HELIOSAT-3 and the ESA - ENVISOLAR project

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ESA EOMD program

European Space Agency (ESA)

Earth Observation Market Development Program (EOMD)

Aim:
Support **industrial use** of **Earth Observation** based information

Consortium:

- **Earth observation data providers**
- **market players** using EO data and selling **end user services**
- **key customers** using such services, **‘downstream business‘**

EOMD projects

Typical EOMD workpackages

- build up **integrated** service chain from EO provider to market player
- **upgrade** both EO provider and market player service chains
- perform a **science review**
- set up a **business plan** for market player services
- create **example customer product**
- do **market trials** with key customers
- **learn** from market trials and improve service chains
- do **again market trials**
- do **marketing** and **promotion** for market player services
- **revise** your **business plan**

Use of irradiance information

Planning

Long term time series

Politics
estimate potential
map ressources

Engineering
site selection
optimise plants according
to local ressource characteristics

Investment decision

Plant management

Near Real Time

performance monitoring

Forecast hours to days

optimized plant management

load forecast

grid stability

energy trading

1) Solar Investment Services

”Premium” site audit for investment decision (for big solar plants)
Webservice based yield estimation (for smaller plants)

2) Plant Management Service

Fault detection -> reliable alarms, assure investment
Performance check for smaller plants

3) Load Forecast

Forecasting for utility purposes

4) Services for Science and Consulting

Time series, maps and statistics of irradiance,
direct and diffuse components,
spectral components

ENVISOLAR partners: key customers

EDISUN POWER

Contracting for
Renewable Energies
and Energy Conservation
Switzerland and Germany

Das Unternehmen
enercity
positive energie

Stadtwerke Hannover AG:
utility
active in Hannover, D
and other regions in Germany

S.A.G. Solarstrom

S.A.G. Solarstrom
Vertriebs GmbH,
photovoltaics,
active in Germany,
Austria, Switzerland
other countries planned

ARMINES
ECOLE DES MINES DE PARIS
enecolo energy ecology
meteo control
MeteoSwiss
CARL VON OSSIETZKY universität OLDENBURG

ENVISOLAR partners: key customers

stromaufwärts Photovoltaik GmbH.

Photovoltaics
(facades, roofs)
Active in Austria

tecsol.fr

Consultant for
rational use of energy
and solar energy
(thermal and photovoltaic).
Active in F, D, NL, E, Tunisia

ARMINES
ECOLE DES MINES DE PARIS
enecolo energy ecology
meteo control
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Blockages and Solutions

Market players have identified a **list of blockages** for the use of satellite-based irradiance information in the **ENVISOLAR proposal phase.**

Answers are provided by ENVISOLAR and other on-going projects as HELIOSAT-3, PVSAT-2,...

Blockages and Solutions

Blockage No. 1: Present algorithms based on **simple empirical approaches**

+ does **not take account ot clouds, aerosols, water vapour and ozone appropriately**

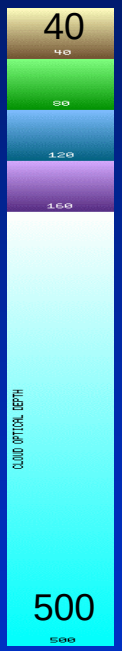
-> EU 5. FP project **HELIOSAT-3**

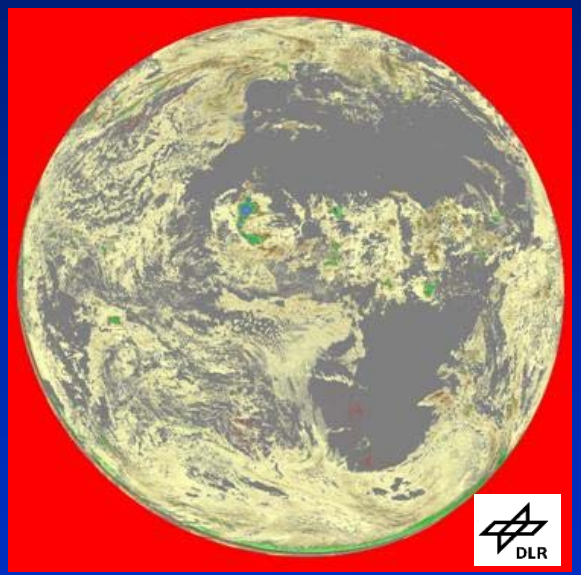
-> HELIOSAT-3 method is physically based and uses

cloud physical parameters
aerosol optical depth, angstroem coefficients
water vapour concentration
ozone concentration

