Land Surface Analysis (LSA SAF)

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Acknowledgments: Isabel Monteiro, Isabel Trigo, Luís Pessanha

Layout

- Introduction
- Land Surface Analysis SAF and its services
- Cooperation activities: Existing, planned and potential
- User services and training
- Overall operations architecture
- LSA SAF and MTG
- LSA SAF and climate
- Conclusions

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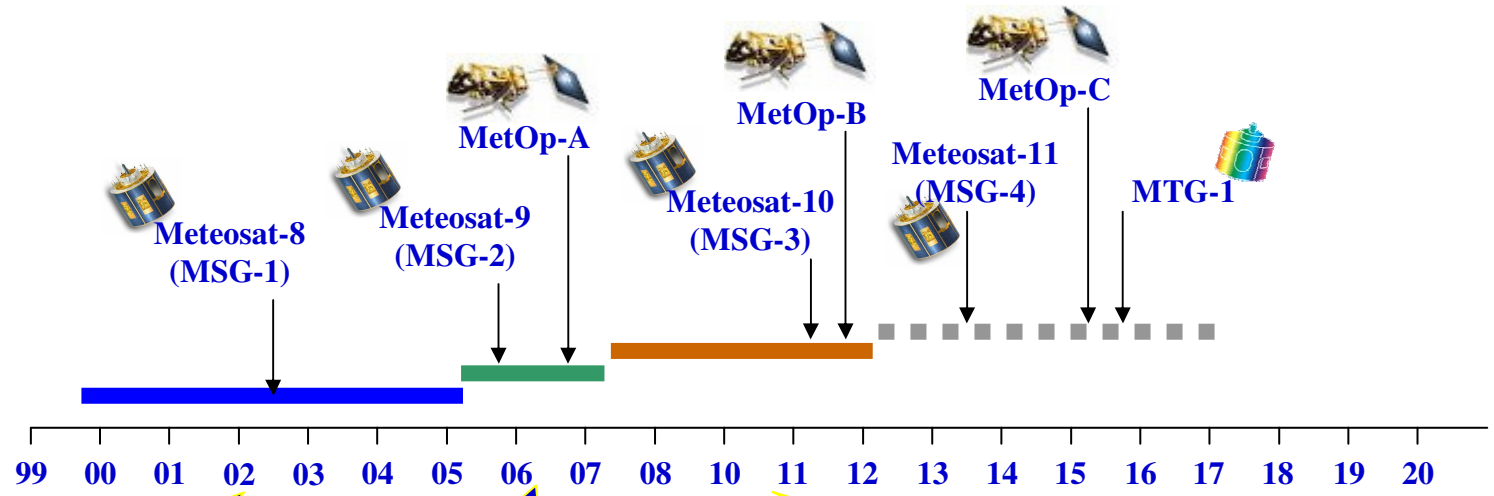
- **Conclusions**

LSA SAF: The brief

- **Develop techniques that allow an effective use of MSG and EPS data related to:**
  - **LAND**
  - **LAND-ATMOSPHERE Interactions**
  - **BIOSPHERIC Applications**
- **Timely provide:**
  - **Products**
  - **User support**

Land SAF Chronogram



Development Phase: Sep 1999

Initial Operations Phase: Feb 2005

Continuous Development & Operations Phase Mar 2007

The Land SAF 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**

- **Organisation principles**
  - **Algorithms developped at one of the participating Institutes**
  - **Algorithms handed over to IM for integration and production**

