

# **CREATE/DAEDALUS and aerosol retrieval**

TNO Physics and Electronics Laboratory

**Gerrit de Leeuw, Robin Schoemaker and  
the CREATE and DAEDALUS teams**





# **CREATE**

**Cronstruction, Use and Delivery of an  
European Aerosol Data base**

**National University of Ireland, Galway (Coord.)**

## **Partners:**

**NILU, Norway**

**ECN, Netherlands**

**LSCE, France**

**Finnish Meteorological Institute**

**Ift, Germany**

**University of Crete**

**TNO, Netherlands**

**MPI, Germany**

**University of Helsinki**

**PSI, Switzerland**





# DAEDALUS

Delivery of **A**Erosol pro**D**ucts for  
**A**ssimilation and environmental **L** **U**Se

LOA/CNRS /USTL, *France (Coord.)*

IASB, *Brussels, Belgium*

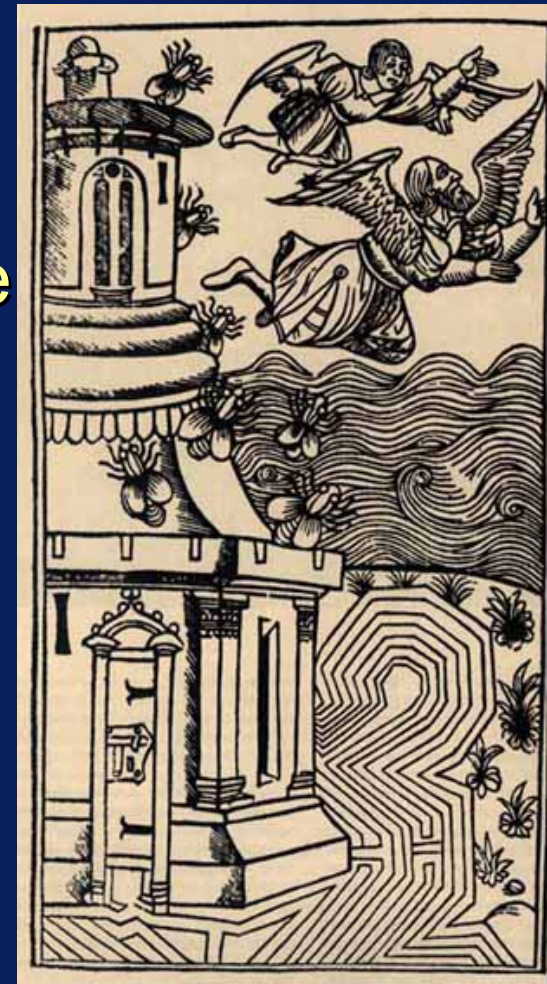
KNMI, *the Netherlands*

TNO-FEL and TNO-MEP, *the Netherlands*

NILU, *Oslo, Norway*

University of Evora, *Portugal*

IES JRC, *Ispra, Italy*



# CREATE & DAEDALUS are GMES Thematic Projects

## Needs and Gaps:

- a) Need for spatial and temporal monitoring of aerosols
- b) Need for common protocol of data submission
- c) Need for long term sustained support for monitoring
- d) Need for quality assurance of data
- e) Need for database for user needs



# CREATE

## Construction, use and delivery of a European Database

Report on aerosol measurement techniques and harmonization of calibration procedures

Recommend list of European monitoring sites

Delivery of aerosol knowledge/training to data providers and data users Examples: Tutorials & Measurement/Analyses Workshops; Field visits

Catalogue of maps of aerosol levels over Europe from measured data and model outputs (see Schulz presentation)

Provision of an European Aerosol Database to EMEP/WMO GAW standard (see Wilson presentation)



# DAEDALUS

- **Impetus for designing long-term sustainable and fully operational European monitoring of aerosol properties**
- **Regional and global scales**
- **Over sea**
- **Over land**
- **Satellite remote sensing**
- **Data assimilation in CTM**
- **Ground based network (PHOTONS) (see Goloub presentation)**
- **User requirements**



