Overview of the Land Surface Analysis SAF (LSA SAF)

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Acknowledgments: *Isabel Trigo, Luís Pessanha, & the LSA SAF consortium*

Layout

- **Introduction**
- **Land Surface Analysis SAF and its services**
- **Cooperation and training activities: Serving the users**
- **Preview on CDOP-2**
- **Conclusions**

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LSA SAF in a nutshell

- **EUMETSAT Satellite Applications Facility on Land Surface Analysis: Dedicated to algorithm development, validation and operational production of land surface related products (primarily) based on European meteorological satellites (MSG and METOP)**
- **Real time operations (i.e., some products are available every 15 min, ~1 hour after observed)**
- **Effective use of MSG and EPS data related to:**
  - **LAND**
  - **LAND-ATMOSPHERE Interactions**
  - **BIOSPHERIC Applications**
- **Timely provide:**
  - **Products**
  - **User support**
- **Reviewed (~annually) by technical and scientific review panels**

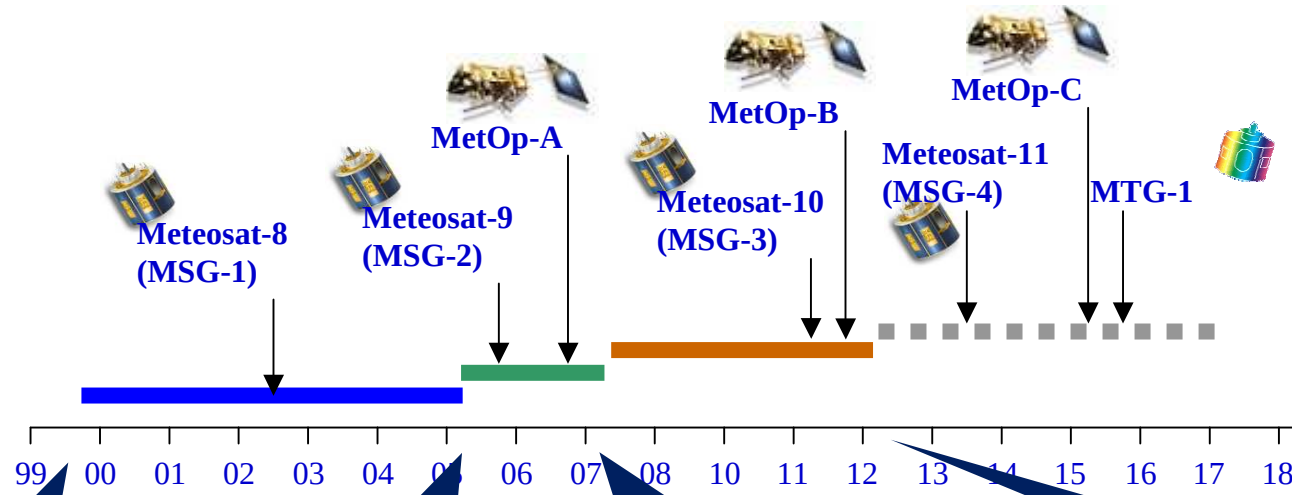
The Land SAF Consortium

A consortium of 7 Institutions in 6 countries

- Instituto de Meteorologia (IM), Portugal
- Meteo-France (MF), France
- Royal Meteorological Institute (RMI), Belgium
- Finnish Meteorological Institute (FMI), Finland
- Karlsruhe Institute of Technology
- IDL, University of Lisbon
- UV, University of Valencia

- Organisation principles
  - Algorithms developed and validated by one of the patners
  - Algorithms handed over to IM for integration and production
  - Operational chain in Lisbon

Land SAF Chronogram



Development Phase: Sep 1999

Initial Operations Phase: Feb 2005

Continuous Development & Operations Phase: Mar 2007

Continuous Development & Operations Phase 2: Mar 2012

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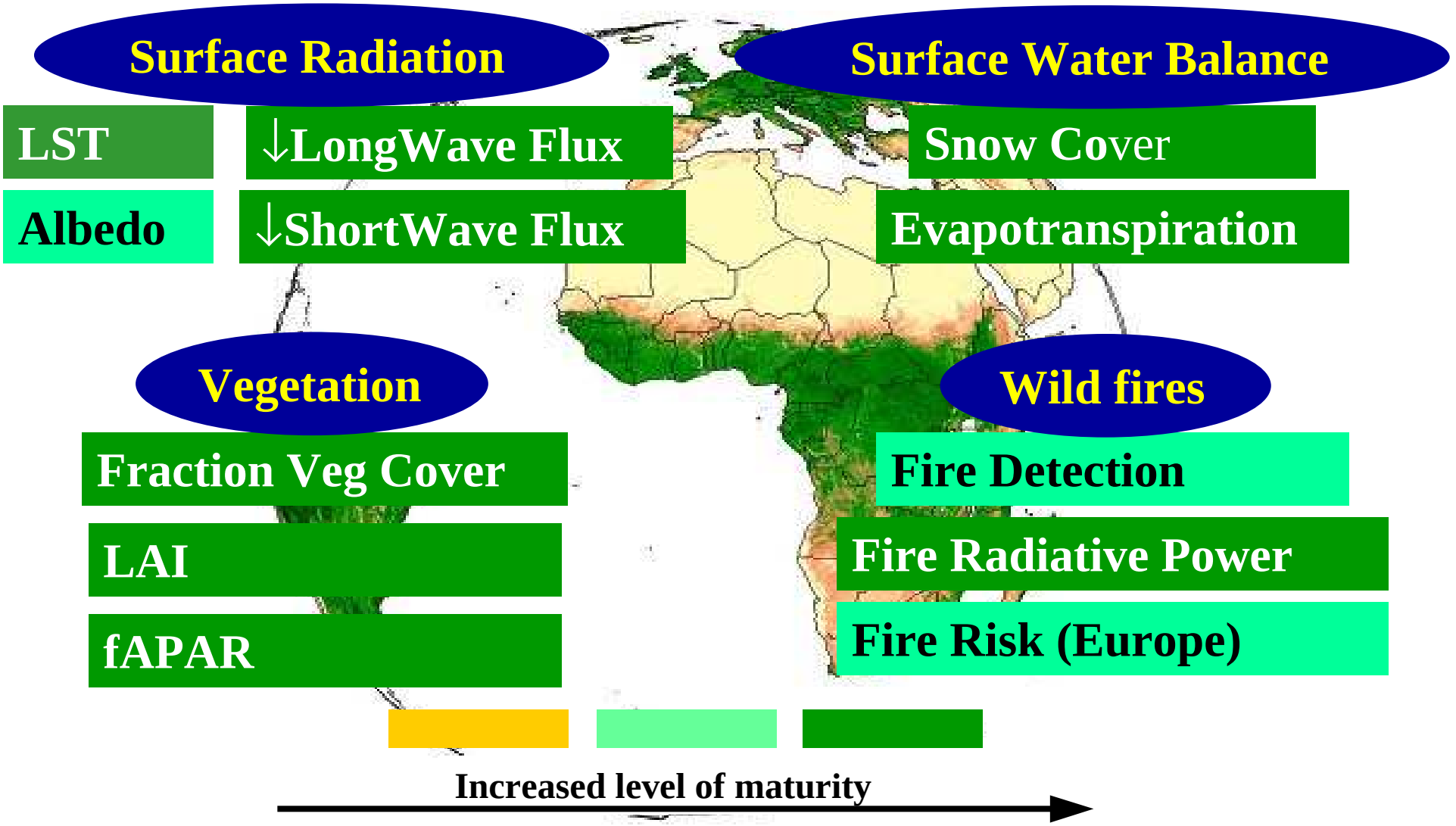
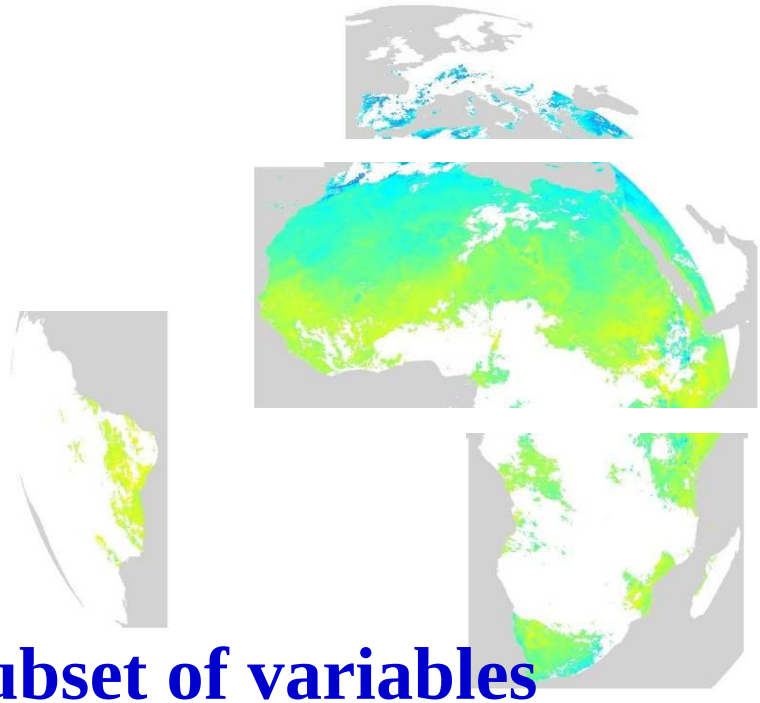
LSA SAF MSG products