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Land SAF MSG products

Instituto de Meteorologia

Surface Radiation

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

Surface Water Balance

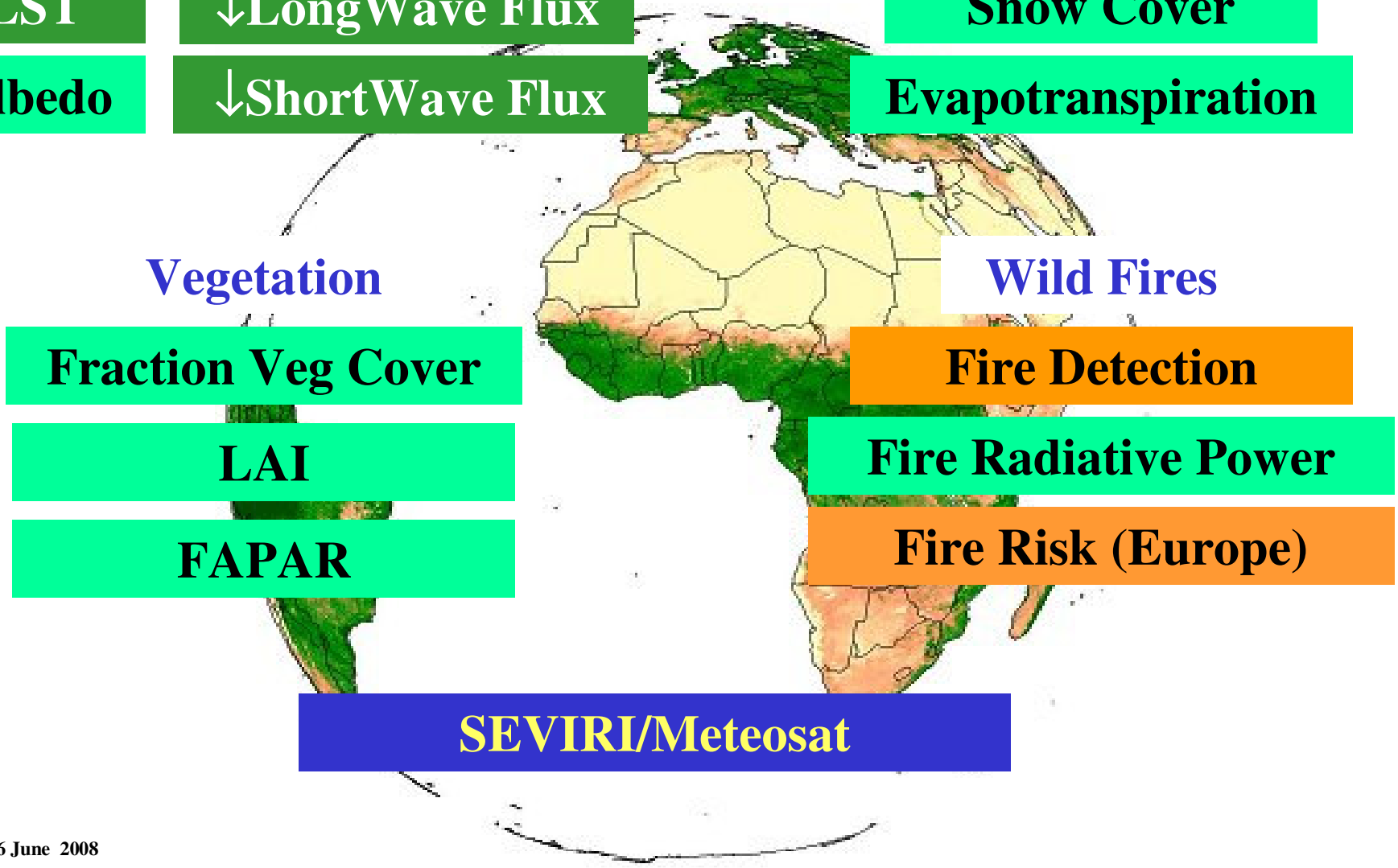
- Snow Cover
- Evapotranspiration

Vegetation

- Fraction Veg Cover
- LAI
- FAPAR

Wild Fires

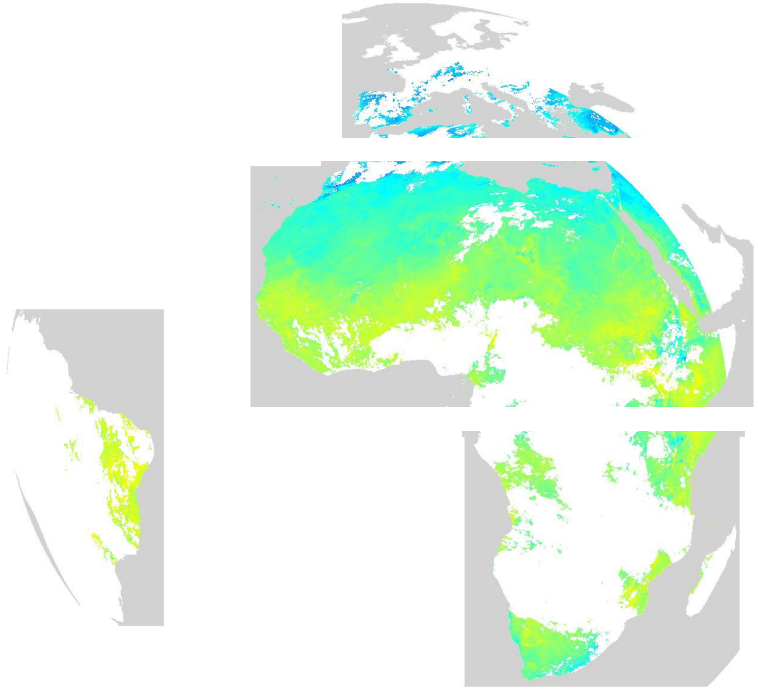
- Fire Detection
- Fire Radiative Power
- Fire Risk (Europe)



SEVIRI/Meteosat

Product characteristics

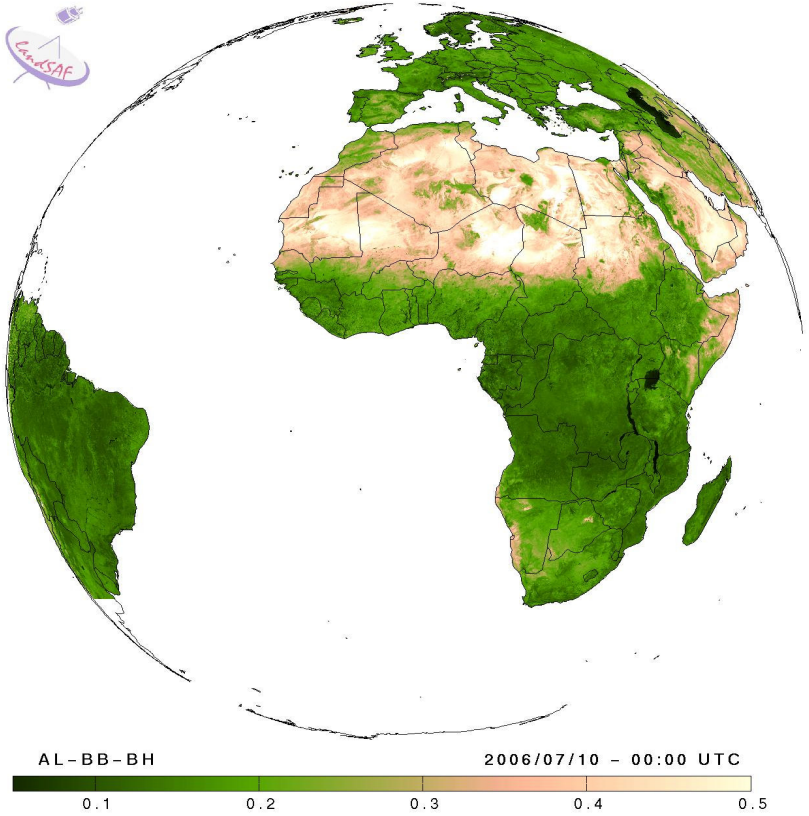
- **All products have a quality flag field associated**
- **4 production areas for MSG**
  - **Europe**
  - **N. Africa**
  - **S. Africa**
  - **S. America**
- **SEVIRI resolution**
- **Variable time resolution**
  - **15 min to 10 days**
- **EPS products generation started**



