Overview of WG1 activities on input data for UV maps

Hugo De Backer & WG1

Memorandum of Understanding

WG1 – Data collection

- **Inventory of available high quality UV-measurements**

  Inventory of high quality UV measurements to validate the results of the reconstruction models

- **Inventory and collection of measured ancillary data**

  Determination of the ancillary data that are necessary to run the models, considering variable spatial and temporal resolution

Long term changes and Climatology of UV radiation over Europe

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Survey of available observations in Europe

- High quality spectral UV data for model validation
- Ozone (column, profile)
- Albedo (including also snow depth/age data)
- Aerosol optical properties (AOD, Angstrom coefficient in different wavelength bands)
- Cloud properties (type, altitude)
- Visibility
- Global irradiation (total, diffuse, different wavelengths)
- Sunshine duration

Results of the survey:

Data are different in

- quality
- time and space resolution
- formats and way to acces

Need for a data exchange tool:

Through we could use a safe password protected system with dataprotocol

BSCW

Be Smart – Cooperate Worldwide

UV and ancillary data for model validation and model comparison (collaboration with WG2 on modelling)

Selection based on availability and latitude range over Europe

Four stations:

- Bergen (Norway)
- Potsdam (Germany)
- Davos (Switzerland)
- Thessaloniki (Greece)

Three years:

- 1982/3, 1999, 2002

Result of model intercomparison (collaboration with WG2 on modelling)

COST publication *EUR 23338 COST Action 726* – Modelling solar UV radiation in the past: Comparison of algorithms and input data.

The best scoring models use global irradiation as proxy input parameter for cloud/aerosol effects

More: Presentations of WG2

Input data series needed for the reconstruction of the UV maps:

- Ozone column
- Global irradiation
- Aerosol climatology
- Albedo (special attention for the alpine region)

Requirements:

- Homogeneous
- Regular grid

To produce maps:

Spatial and temporal interpollation necessary on the input parameters

However:

Each input parameter has different scales in variability

→ Different approach for each parameter

Ozone data:

COST726 daily total ozone data set has been created (1950-present):

Before 1979:

Based on a two step statistical regression model for each grid point and four seasons *(explanatory variables selected from a set of meteorological variables and teleconnection indices by multivariate adaptive regression splines)*

Regression coefficients determined against the “NIWA” total ozone set (combined satellite data)

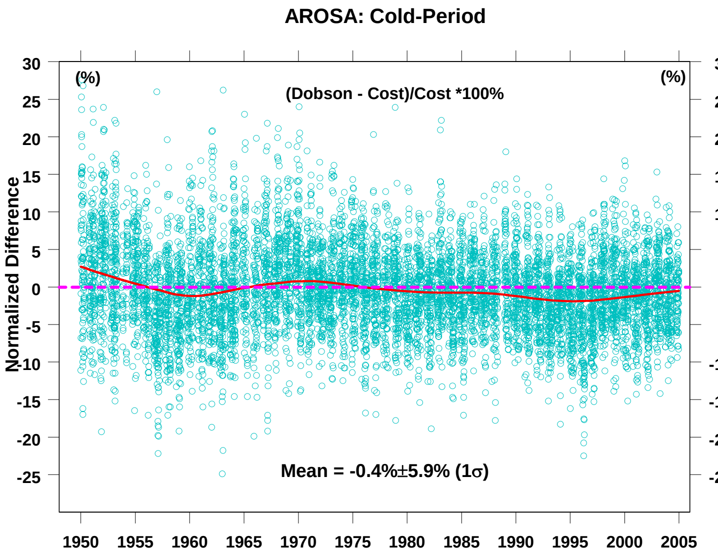
After 1979:

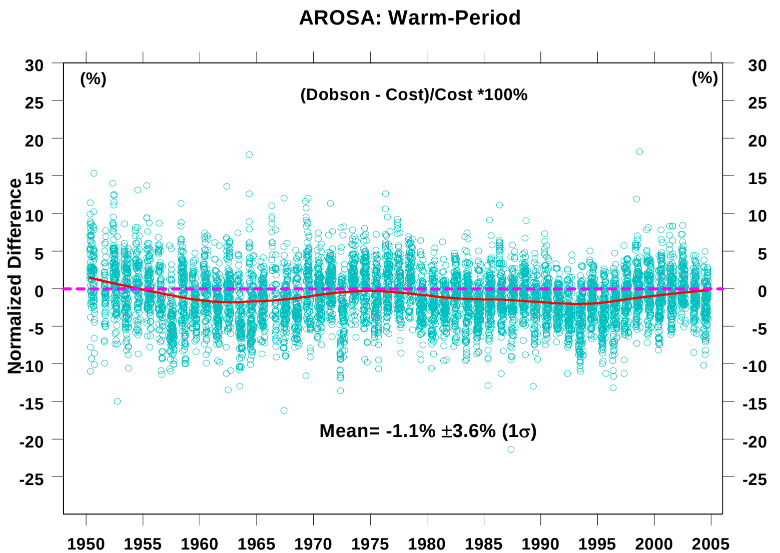
The “NIWA” data set

Ozone data (continued):

