Report of the European Commission’s Joint Research Centre

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European Commission

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José Manuel Barroso

27 Members

Commissioner
Antonio Tajani
Industry & Entrepreneurship

Director-General
Daniel Calleja Crespo,
Enterprise and Industry

Brussels, Belgium
~1000 staff
responsible for ~1500 B€

space

European Space Policy

European Satellite Navigation programme

European Earth Observation programme

ENTR mission

- promote a growth-friendly framework for European enterprises
- support the European presence in space and satellite navigation
GMES/Copernicus is an EU-led initiative

- aims at developing operational user services,
- based on satellite earth observation and in-situ data,
- consists of 3 components:
  - Space Component – coordinated by ESA
  - In-situ component – coordinated by EEA
  - Service Component – EU/public supported


In Feb 2013 European Council agreed for GMES to be funded with 3783M€ inside the EU multiannual financial framework (2014-2020). MFF negotiations ongoing.
QAQC needs

**DG ENTR requires mechanism to reliably assess the compliance of GMES/Copernicus CCS products with predefined quality criteria.**

- Is quality of ECVs from other (Atmosphere, Land, Ocean) Copernicus services good enough?
- Is a new retrieval algorithm going to improve the quality of the products?
- Can EO product quality be guaranteed to private sector users (with business model for added value)?

**DG CLIMA, DG DEVCO, DG AGRI & DG ENV needs:**

- Does EO product quality permit its usage as baseline / reference in policy decisions and environmental legislation?
European Commission

President
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Commissioner
Maire Geoghegan-Quinn
Research, Innovation & Science

Director-General
Dominique Ristori,
Joint Research Centre

7 institutes in 5 MS
~2600 staff (+250 comp.)
~330 M€/y (+ ~40 M€/y comp.)

JRC mission
- provide customer-driven scientific and technical support
- function as reference center of science and technology for EU
- be independent of special interests, whether private or national.

- EO products
- cal/val
Non-Nuclear Direct Actions of the Joint Research Centre

The JRC shall focus on:

1) Excellent Science:
   ➢ Carry out research to enhance the scientific evidence base for policy making...

2) Industrial leadership:
   ➢ Contribute to facilitating the use, standardisation & validation of space technologies and data, in particular to tackle the societal challenges.

3) Societal challenges:
   ➢ Climate action: Investigate the cross-sectoral challenges of the sustainable management of natural resources through monitoring of key environmental variables.


wmo.int/pages/prog/sat/documents/ARCH_strategy-climate-architecture-space.pdf
targeted EO products

retrieval algorithms developed in-house

Surface Albedo

product verification efforts

FAPAR

JRC-FAPAR

SeaWiFS at 2.17 km

Ground estimation
Ref: Fensholt et al. 2004

±0.1

Surface Albedo

MISR versus Meteosat

MISR versus MODIS

MODIS versus Meteosat

Normalised water-leaving radiance

ensemble retrievals & validation

JRC-TIP

model parameters  diagnostic fluxes

- effective Leaf Area Index
- absorption by vegetation
- background albedo
- transmission to background
- effective single-scattering albedo
- absorption by background

associated uncertainties

- uncertainty of effective LAI
- uncertainty of absorption by veg

Hainich test site (Germany)

JRC-TIP uses BHR from MODIS, MISR

quality assurance of RT models

Canopy RT models are used in design of satellite retrieval algorithms

- RAMI On-Line Model Checker (ROMC)
  - automate benchmarking process
  - assess shortwave RT scheme of GCMs
  - increase complexity

- RAMI-1 (1999)
- RAMI-3 (2005)
- ROMC (2007)
- RAMI4PILPS (2008/09)
- RAMI-IV (2009/10)

**RAMI-IV** “abstract canopy” analysis complete:
- uses existing ISO-standards to evaluate models

**ROMC** is being expanded to increase functionality:
- emphasis on “user friendliness” & data content

Pinty et al., 2001, 2004 (JGR); Widlowski et al., 2007, (JGR), 2008 (RSE); Widlowski et al, (2013 – under review) JGR
model-based QA of retrieval methods

- **Local scale**
  - thresholded fisheye image
  - transmission transect

- **Canopy scale**
  - PAR sensor
  - LAI 2000 fisheye
  - Elementary Sampling Unit (ESU)

- **Landscape scale**
  - transmission transect
  - 3-Flux ($\alpha=R$)
  - 2-Flux (1-T)


www.xfrog.com, Dax Phandi, MDK2.0
‘space’ versus ‘in situ’ retrievals

**space retrieval:**
- account for impact of atmosphere (atmos. correction)
- transfer radiation measurements to quantity of interest

**in-situ retrieval:**
- account for impact of spatial variability (upscaling)
- transfer radiation measurement to quantity of interest

- top-of-atmosphere level
- top-of-canopy level
- background level
- ‘pixel’
- ESU
- elementary sampling unit
- space measurement with calibrated sensor
- in-situ measurement with calibrated sensor
QA of satellite retrieval algorithms

RT simulation level

TOA

RAMI

TOC

BOC

scene architecture

abstract

realistic

exact

Ongoing efforts using TLS, etc.
- 3DVegLab
- MetEOC
- EDOCROS

PICS
"Agencies to indicate interest for participating in an intercomparison effort of ECV ‘retrieval algorithms’ under controlled conditions using instrument-specific synthetic TOA datasets generated over highly realistic land sites (both vegetated and non-vegetated) with RAMI-verified Monte Carlo models of known accuracy and precision."

"A letter of support from WGCV to the JRC would be needed for this effort due to the substantial commitment of resources required to generate agency and instrument-specific TOA datasets."
Thank you!

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