Surface Radiation Budget: Shortwave

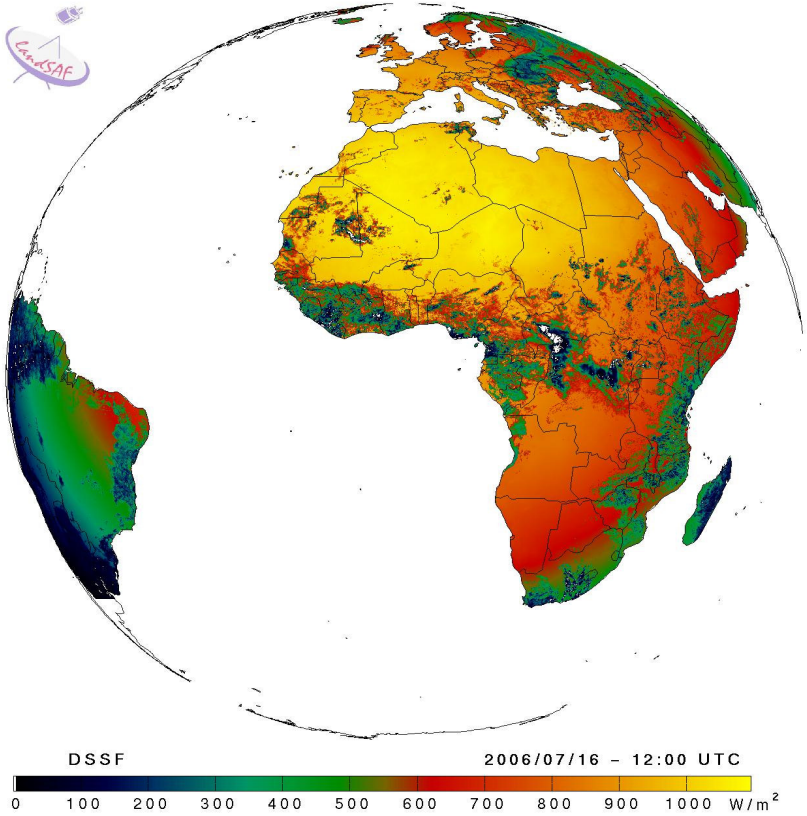
ALBEDO

Daily, 10-daily composites



Downwelling SW Flux

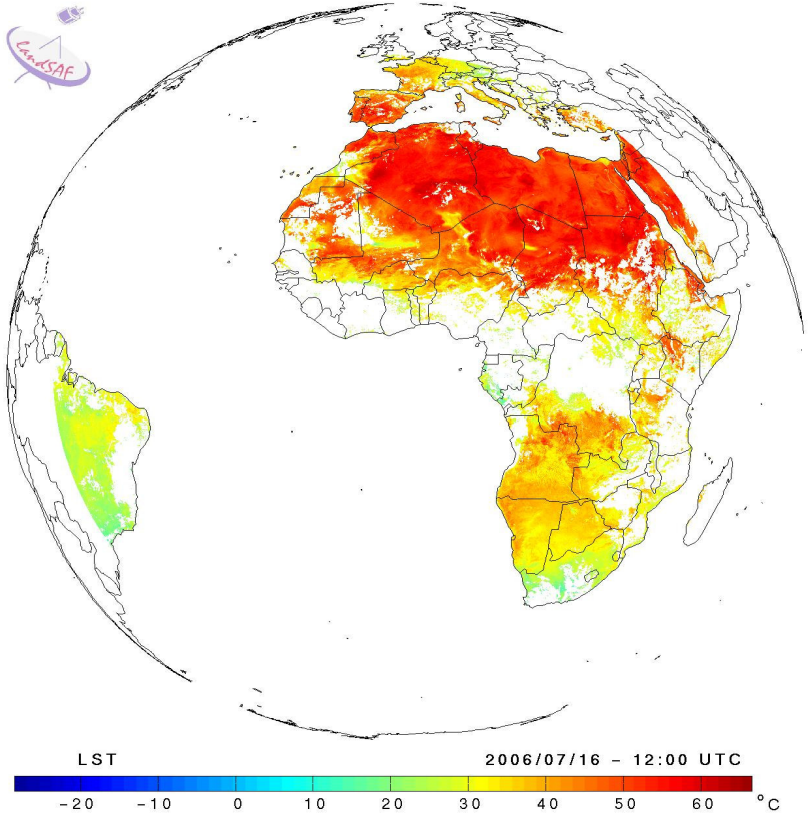
Every 30 min



Surface Radiation Budget: Longwave

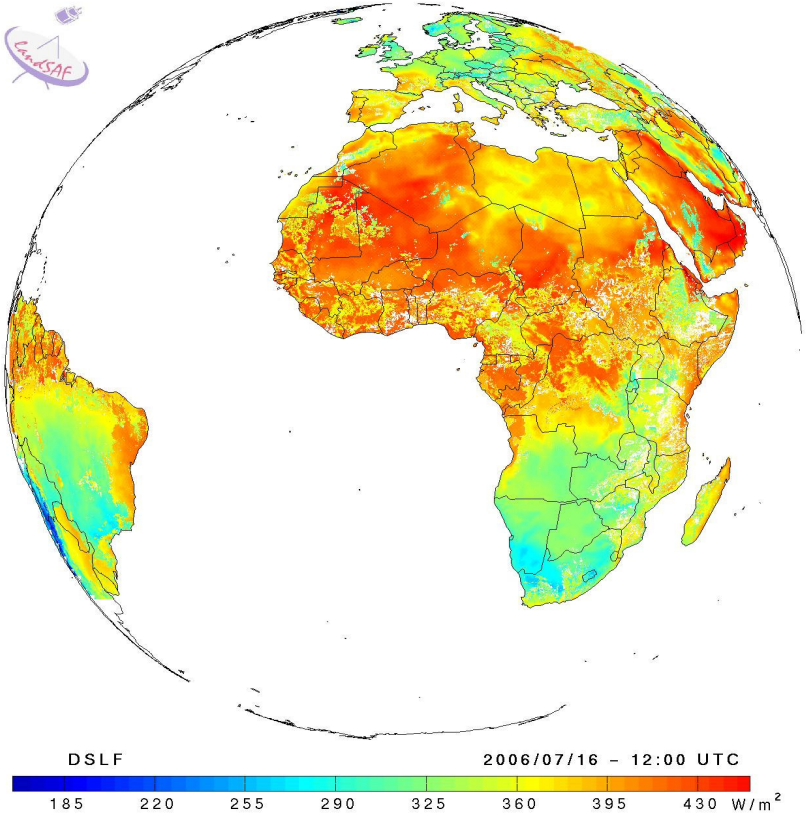
Surface Temperature

Every 15 min



Downwelling LW Flux

Every 30 min

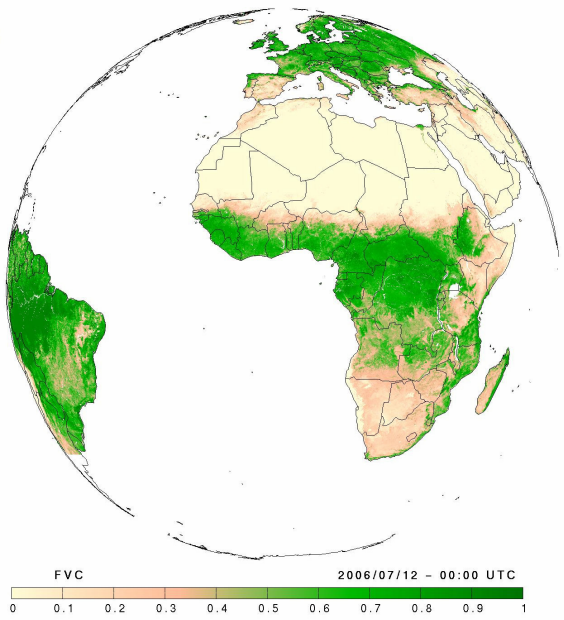


Emissivity

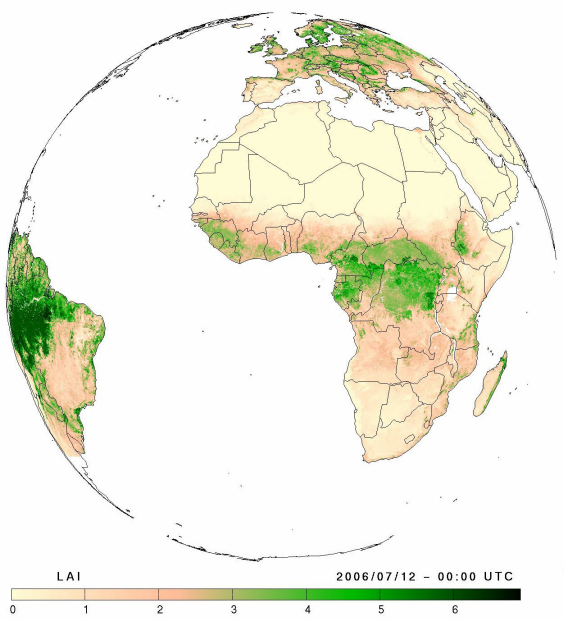
Vegetation and wildfire parameters

- **Fraction of Vegetation Cover**
- **Leaf Area Index**
- **fAPAR**
- **Fire detection**
- **Fire Radiative Power**
- **Fire Risk**