Validated by long term observations at selected stations

(Arosa, Belsk, Longyearbyen, Oxford, Lerwick and Upsala)





Details: presentation by Janusz Krzyścin

Global solar irradiation:

Used to derive Cloud Modificaton Factors (CMFs)

Can be extracted from ERA-40 (ECMWF) re-analysis but contains systematic deviations

→ Corrected with data from observations (different sources)

Converted to CMFs for the UV

Details: presentation of Henning Staiger

Global irradiation (continued):

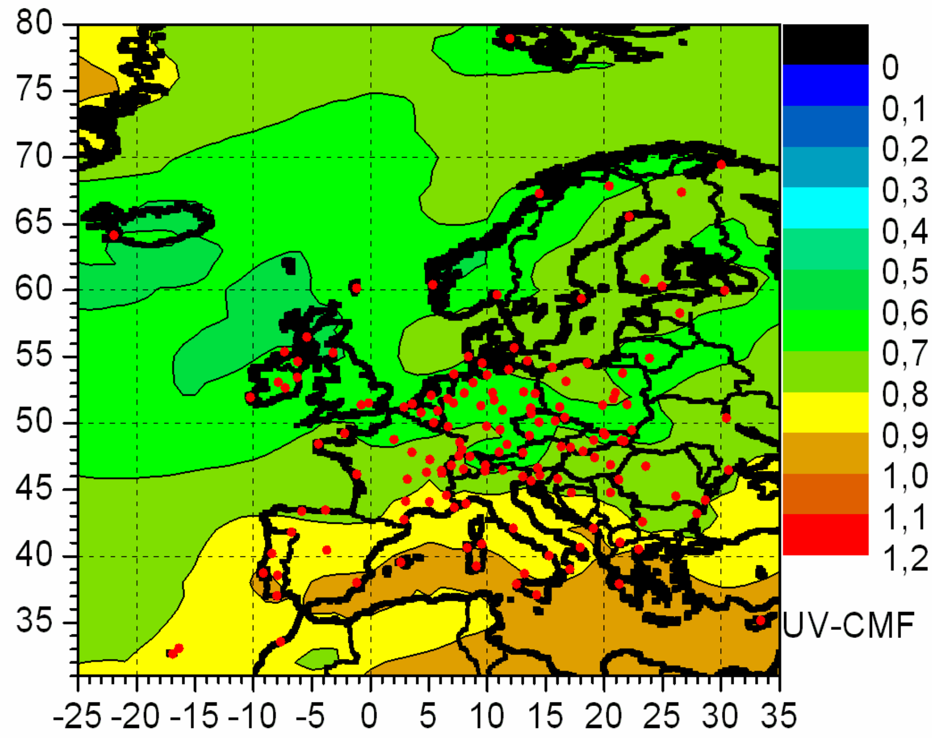
Data sources:

World radiation Center (very strickt quality checks)

National Renewable Energy Laboratory

National Meteorological Services

Other networks (Environmental Agencies, Universities, …)



Average UV-CMFs for July

Aerosol climatology:

Optical parameters needed:

- aerosol optical thickness (τ_λ)
- Angstrom parameter (α)
- single scattering albedo (ω_λ)
- the asymmetry factor (g_λ)

Spatial distribution τ_{308} derived from MODIS (satellite) τ_{550} with $\alpha_{440\text{-}870}$ from AERONET (groundbased)+Kriging interpollation