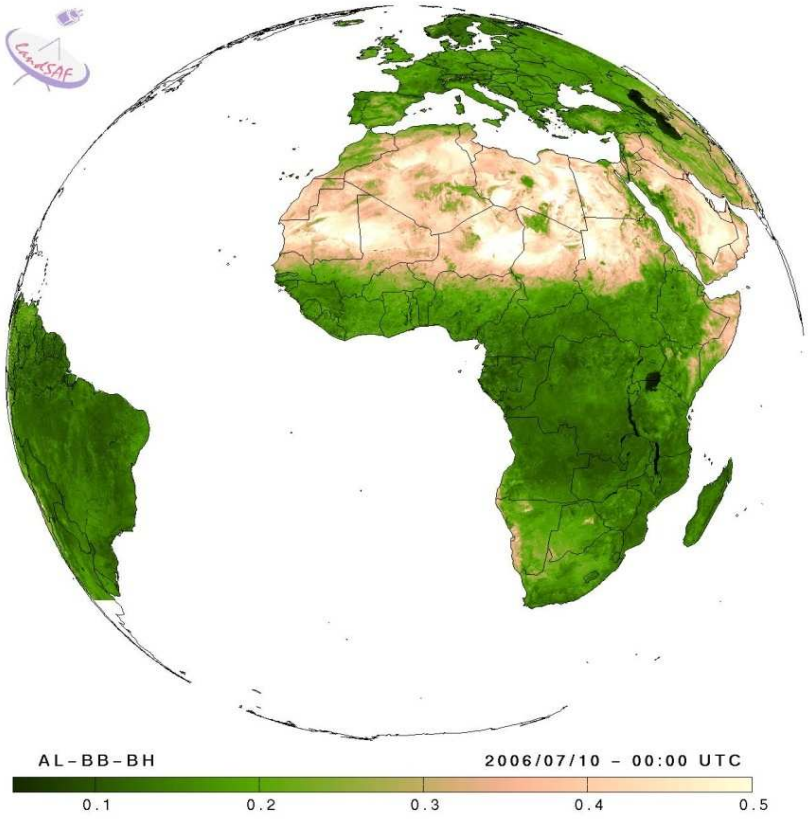
Product characteristics

- **All products have a quality flag (a-priori error bar for LST) field associated**
- **All products have a User Manual and a comprehensive Validation Report**
- **4 production areas for MSG**
  - **Europe**
  - **N. Africa**
  - **S. Africa**
  - **S. America**
- **SEVIRI resolution**
- **Variable time resolution**
  - **15 min to 10 days**
- **EPS products generation for a subset of variables**