# **DAEDALUS Deliverables**

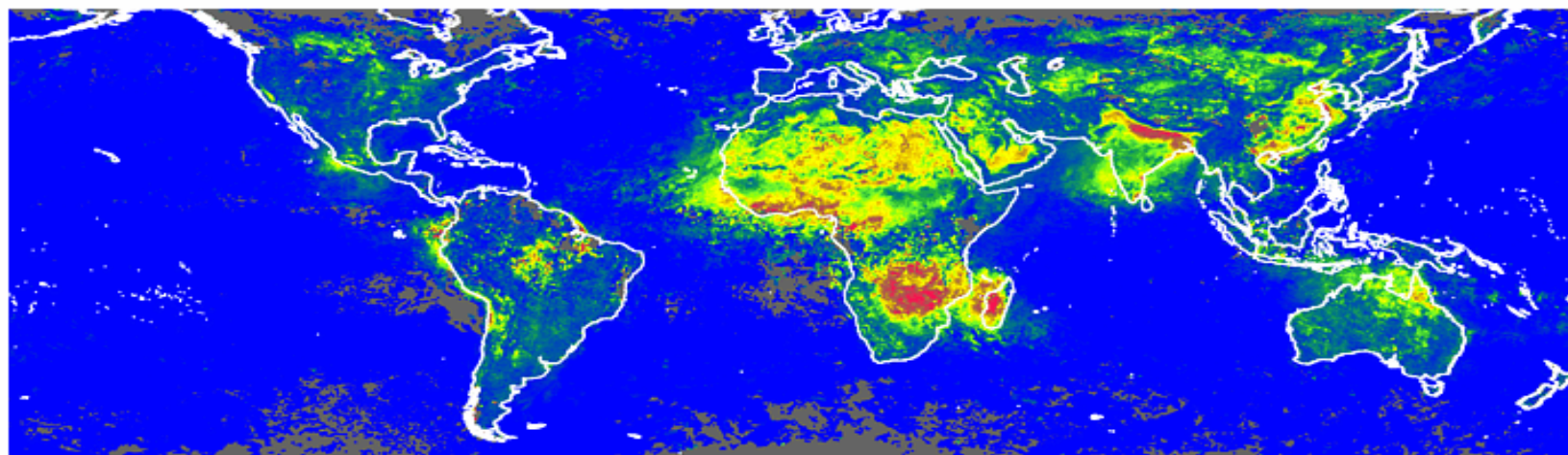
- **Report on data availability and quality**
- **Report on optimisation of ground-based networks for in-situ and remote sensing measurements**
- **Users workshop and workshop report**
- **Evaluation report PHOTONS network**
- **Report on existing technology and expected operationalisation for a daily aerosol product**
- **Assessment of current assimilation techniques and requirements for a fully functional aerosol assimilation system**
- **Proposal for the aerosol monitoring component of the European capacity for GMES**