Fraction Veg Cover



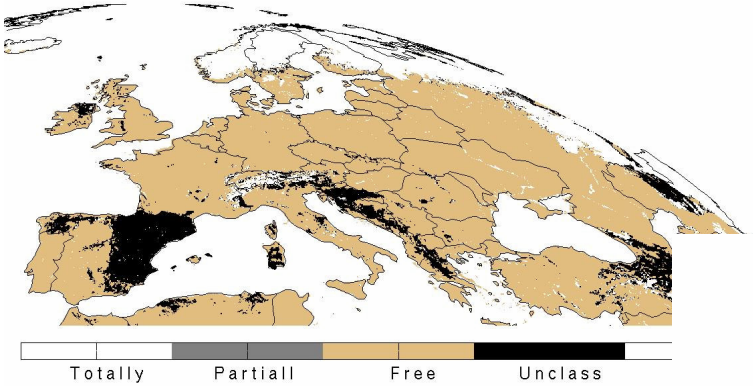
LAI



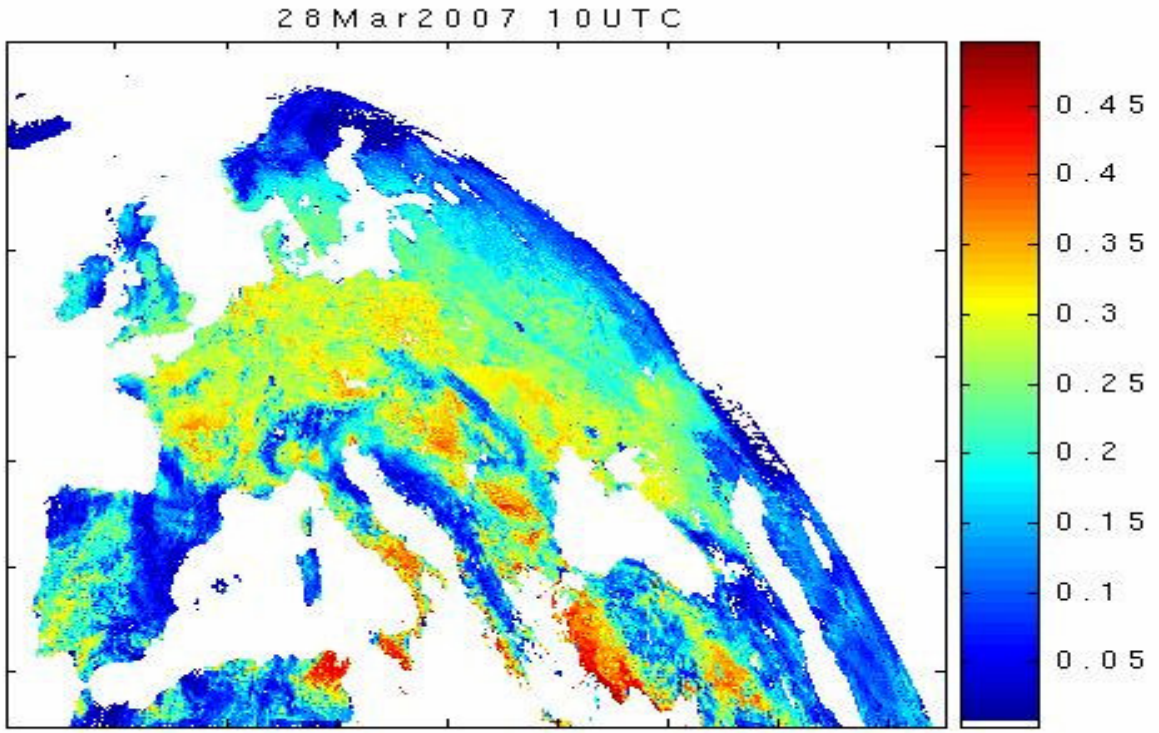
July 2007

Water balance

Snow Cover



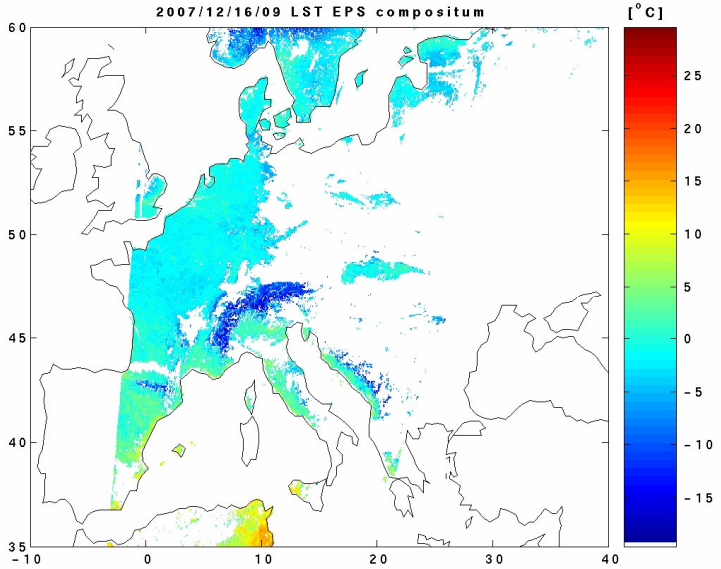
Evapotranspiration



EPS products

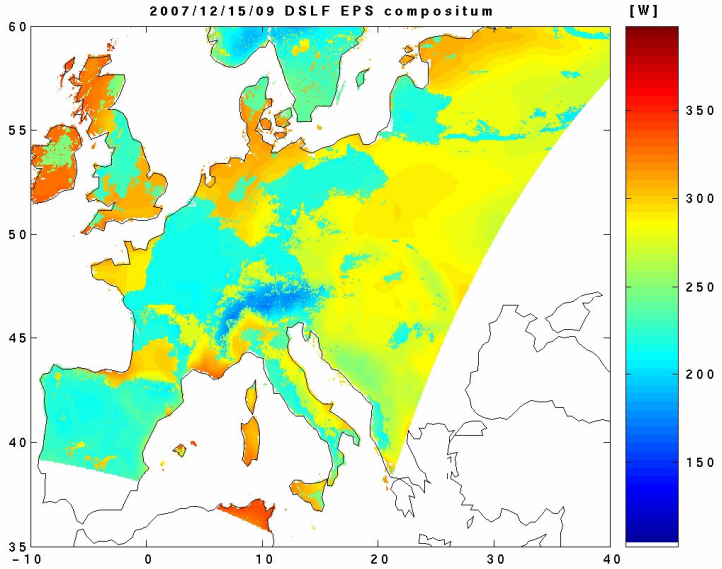
16 Dec 2007 09 UTC

LST



15 Dec 2007 09 UTC

DSLF



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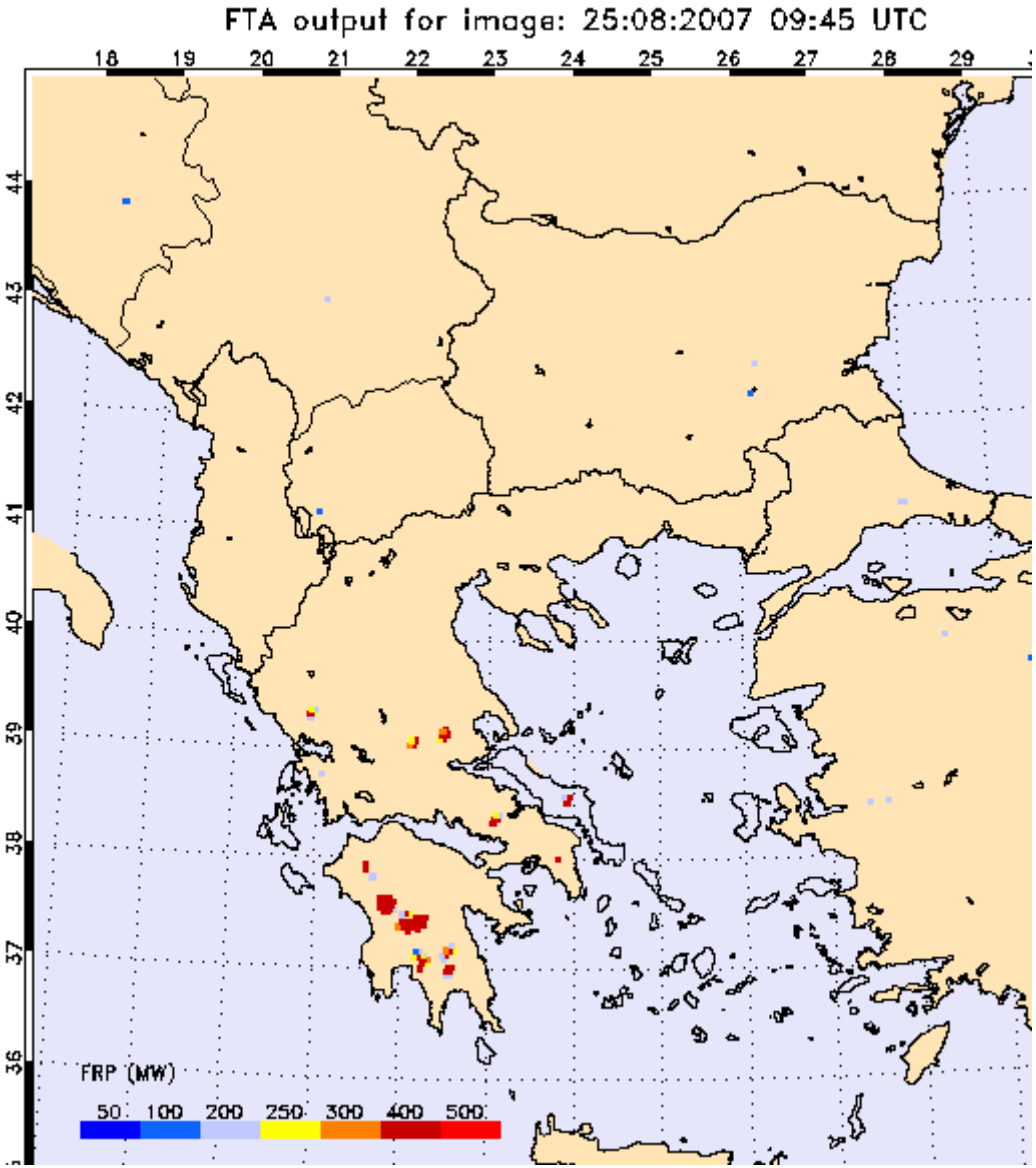
Cooperation activities