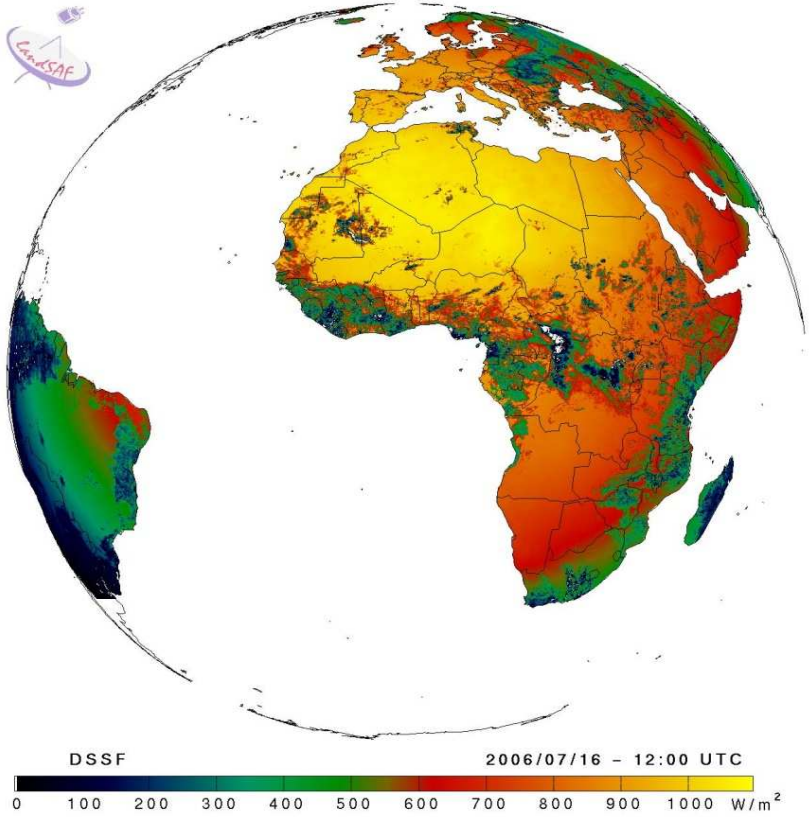


Surface Radiation Budget: Shortwave

ALBEDO
Daily, 10-daily composites



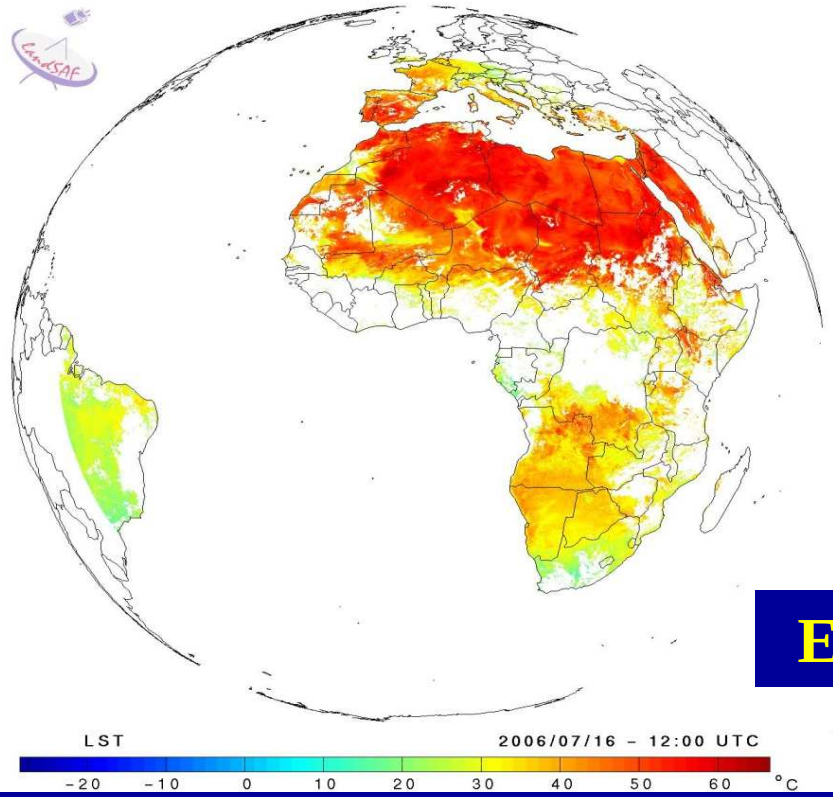
Downwelling SW Flux
Every 30 min



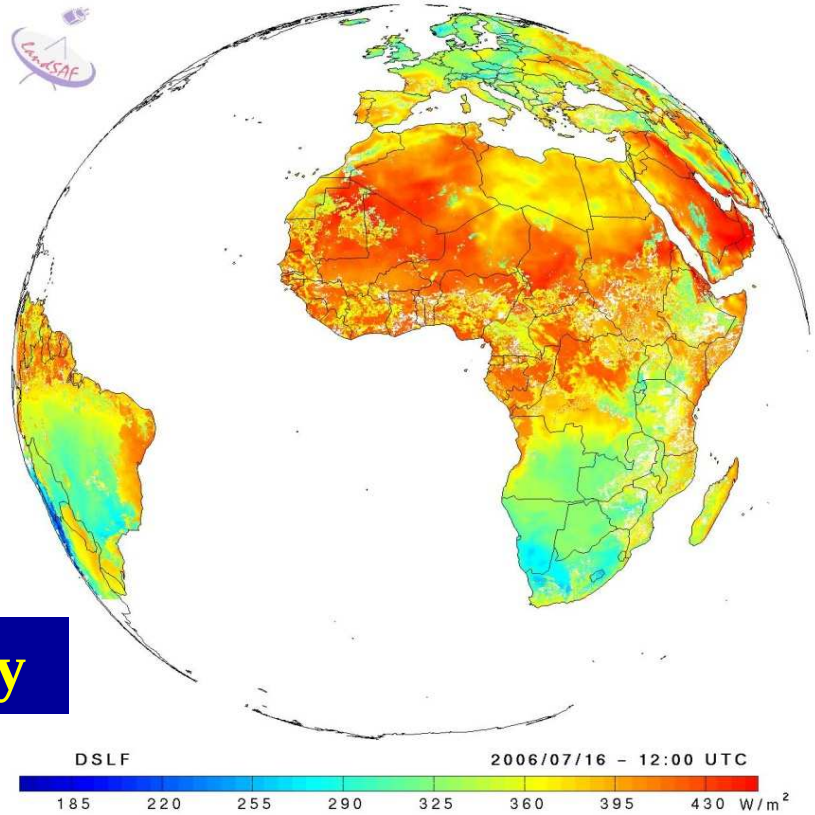
15 Jul 2006 (12 UTC) – 16 Jul 2006 (12 UTC)

Surface Radiation Budget: Longwave

Surface Temperature
Every 15 min



Downwelling LW Flux
Every 30 min

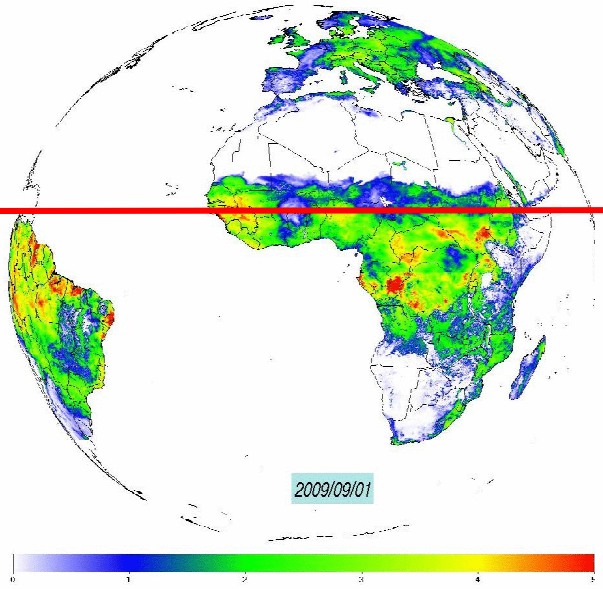


Emissivity

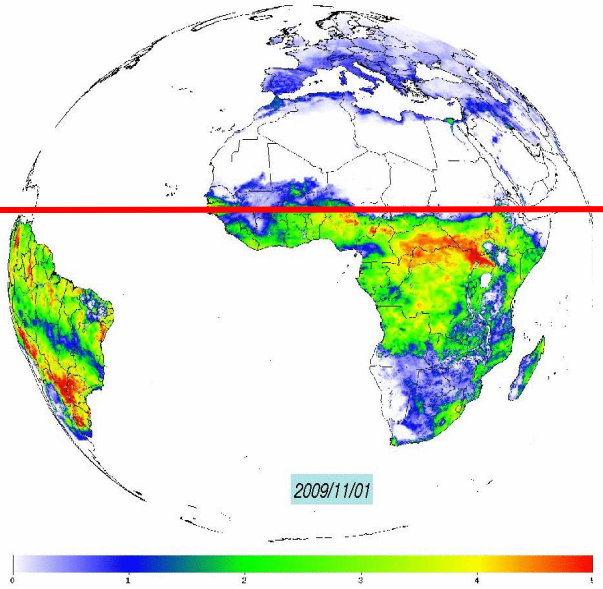
15 Jul 2006 (12 UTC) – 16 Jul 2006 (12 UTC)