# Climatology of tropospheric aerosols: Global



## Aerosol index from POLDER on ADEOS November 1996

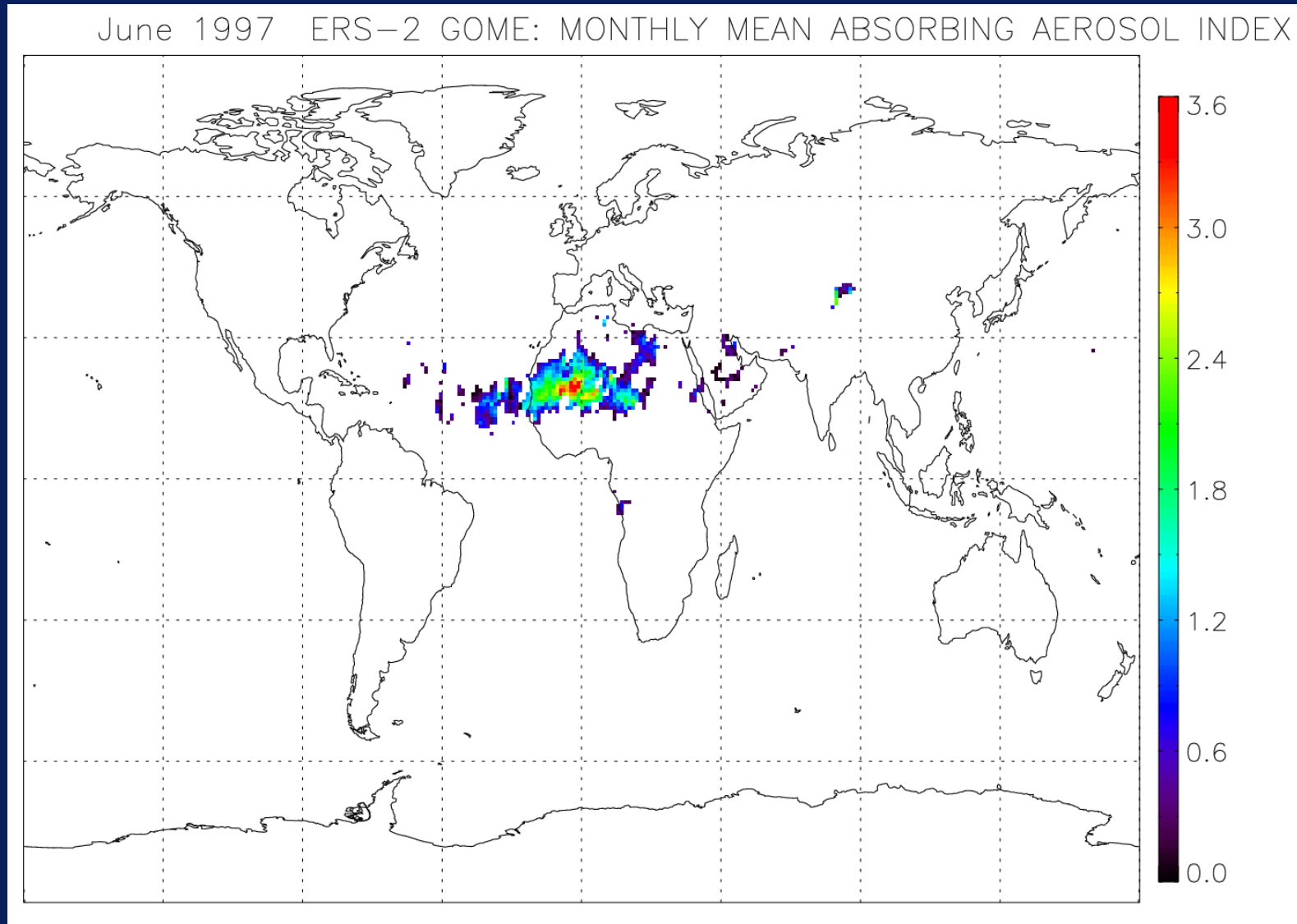


POLDER Data: CNES/NASDA  
Processing: LOA/LSCE