- **Cooperation with other SAFs**
  - **Shared validation of fluxes with CM and OSI SAF**
  - **Use of other SAFs' 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**
    - **Complementary of the other Fire products in the LSA SAF portfolio**
    - **Demonstrated flexibility of overall software architecture**
- **Geoland-2 (FP7 project to start 4Q08): LSA SAF partners are consortium members**
- **Work closely with key users**
  - **JRC (agrimetereological applications, VEGA intercomparison)**
  - **African targeted applications**
    - **Need for specific product development with key African users**
    - **Targeted training**

Fire Radiative Power: Summer 2007, Greece



Geoland-2 products

- **Albedo – AL**
- **Downward surface fluxes:**
- **Downward Short-wave Radiation**
- **Downward Long-wave Radiation**
- **Land Surface Temperature – LST**

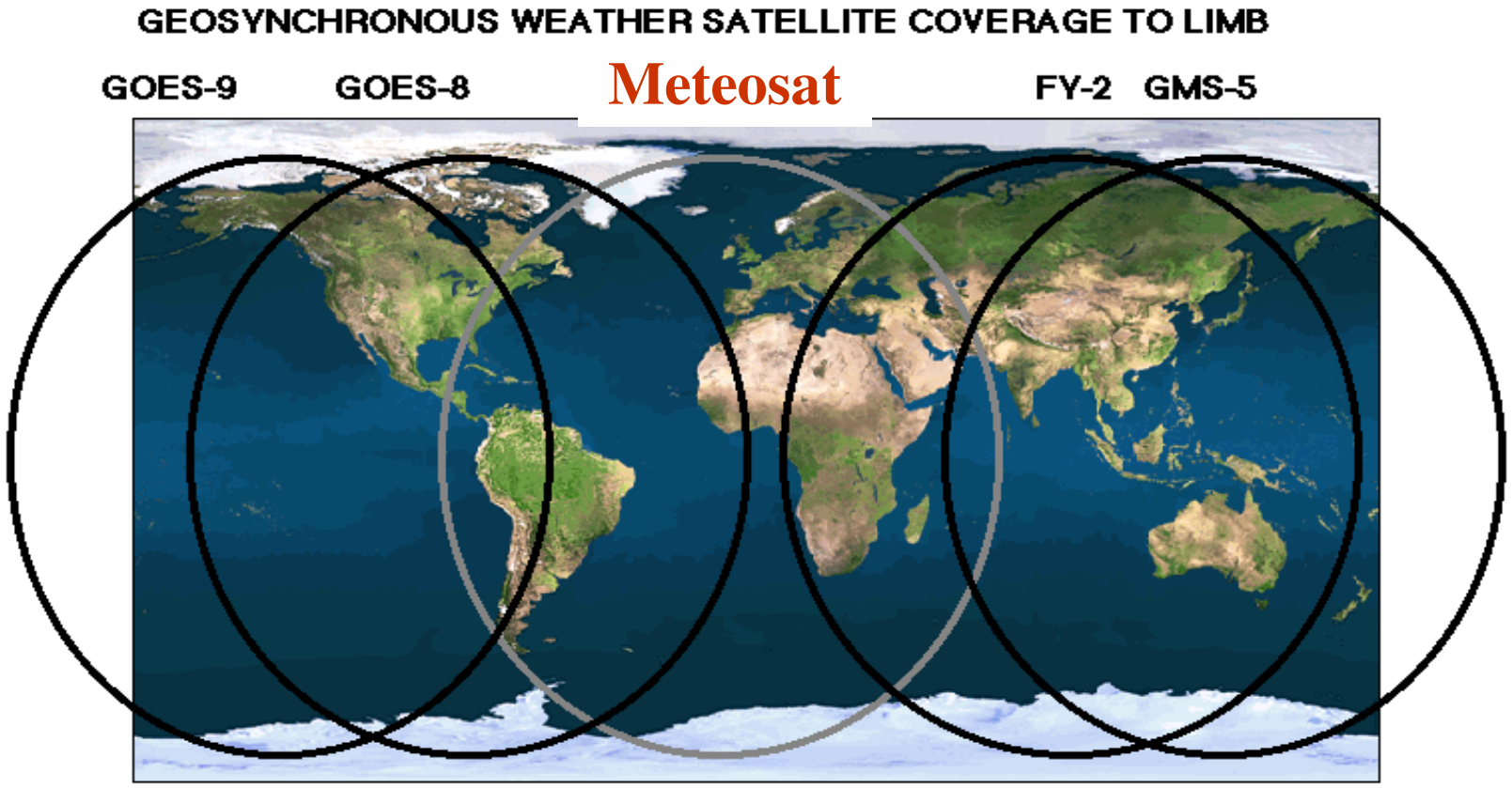
- **At T0, our contribution to geoland-2 will be exactly the corresponding LSA SAF products**

Independent Validation: **EOLAB**

Participation at geoland-2: Coverage

Global — **Constellation of GEO**

High Spatial Resolution — **Merge GEO and LEO**



- GOES (USA), GMS (Japan), and FY(China) have open reception and distribution via NASA-funded internet.
- METEOSAT (Europe), through NOAA, requires license to decrypt and limits distribution for 3 days after observation.

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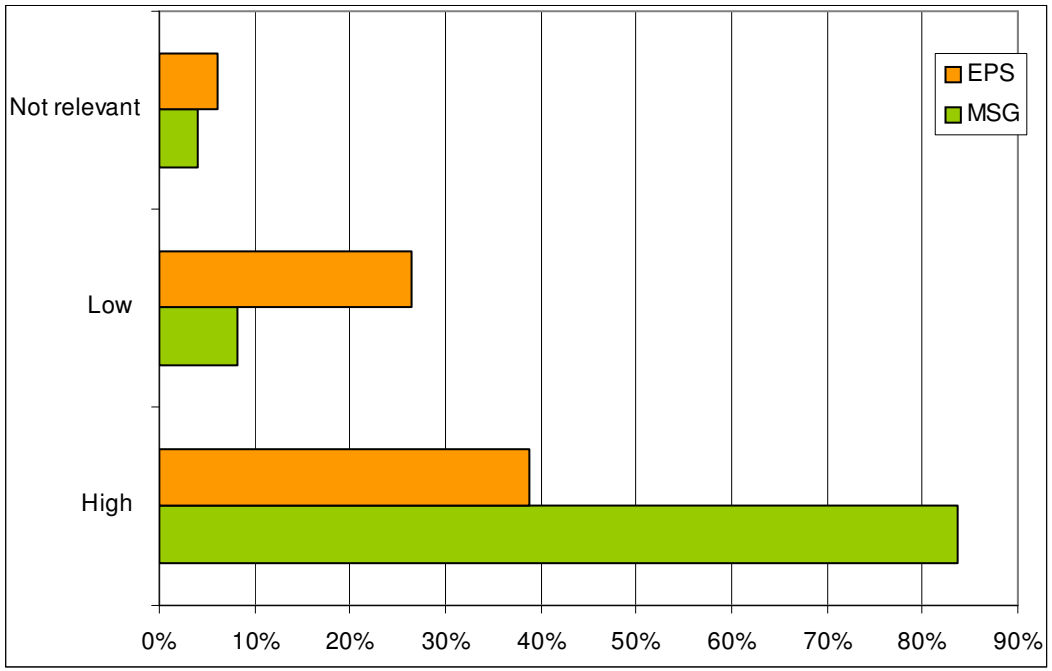
The user feedback loop