Daily evapotranspiration (mm)

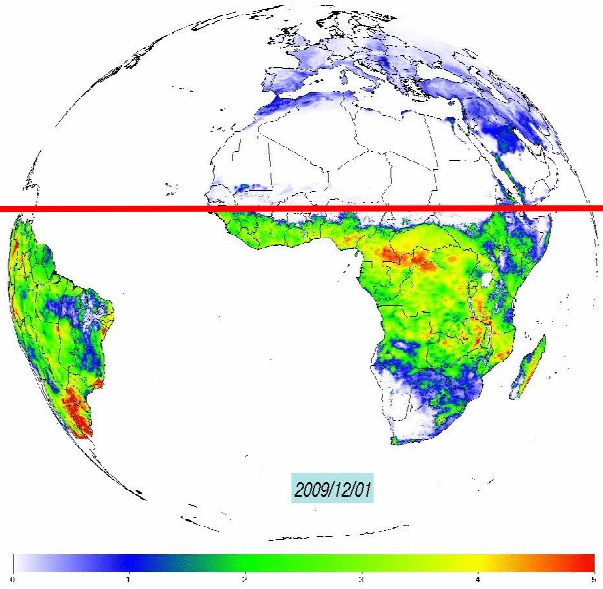
September 2009



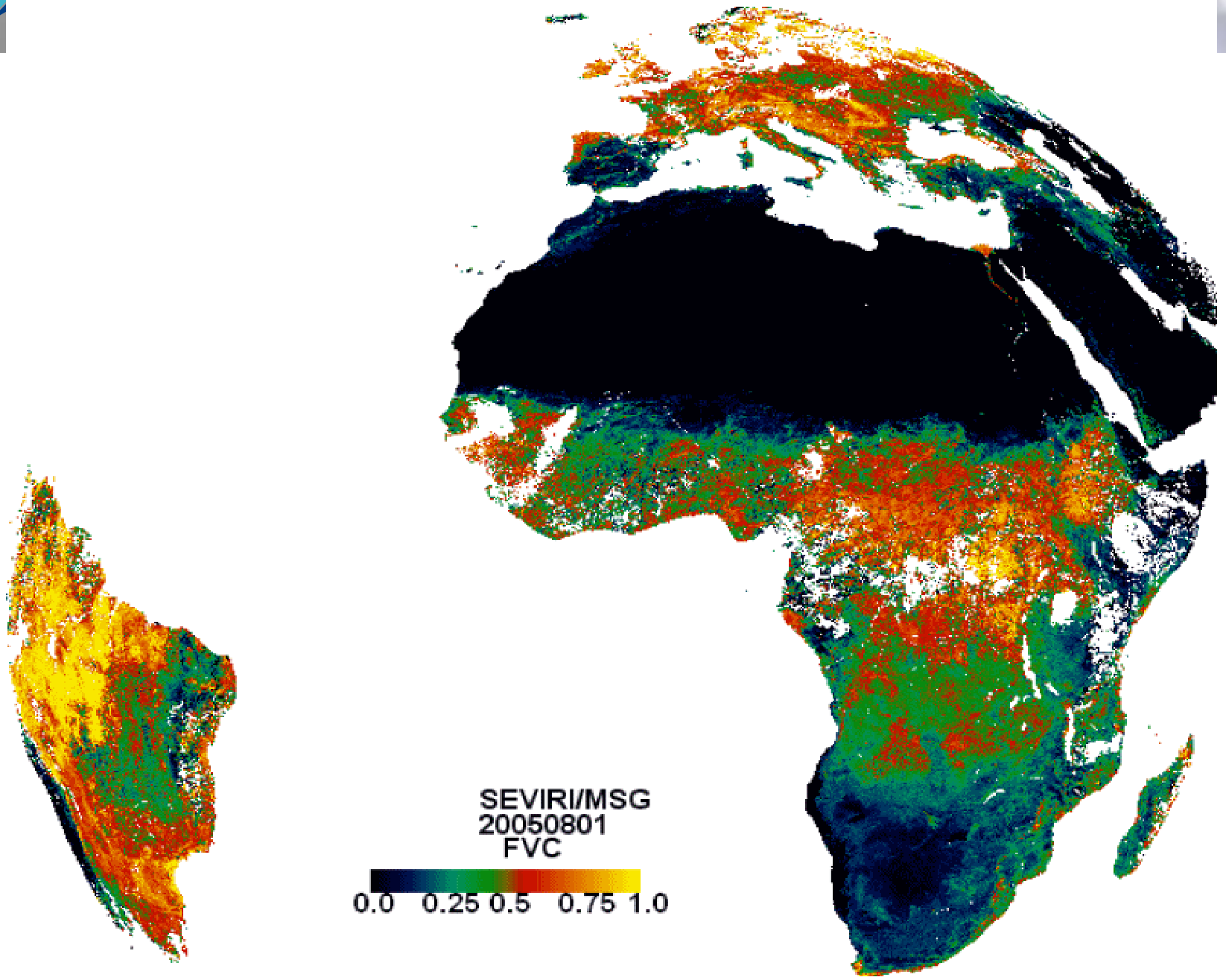
November 2009



December 2009



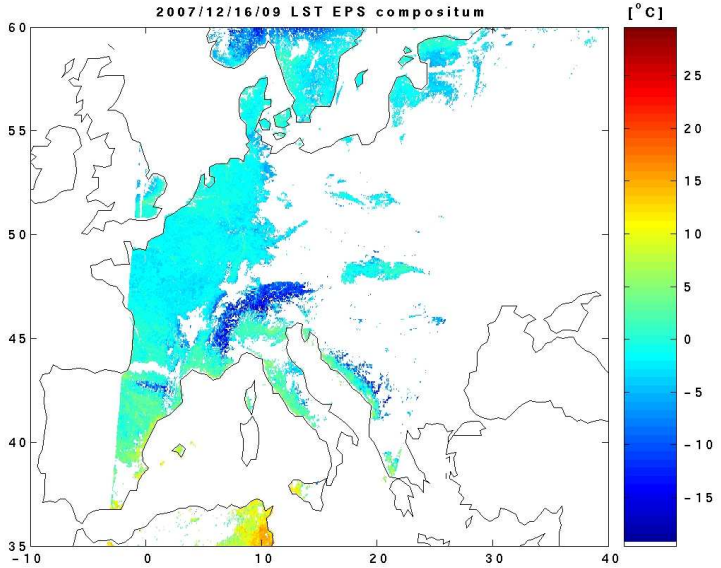
Fraction of vegetation cover (Sep 05- Sep 07)