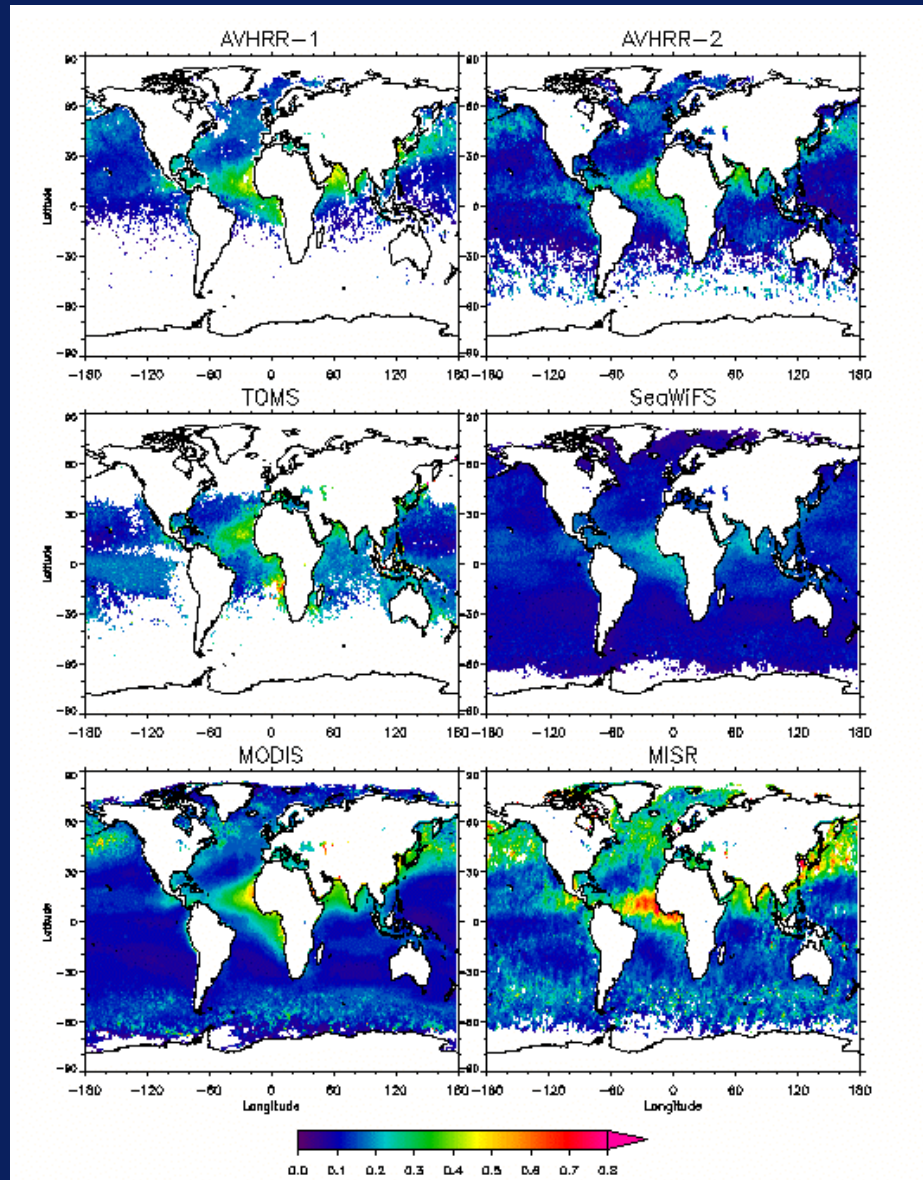




Global map of the absorbing aerosol index from GOME for June 1997, as retrieved with the KNMI AAI algorithm from GOME level 1b data.