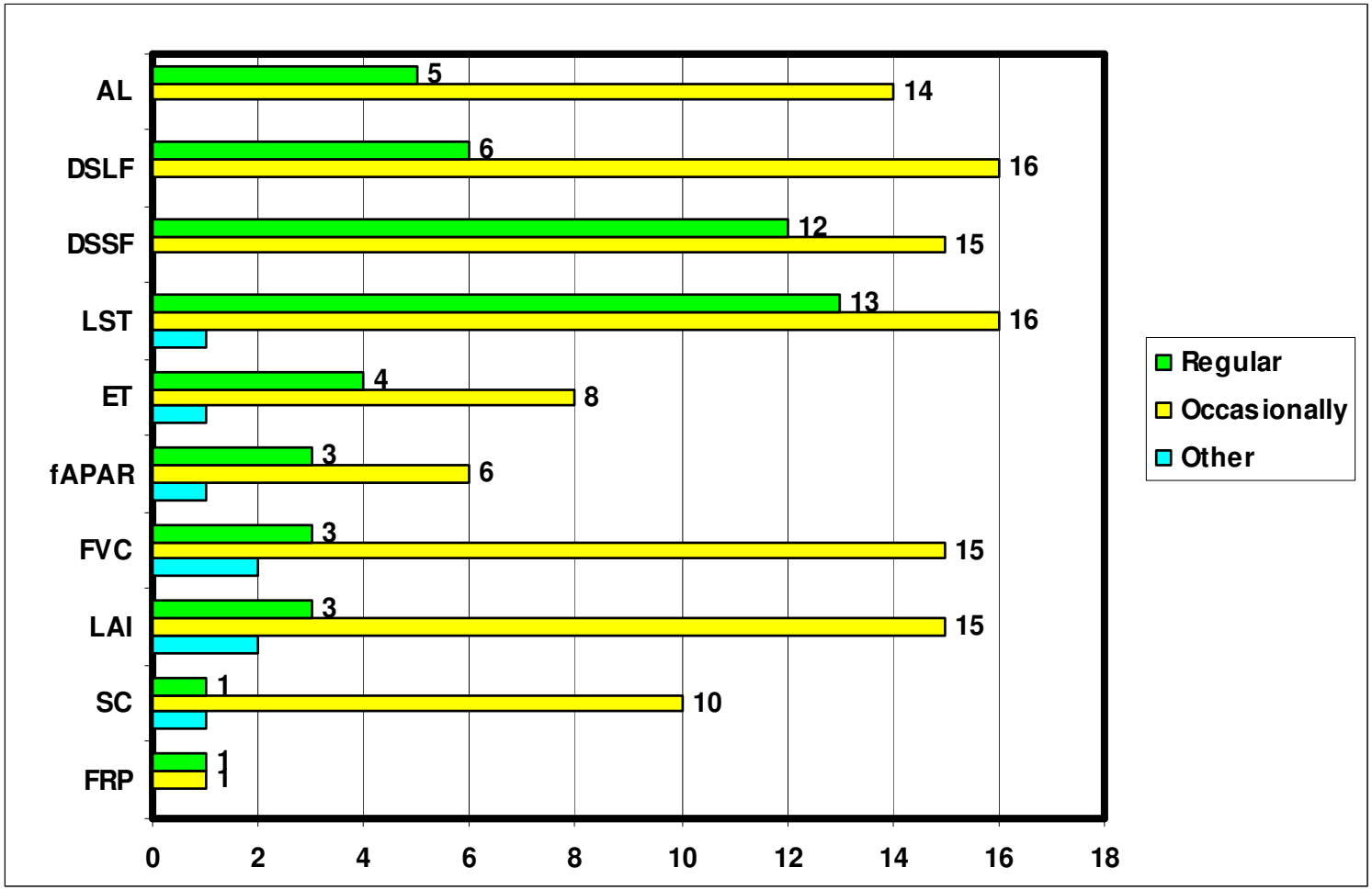
- **Users (> 100)**
  - **Numerical Weather Prediction**
    - **Update parameters, Assimilation & Forecast Verification (ECMWF, MF, INM, IM, …)**
  - **Agriculture & Forestry (JRC)**
  - **Research (e.g. AMMA, U. Leicester, U. Wisconsin)**
  - **Hydrology (U. Firenze, MIT)**
  - **Environmental Monitoring (geoland/GMES)**
  - **(...)**
- **Help desk**
- **Regular workshops (2002, 2004, 2006, 2008) for user feedback and evolution of user requirements**

Questionnaire to users: Spring 2008

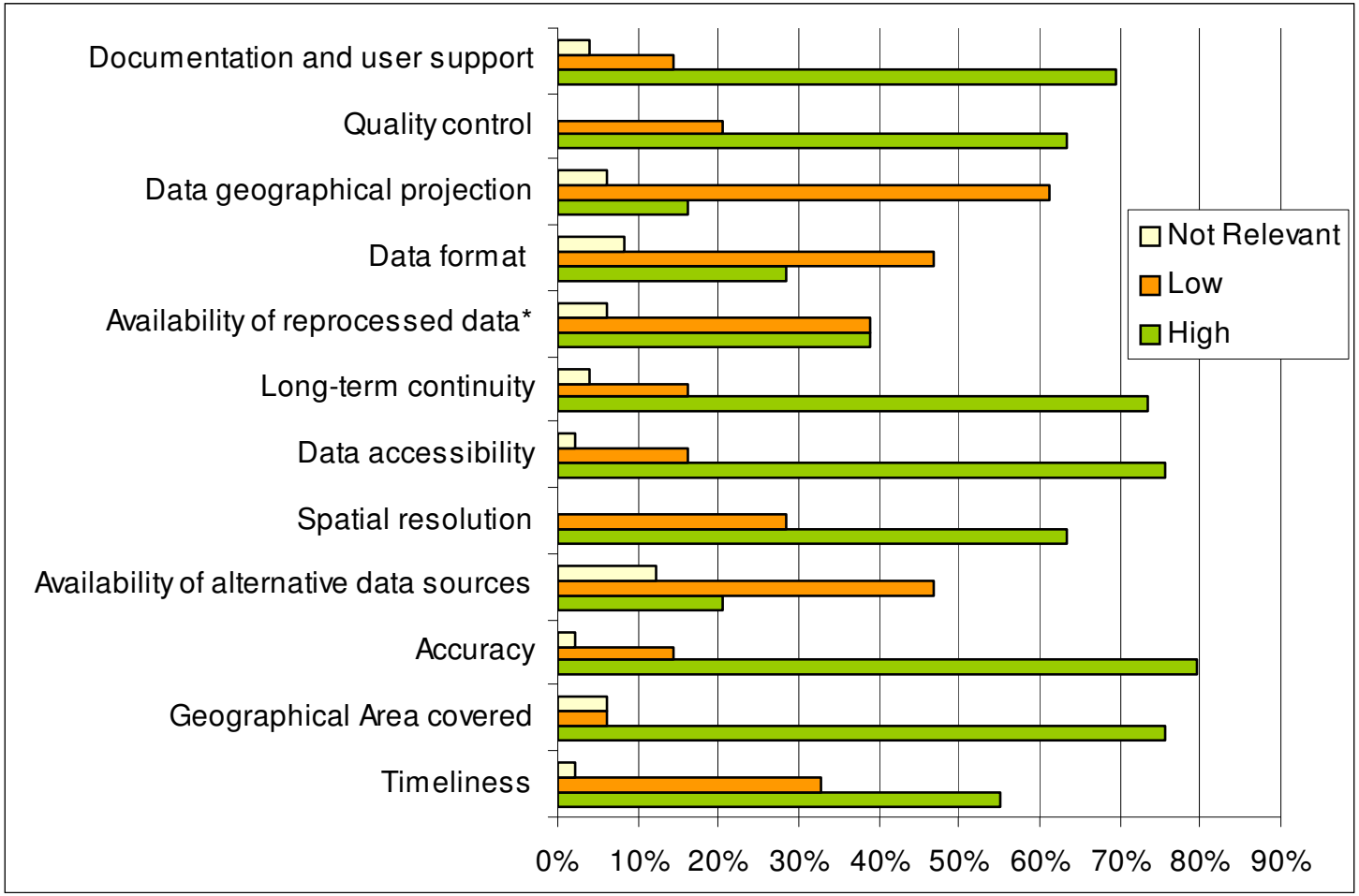
- **A questionnaire was sent to all external registered users (336)**
  - **Sent on 14 April; closed 15 May**
  - **Weekly reminders were sent**
- **49 (15%) responded to the survey**
- **Currently, our users are mainly interested in MSG data**