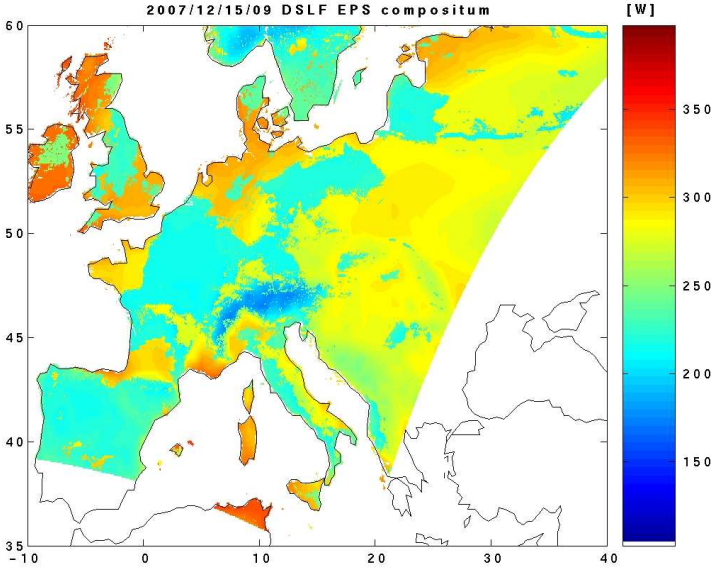
Thanks to J. Garcia-Haro, U. Valencia

METOP/AVHRR products

16 Dec 2007 09 UTC
Surface Temperature



15 Dec 2007 09 UTC
Downwelling LW Flux



- **Generation Frequency – 12 h**
- **Based on METOP/AVHRR, over land ...**
- **Available for Europe since Jan 2008**
- **Globally early 2011**

Additional information & service components

- VITO computes and distributes time composites, re-gridded
- LSA SAF/IM participates in GMES land (geoland-2)
- Users (> 500 registered users)
  - Numerical Weather Prediction
    - Update parameters, Assimilation & Forecast Verification (ECMWF, MF, INM, IM, …)
  - Agriculture & Forestry (JRC)
  - Research (e.g. AMMA, U. Leicester)
  - Environmental Monitoring
  - Hydrology
  - (...)
- Help desk
- Regular workshops (biennally since 2002; Toulouse) for user feedback and evolution of user requirements

Operational system

EUMETCast

AVHRR
ASCAT
SEVIRI

RMDCN

ECMWF

Retrieval System

&

Pre-Processing

Product Generation

Post-Processing

NRT

EUMETCast

UMARF

ARCHIVE

Off-Line

native formats→ HDF5

- **radiances, TBs**
- **temporal/spatial interpolation**
- **cloud masking**
- **...**

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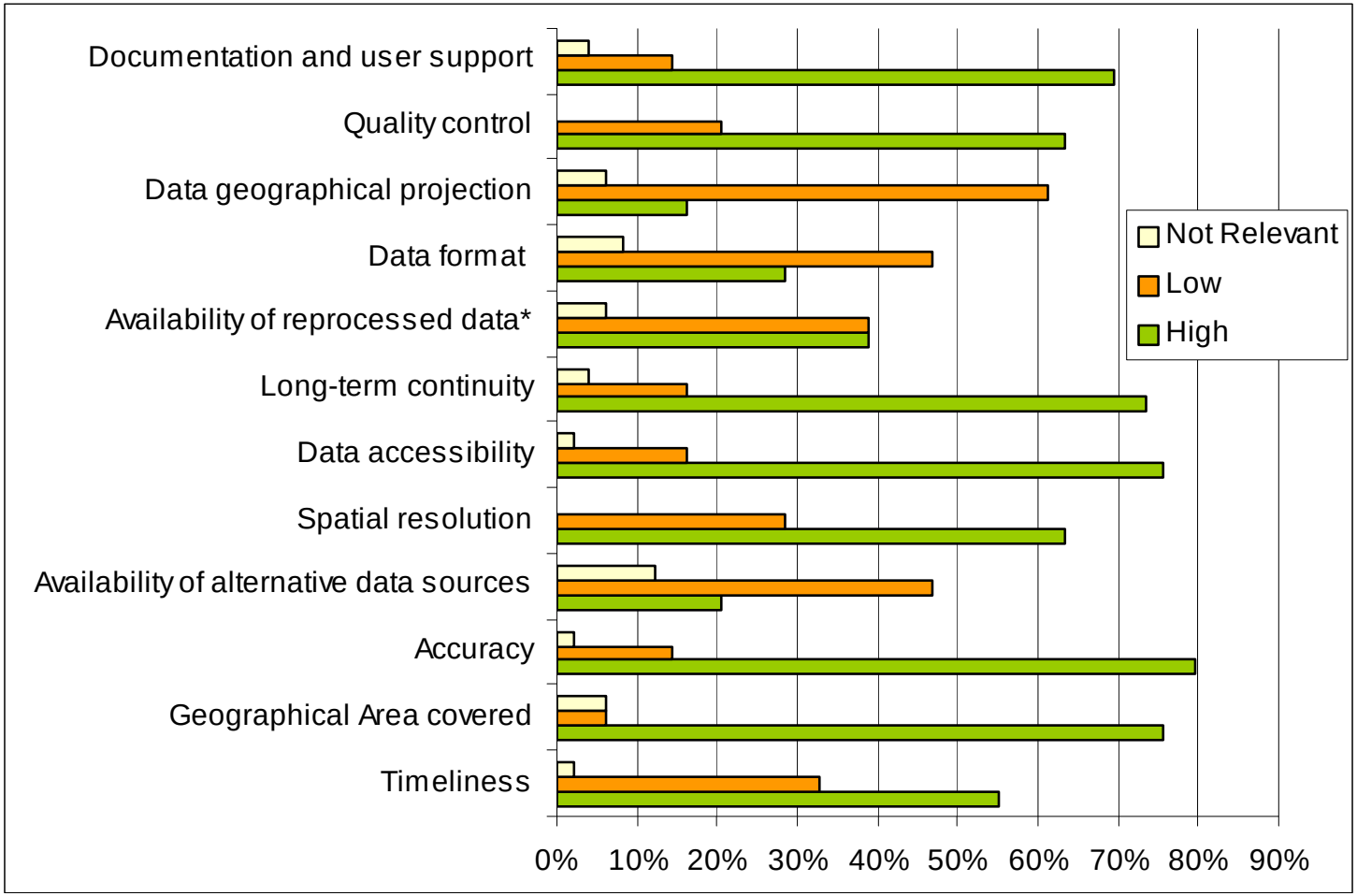
Cooperation and training activities