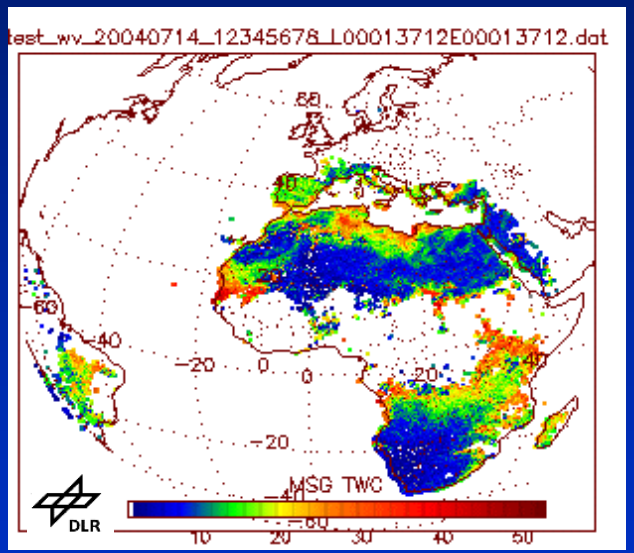
Blockages and Solutions

New Meteosat Second Generation satellites allow to retrieve
cloud physical parameters and water vapour directly
-> input for HELIOSAT-3 -> usage of radiative transfer models possible





MSG cloud optical thickness

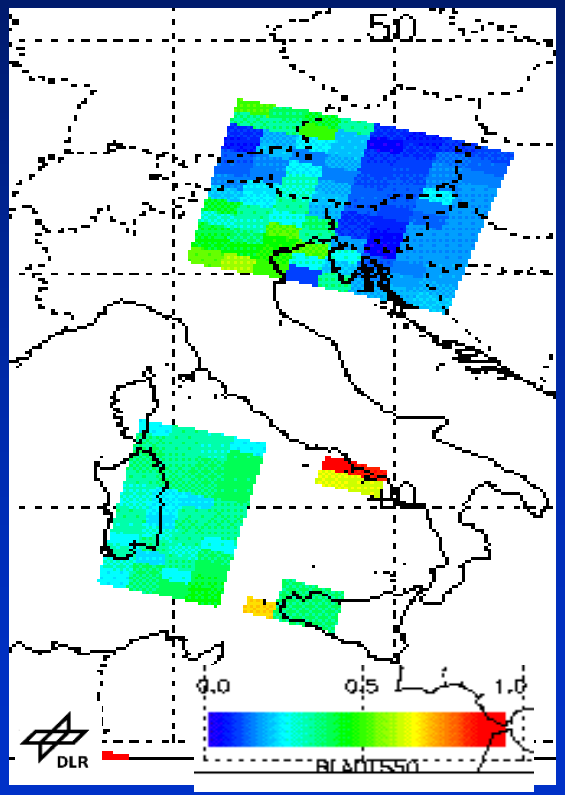


MSG water vapour total column

Blockages and Solutions

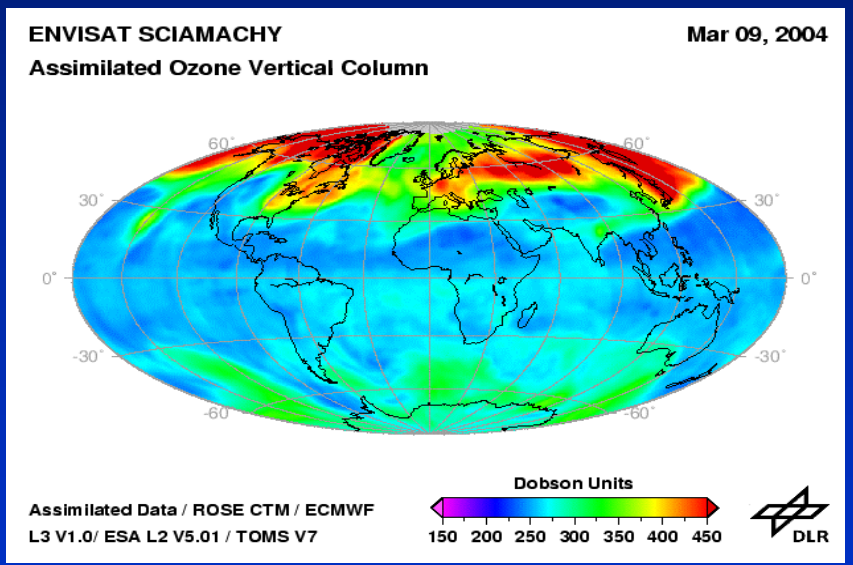
Additional information: aerosols and ozone