Other parameters estimated constant at ω~0.94 and g~0.75 in UV region

Details: presentation by Natalie Chubarova

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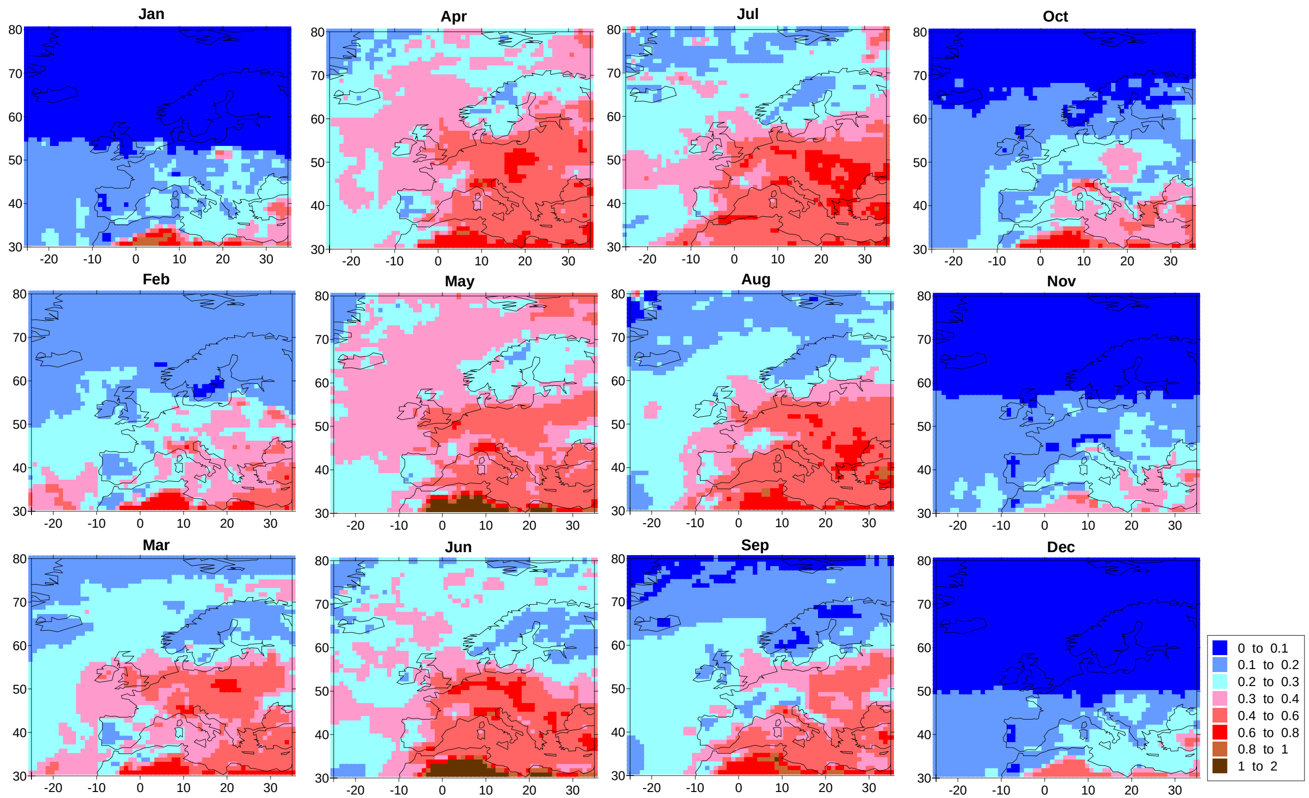
Aerosol climatology (continued):



Spatial distribution of τ_{308} according to MODIS/AERONET datasets

Albedo:

Albedo in snow-free conditions low and constant (‹10%)

Snow has large impact on the albedo

Multiple reflections -› consider the effective albedo for a region

COST726 albedo determined from ERA-40 snowdepth (low spatial resolution, long time series) and JRC derived METEOSAT surface albedo (high spatial resolution, shorter period) and cloud optical thickness in the UV

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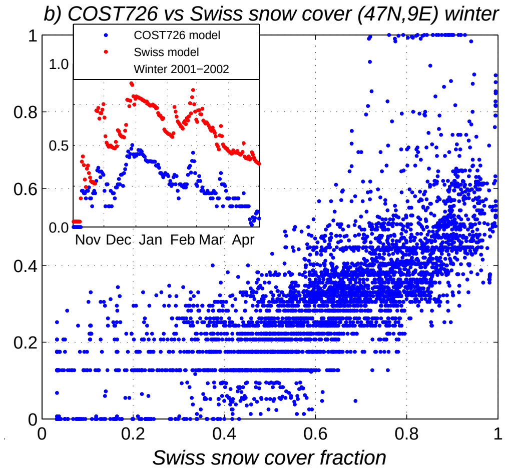
Albedo (continued):

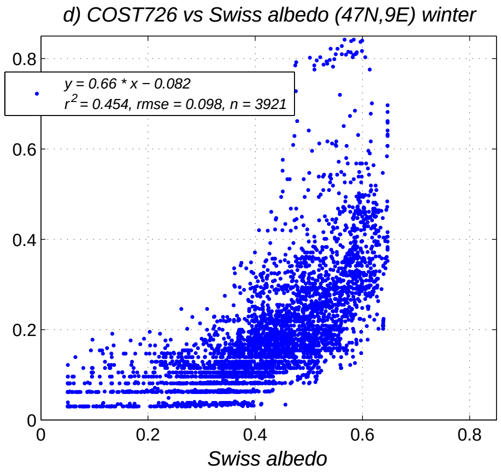
COST 726 Albedo validation against Swiss method based on observed snow cover fraction:

• Correlation not high but significant

• COST726 albedo generally lower than Swiss albedo



COST726 maybe more relevant for UV because of darkening effects from cities and forests (increasing with snow age)



Differences most important in difficult situations (mountains, presence of snow); uncertainties smaller during summer when UV radiation is highest

Details: presentations by Laurent Vuilleumier and Jean Verdebout

Conclusion

✓ WG1 set up a tool for data exchange between the different partners (observers and modellers)

✓ WG1 prepared input data set for the reconstruction of UV fields over Europe for the COST 726 action (ozone column, global radiation/CMFs, aerosol, albedo)

✓ WG1 prepared UV data for the validation of the models used for the reconstruction (4 stations, three years)

Many thanks to all the active contributions of the different participants of WG1