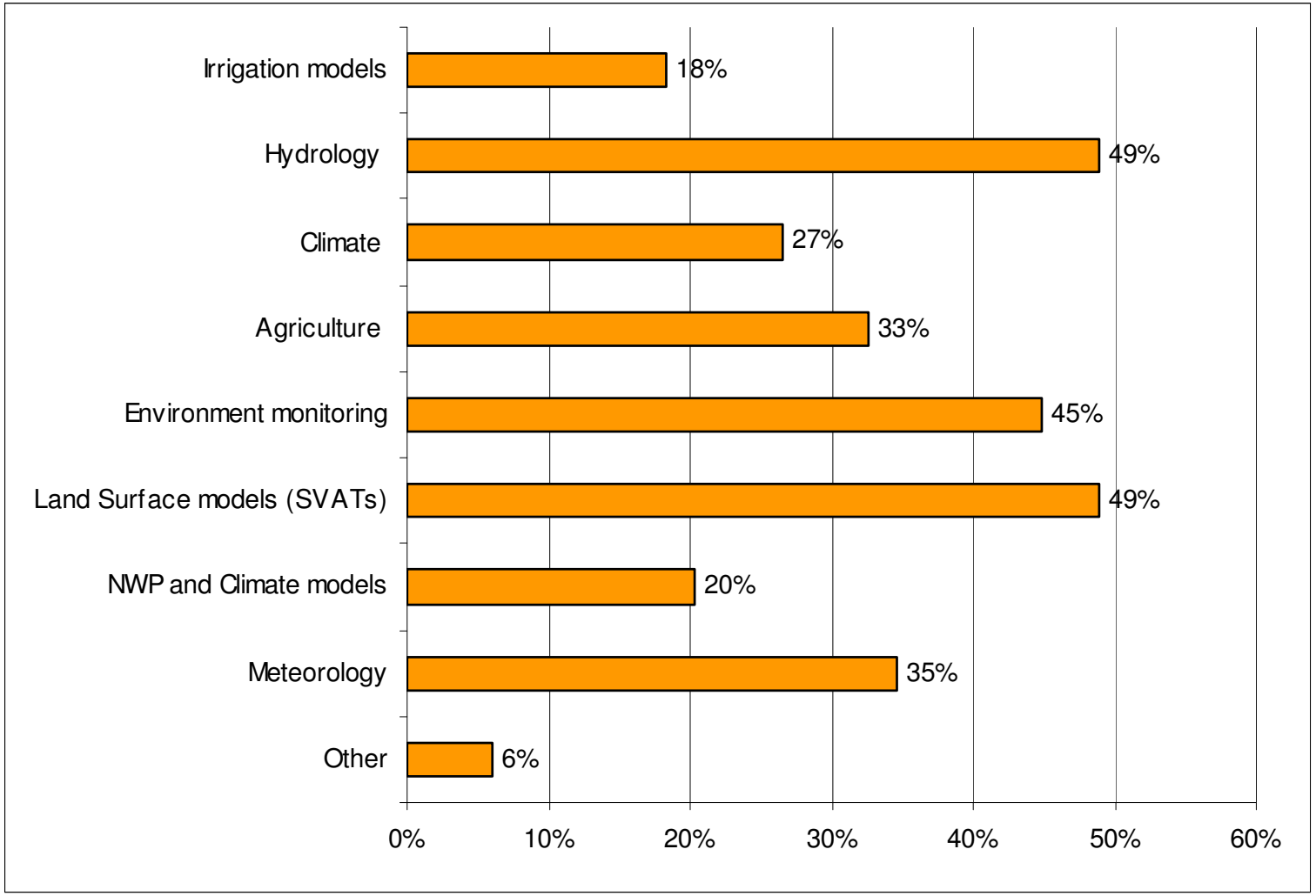
Current use of Land SAF data



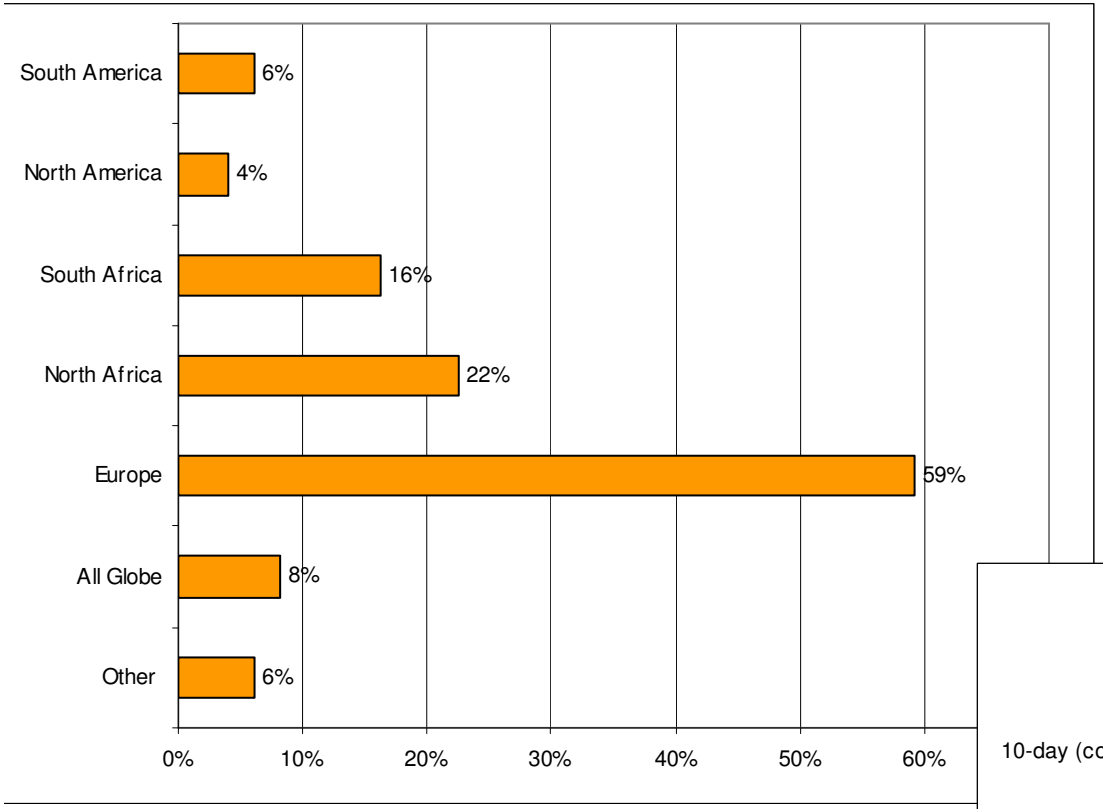
Critical elements to use Land SAF data

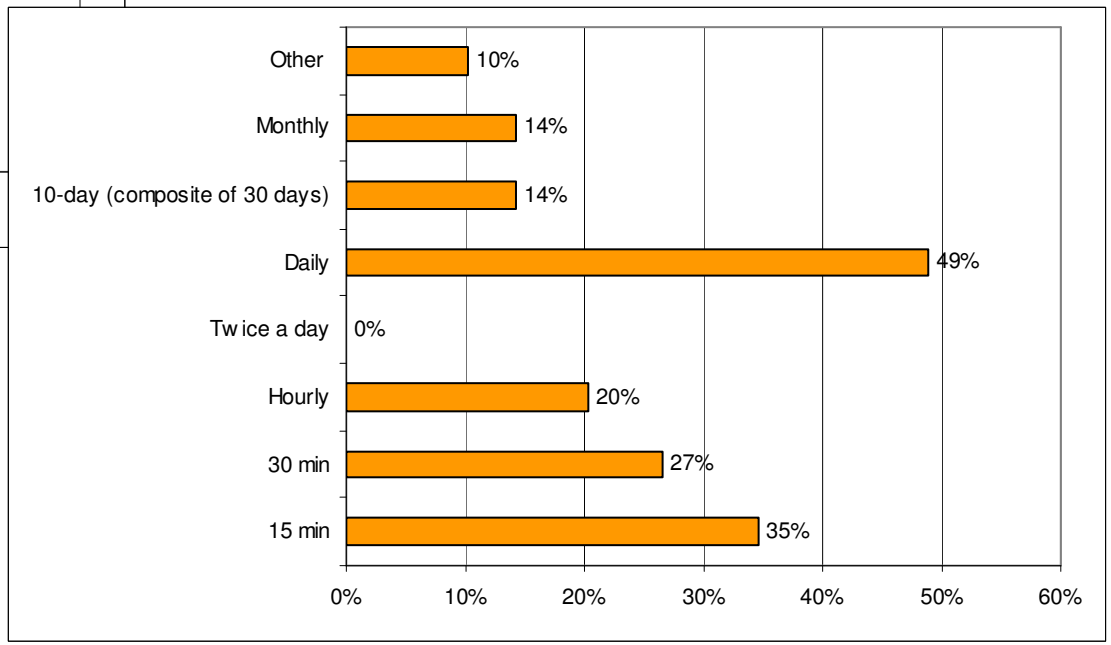


Applications of Land SAF products



Geographical area and time frequency





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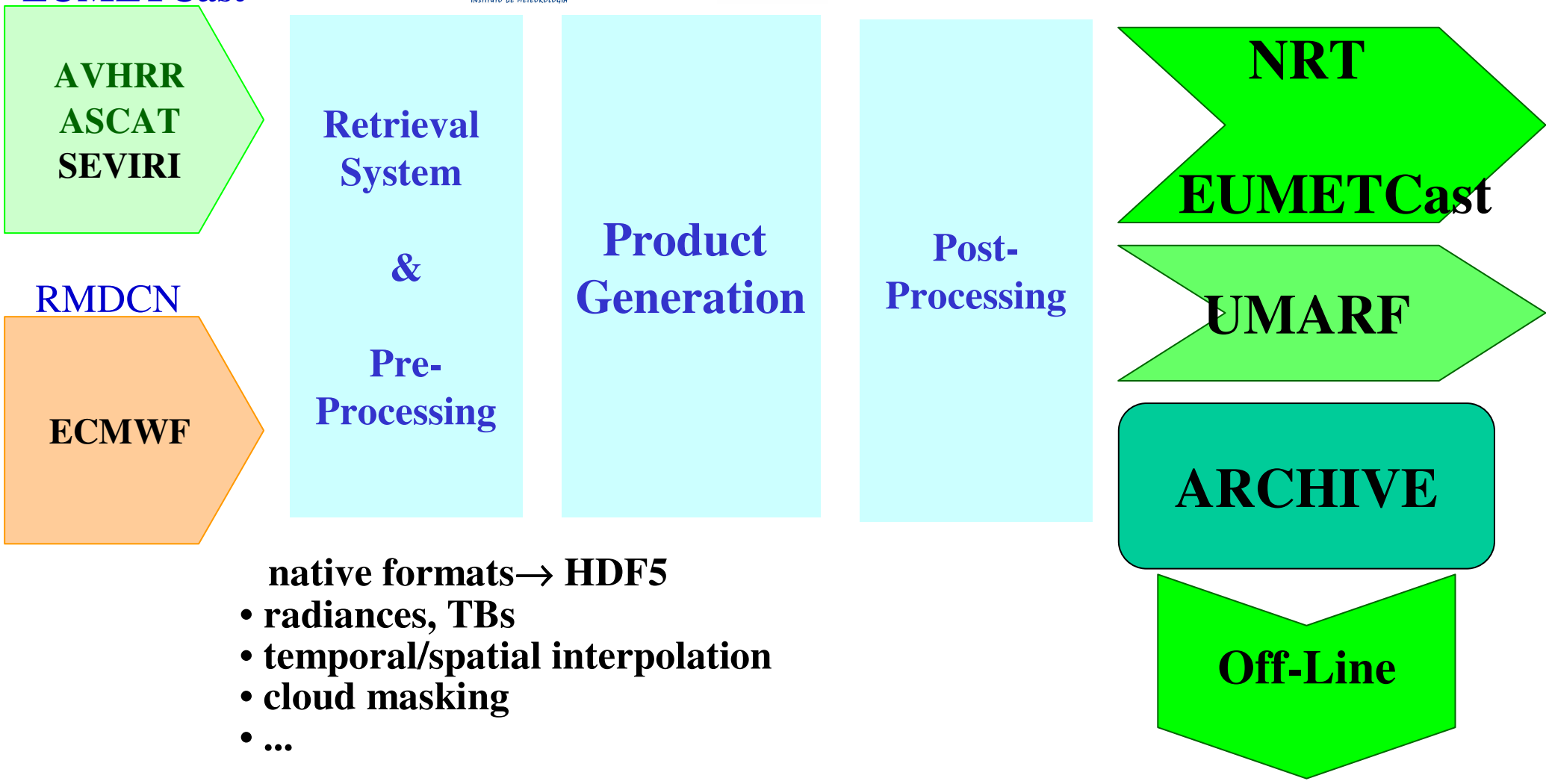
LSA SAF operational system

- **Centralized at IM**
- **Algorithm Code delivered by R&D Team**
  - **Algorithm Plugging Interface Document**
    - **Fortran90, C**
    - **System – algorithm interfaces**
  - **Pre- & Post-processing by IM**
    - **Satellite data**
    - **NWP & Static fields**
    - **Re-projection**

Operational system



native formats→ HDF5

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

Operational system

- **Clusters of Linux PCs**
  - **Operational chains (GEO & LEO)**
  - **Parallel chains – algorithm testing**
  - **Re-processing chain easily implemented**
  - **Truly modular system**
  - **Redundancy**
- **Archiving System**
  - **Centralised on-line storage**
  - **Off-line Archive**

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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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Climate use of LSA SAF products

- **Many current users (e.g., agrometeorological applications) of ALL products would prefer to have anomalies (implying climate-like products)**