- **Cooperation with other SAFs**
  - **Shared validation of fluxes with CM and OSI SAF**
  - **Use of other SAF's parameters to improve LSA SAF products (e.g., H-SAF soil moisture to improve LSA SAF ET)**
- **Cooperation with MPEF**
  - **Production of Fire Radative Power, developped at EUMETSAT HQ**
    - **Demonstrated flexibility of overall software architecture**
- **Geoland-2 (FP7 project, 2008-2012): LSA SAF partners are consortium members; Constellation of geostationary satellites (see poster)**
- **Work closely with key users**
  - **JRC (agrimetereological applications, VEGA intercomparison)**
  - **ECMWF for Fire Radiative Power**
- **Training**
  - **One training event in Mozambique**
  - **Modules developed for EUMETRAIN**
  - **Regular participation in remote sensing courses in Brazil**
  - **…**

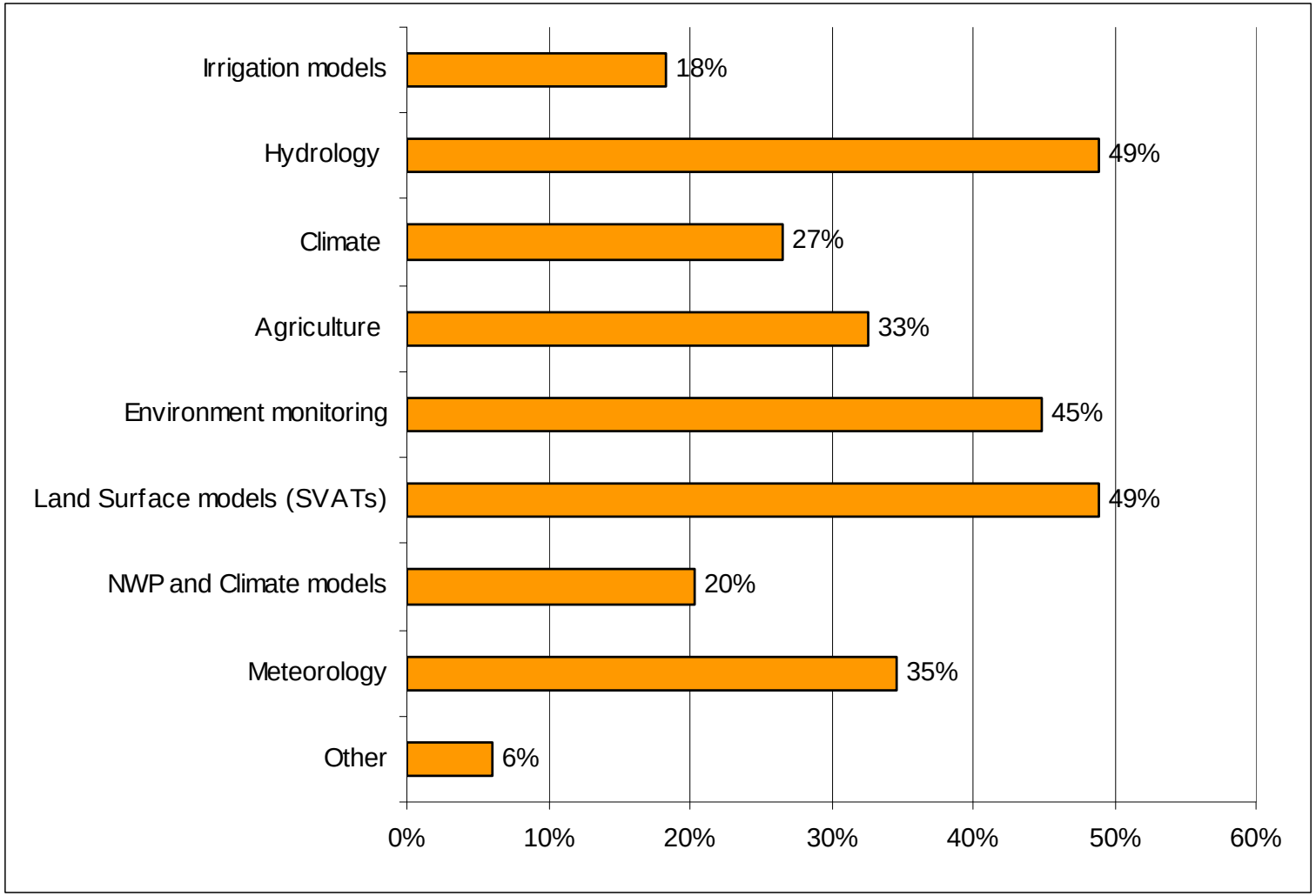
User questionnaire 2008 (1/3)

Critical elements to use LSA SAF data



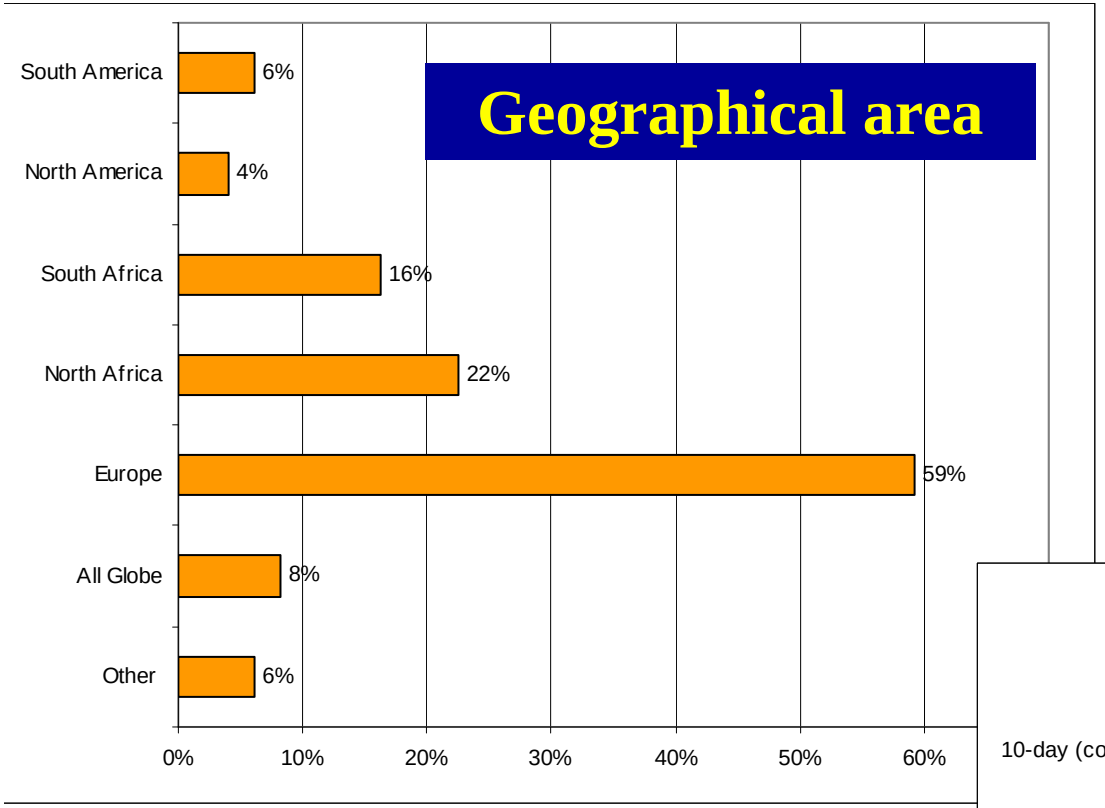
User questionnaire 2008 (2/3)

