECVs for AQ, chemistry-climate, and trends
- MACC-II & GIO Global Land
- S5P and new geostationary sensors (TEMPO, S4, GEMS)





### QA4ECV users



#### **Obtain data through:**

Project website - <u>www.qa4ecv.eu</u>

#### Needs/requirements will be identified

from the start of the project; <u>user survey</u>, <u>set-up helpdesk</u>

#### QA4ECV obtains user needs through

- Maintain active dialogue with users and key projects to ensure dissemination and use of QA system
- Coordinated outreach with other 4 other FP7 Space projects

#### Feedback will be organized through

Helpdesk

Links to relevant projects (ESA CCI, EUMETSAT SAF)

Within our project (fitness-for-purpose WP)



#### **Expected** impacts

- 1. Concept service to underpin European-wide ECV services
- 2. Validation system (QA independent ref., retrieval & product)
- 3. Tools for 'do-it-yourself' QA
- 4. Quality assured multi-decadal records Land & Atmosphere

- 1. Interaction with policy makers and users at start and throughout the project
- 2. Ingestion of Land ECV records in (climate) models will add to European Clearing House Mechanism