  - **Can this be addressed by calibration based on seasonal cycle and/or interannual variability?**
- **Products not covered by CM SAF**
  - **LST, SC, VEGA, Fire Products, ET**
- **Identifying user needs**
  - **Length of period required**
  - **Stability of algorithm version**
  - **Spatial coverage**
  - **Next ERA (ERA-70)?**
- **Identifying system needs**
  - **New "reanalysis" operational chain**
  - **Archive (be aware of multiple passes through the same period)**
  - **Dissemination in "bulk"**
  - **If METEOSAT 1st generation data needed, we face a challenging problem, not only of sensor intercalibration, but also product homogeneization**

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Summary, conclusions and perspectives

- **Aalgorithm development, validation and operational production of land surface related products based on European meteorological satellites (MSG and METOP):**
  - **LAND**
  - **LAND-ATMOSPHERE Interactions**
  - **Land Biosphere Applications**
- **Outlook**
  - **Strenghten our links with users, with increased emphasis on collaborative efforts with key users, including targeted training efforts**
  - **Plan for the upcoming MTG products**
  - **Explore feasibility of options to deliver climate-like LSA SAF products**
  - **LSA SAF partners will participate in GMES land (geoland2)**
- **Product dissemination**
  - **Daily from our web site**
    - **http://landsaf.meteo.pt**
  - **EUMETCAST**
- **Further information**
  - **http://landsaf.meteo.pt**