Applications of LSA SAF products

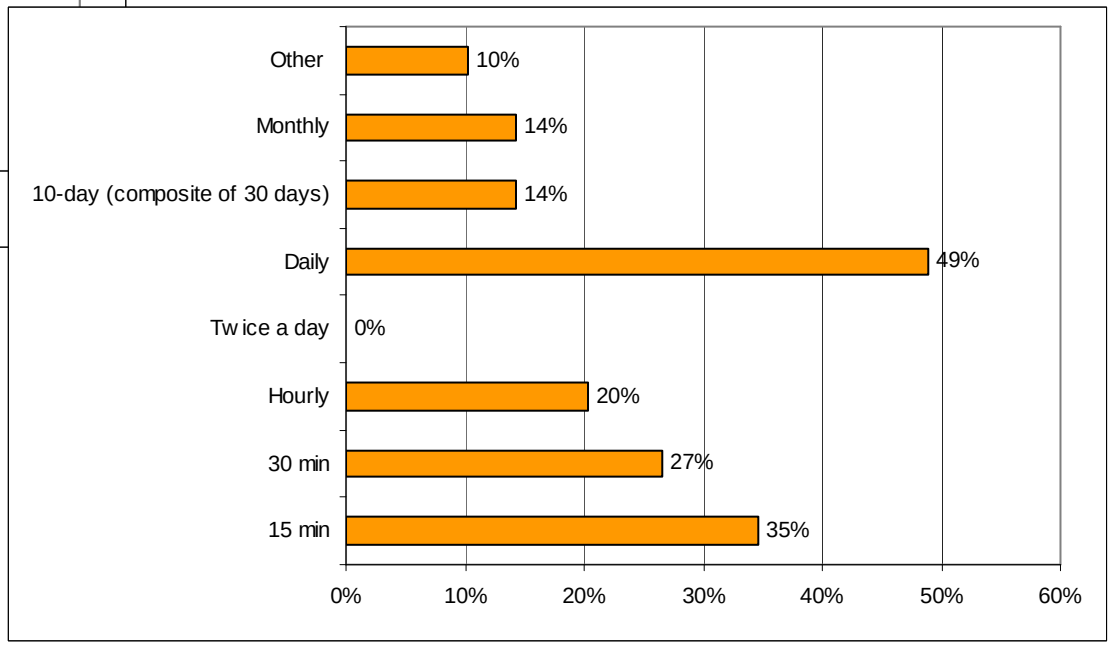


User questionnaire 2008 (3/3)

Geographical area



Time scales of interest



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CDOP-2
LSA SAF ~~Current~~ Consortium

- Instituto de Meteorologia (IM), Portugal
- Meteo-France (MF), France
- Royal Meteorological Institute (RMI), Belgium
- ~~Finnish Meteorological Institute (FMI), Finland~~
- IMK, University of Karlsruhe
- IDL, University of Lisbon
- UV, University of Valencia

CDOP-2 new members:

KCL (UK)

VITO (Belgium)

Family of Products: Current status

Instituto de Meteorologia

LSA SAF

Surface Radiation

- LST
- ↓LongWave Flux
- Albedo
- ↓ShortWave Flux

Surface Water Balance

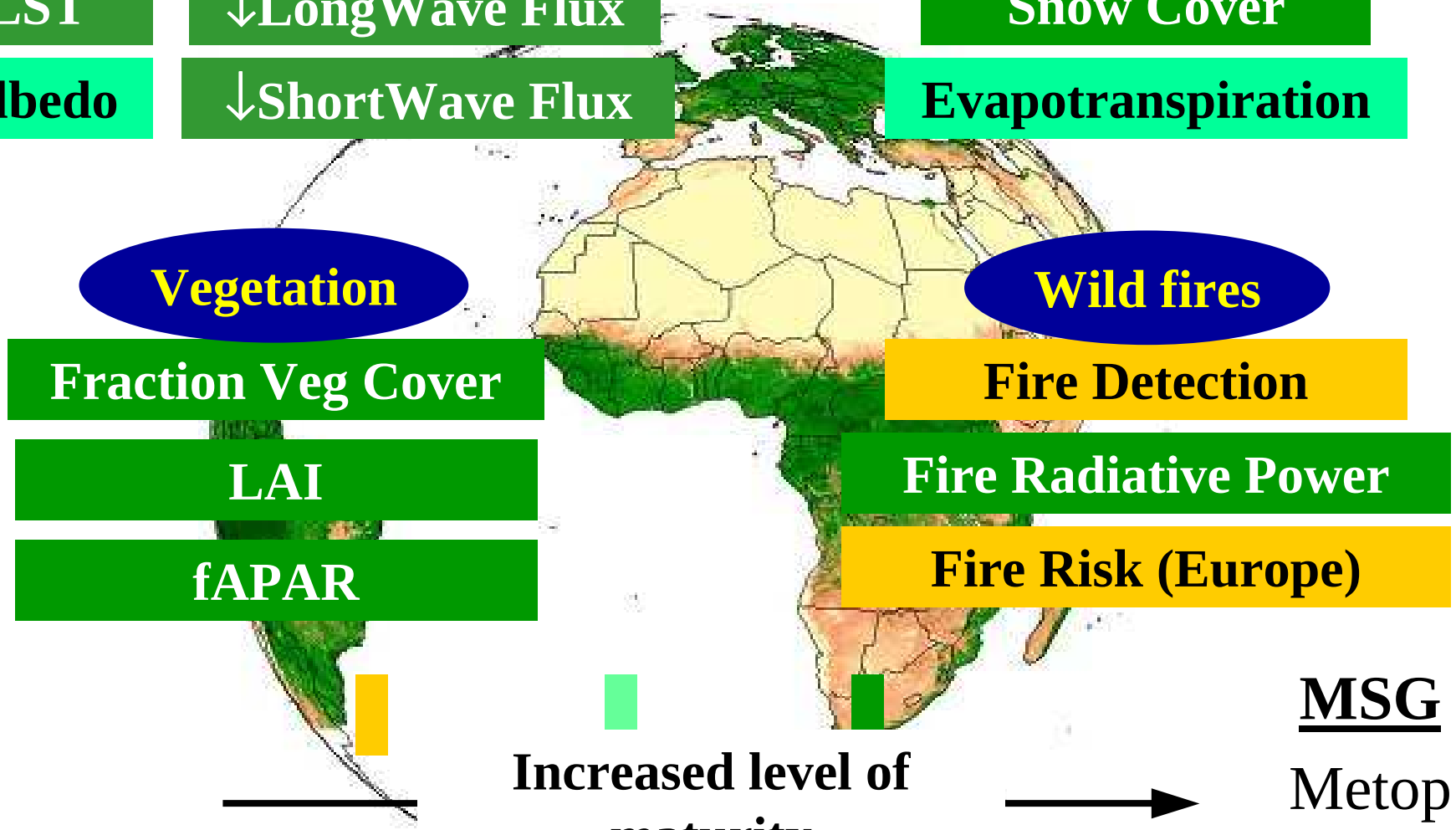
- Snow Cover
- Evapotranspiration

Vegetation

- Fraction Veg Cover
- LAI
- fAPAR

Wild fires

- Fire Detection
- Fire Radiative Power
- Fire Risk (Europe)