Data source: ENVISAT, METOP, TOMS satellite instruments



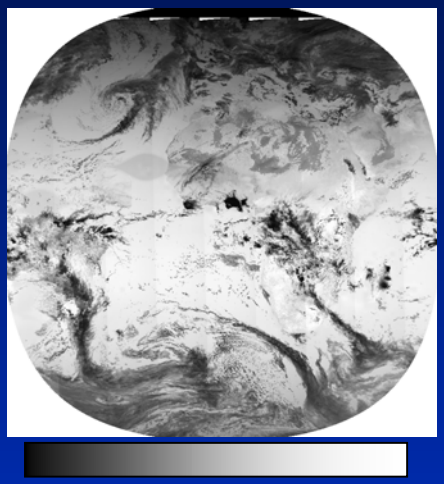
ENVISAT
aerosol optical depth
and type

ENVISAT ozone column



Blockages and Solutions

Blockage No. 2: **Quality of hourly satellite based data** needs to be improved



0 1200 W/m2

Feb 15, 2004; hourly radiation
11 - 12:00 true solar local time
HELIOSAT-2 in HelioClim-2 chain
(SoDa service)

a) MSG provides 4 images per hour
instead of 2 images per hour before

-> better representation of variation inside one hour

b) MSG offers HRV channel with 1 km resolution

-> better spatial resolution

ENVISOLAR science review (A. Zelenka):

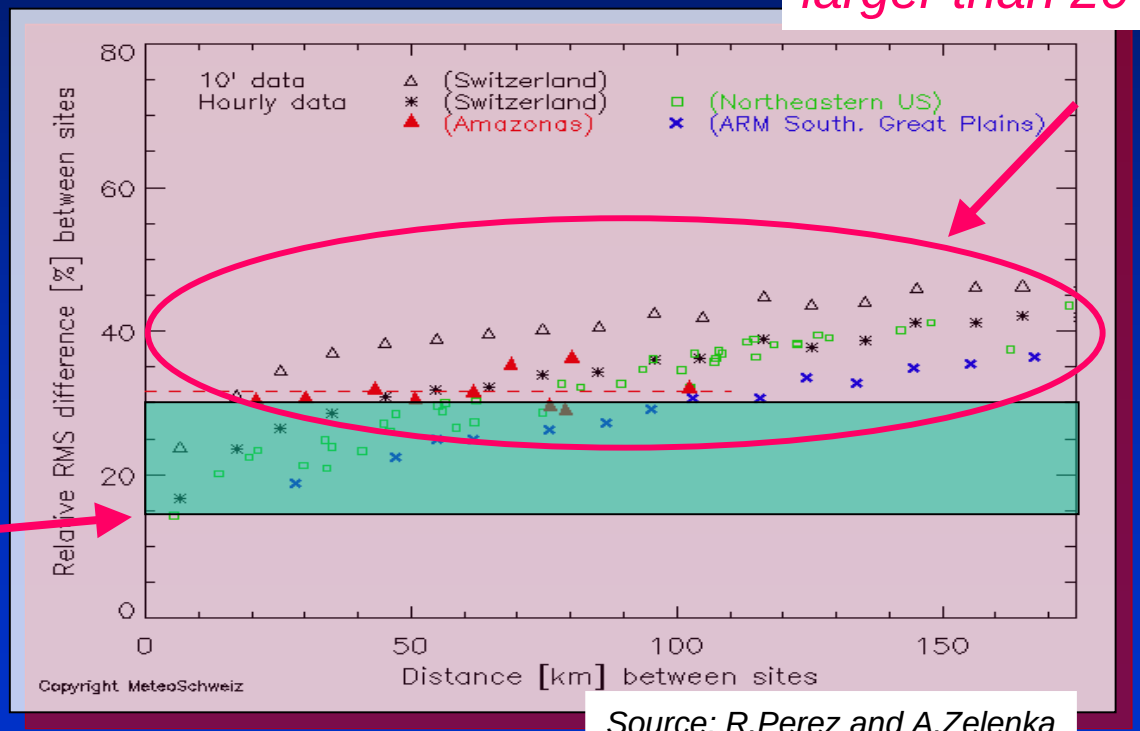
RMSE is mainly due to missfit
between ground measurement (point)
and satellite measurement (pixel average)