# Intercomparison of aerosol satellite climatologies

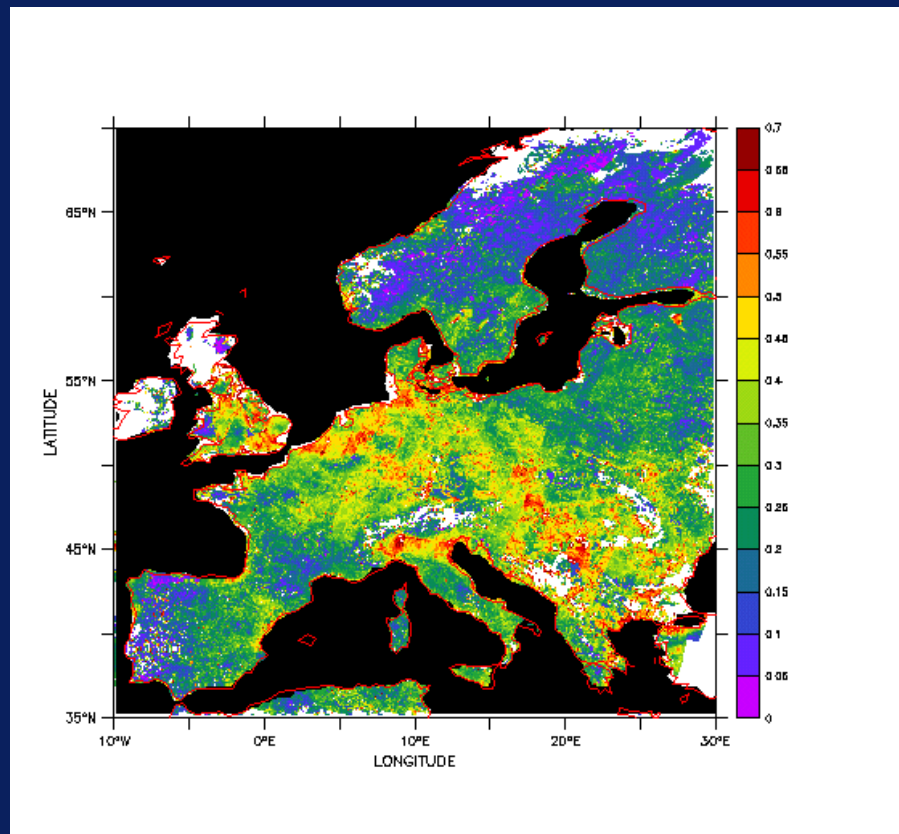


G. Myhre, NILU



# Climatology of tropospheric aerosols: Regional

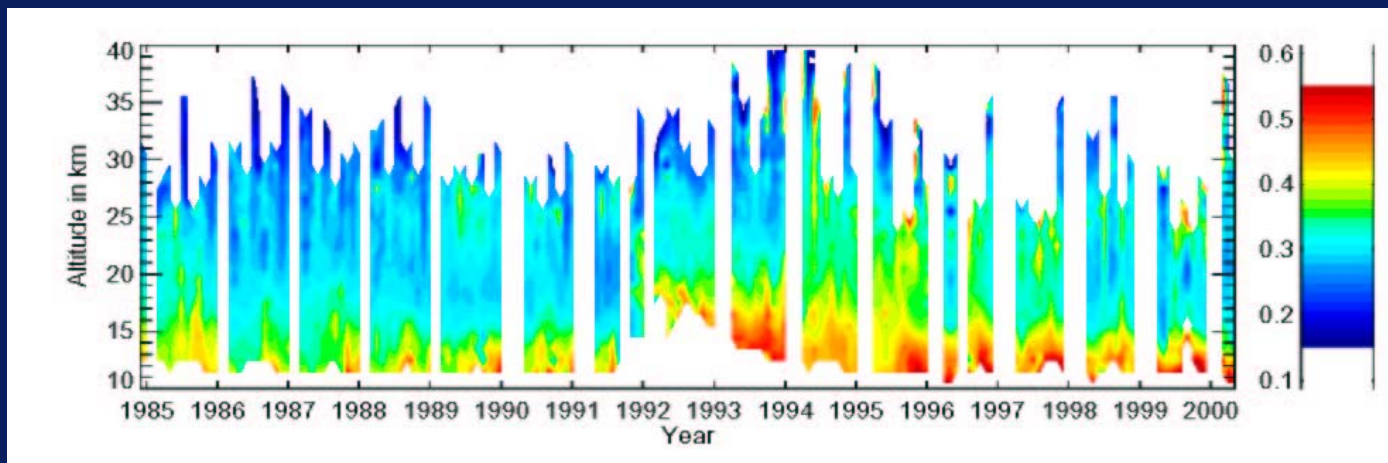
## Aerosol Optical Depth over Europe from ATSR-2