Increased level of maturity

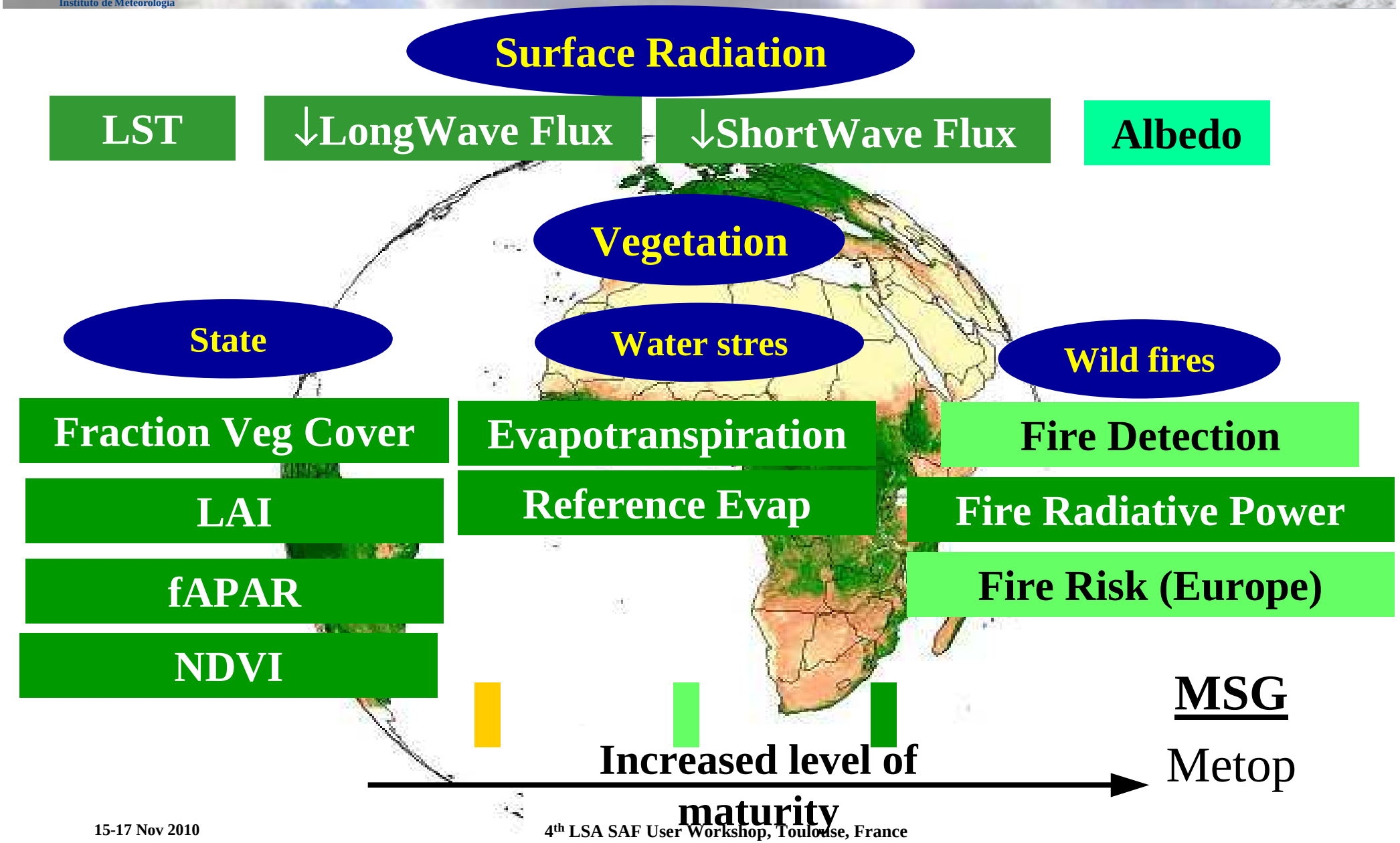
MSG

Metop

Family of Products: CDOP-2

Instituto de Meteorologia

LSA SAF



LSA SAF Strategy for CDOP-2

Product & Service Continuation

- Maintenance, quality monitoring & validation of MSG & EPS inherited products
- Upgrade of existing algorithms for MTG data

New Algorithms / Products aim to:

- Overcome known deficiencies of current products
- Address requests from user community

- Land surface modelling (carbon fluxes, hydrology)
- Agriculture and forest applications
- NWP
- Climate studies
- Environmental monitoring
- Food security

User support

- **Toolbox to allow more friendly handling of data (NRT / off-line):**
  - **Selection of time window for processing**
  - **Definition of Regions of Interest and Projections**
  - **Product/channel selection**
  - **Data / image format**

- **Training:**
  - **Applications of LSA SAF products**
  - **To be carried out in cooperation with other programmes (e.g., EUMETrain, EUMETSAT)**

LSA SAF products and MTG

- **LSA SAF will use radiances from the (Full Disk) Imagery Mission, (SEVIRI follow-up)**
- **Better spatial resolution will be of benefit to all LSA SAF products**
- **Enhanced spectral characteristics vs. SEVIRI**
  - **FD-VIS 0.4** **Better aerosol, should improve AL, SW flux, but also LW flux and LST**
  - **FD-IR 3.8/8.5** **Extended dynamical range for fire applications**
  - **FD-IR 1.3 et al** **Improved cloud mask and cloud type specification**
- **Impact on products**
  - **All products, given better clouds**
  - **Fire products**
  - **AL, radiative fluxes and LST, cascading into other products (VEGA, ET)**
  - **More competitive VEGA products with enhanced spatial resolution**

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Summary, conclusions and perspectives

- **Aalgorithm development, validation and operational production of land surface related products from remote sensing data, with a particular emphasis on EUMETSAT satellites:**
  - **LAND**
  - **LAND-ATMOSPHERE Interactions**
  - **Land Biosphere Applications**
- **Outlook**
  - **Strenghten our links with users, collaborative efforts with key users, including targeted trainin**
  - **CDOP-2 and plan ing MTG products**
  - **LSA SAF p ticipate in GMES land (geoland2)**
- **Produc on**
  - **our web site (http://landsaf.meteo.pt)**
  - **ETCAST**
- **Further information**
  - **http://landsaf.meteo.pt**
  - **Trigo et al. 2010, Int. J. Rem. Sens., in press**
  - **LSA SAF poster**

The users (you !) are on the driving seat