Accuracy of satellite is better if distance between ground station and area of interest is larger than 20 ... 50 km

Typical RMSE of hourly irradiances

15 % to 30 %

Theoretical lower limit of RMSE is ca. 15 %



Source: R.Perez and A.Zelenka

Blockages and Solutions

Blockage No. 2: **Quality of hourly satellite based data** needs to be improved

Typical MBE
of hourly irradiances *0 % to ± 20 %*

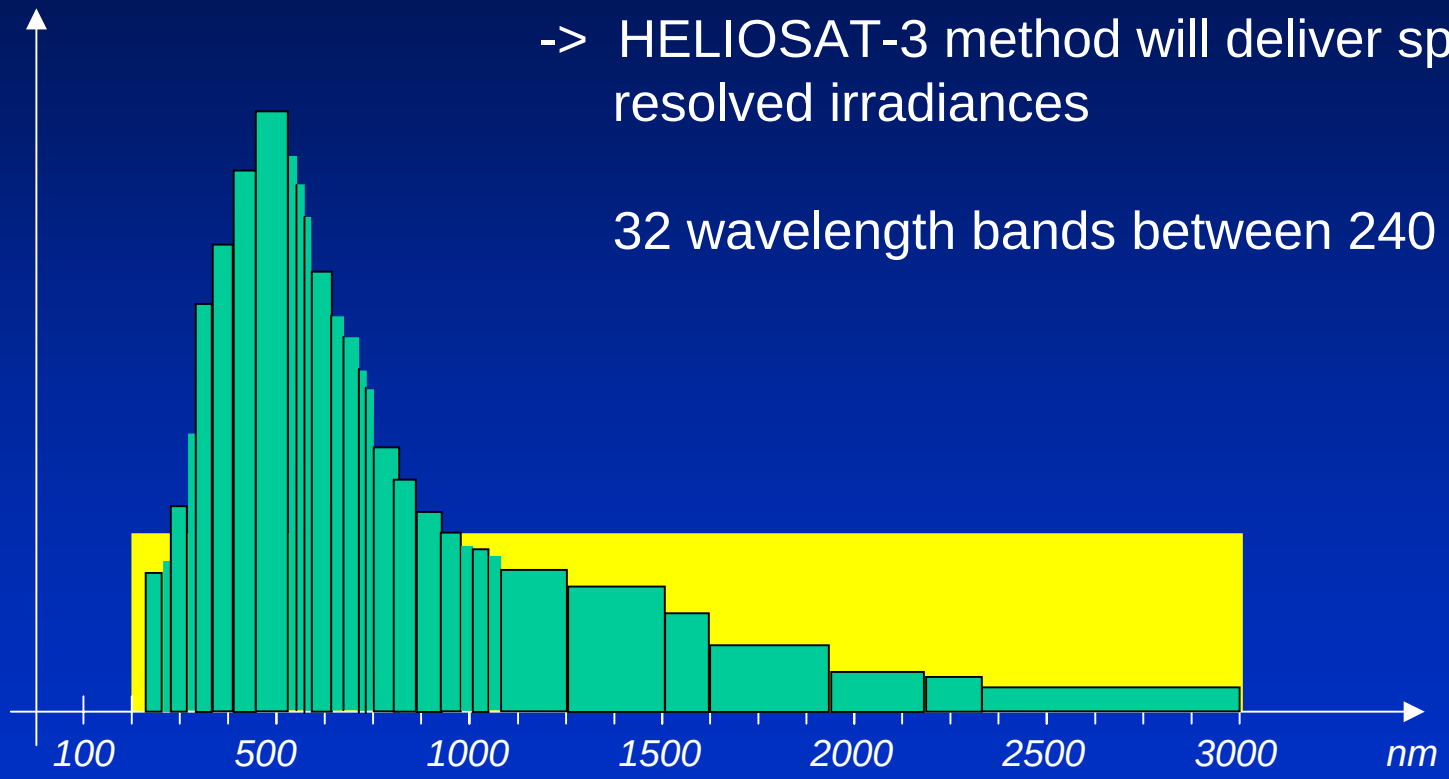
ENVISOLAR science review (A. Zelenka):

MBE is mainly due to wrong clear sky parameters
aerosols and water vapour.

-> new HELIOSAT-3 input parameters

Blockages and Solutions

Blockage No. 3: **No spectrally** resolved data



-> HELIOSAT-3 method will deliver spectrally resolved irradiances

32 wavelength bands between 240 and 4600 nm

Blockages and Solutions

Blockage No. 5: **Precision** on solar irradiance **forecasts**

-> ENVISOLAR will further assess the
irradiance forecast used up to now by Meteocontrol

-> new virtual Institute of Energy Meteorology (vIEM)
has solar irradiance forecast as one of its major workpackages

Blockages and Solutions

Blockage No. 6: **Precursor services** are **fragmented**, difficult to use

-> ENVISOLAR brings providers of several precursor services together

-> market players work together to develop the market

Blockages and Solutions

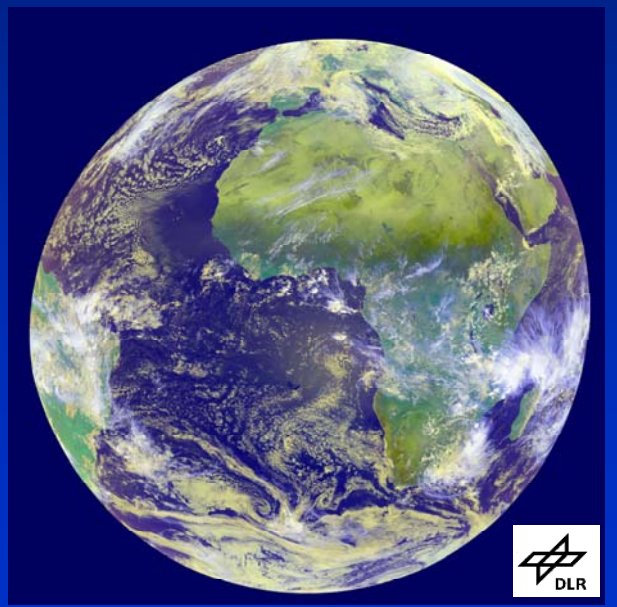
Blockage No. 7: **Existing archives** are **restricted** in terms of **spatial and temporal coverage**

-> ENVISOLAR helps to set up technical infrastructure to store MSG full disk in full pixel resolution

-> **Europe and Africa**

-> **1 km and 3 km resolution**
(depends on channel and algorithm)

-> **15 min. temporal resolution**



Blockages and Solutions

Blockage No. 10: **no fast access** to **long term time series** in high resolution, delivery times unacceptable

-> ENVISOLAR helps to set up technical infrastructure

e.g. re-structuring of archives at DLR
new database at Ecole des Mines

Blockages and Solutions

Blockage No. 12: **show added value** of market player services
in comparison to cost free available information sources

-> quantify added value through market trials
with key customers

Future

- market trials start Jan 2005
- further integration of new MSG and ENVISAT information (2005)
- include user feedback into processing chains (2005)
- expand customer base (2006)

Summary

- approach of ENVISOLAR project
- list of blockages identified and solutions proposed
- ENVISOLAR offers the possibility to do both

  market development

  and further technical developement on interfaces

for services developed in other projects as e.g. HELIOSAT- 3, PVSAT-1 and -2, SoDa, ...