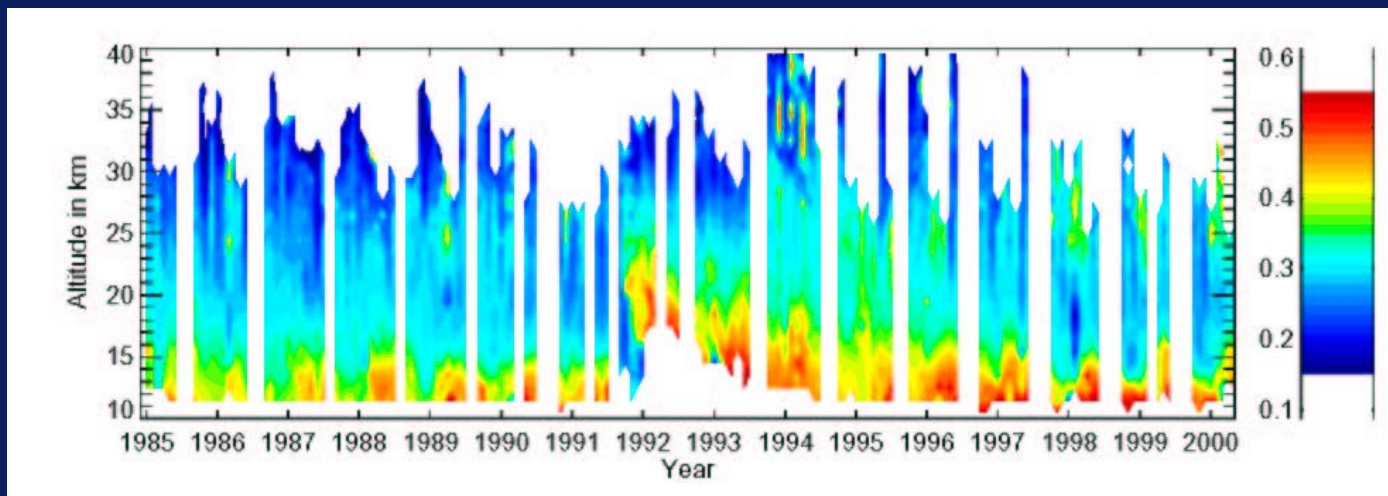
C. Robles Gonzalez et al., 2000



# Climatology of stratospheric aerosols



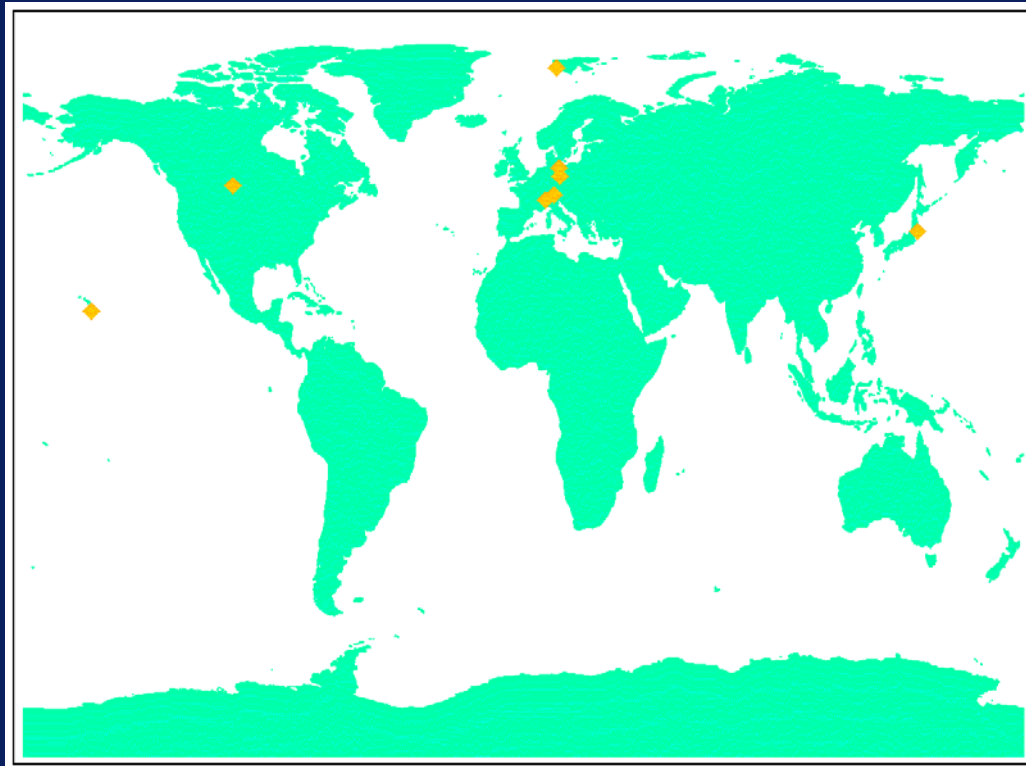
Mean profile of mode radius in  $\mu\text{m}$  versus time for SAGE II in the  $50^{\circ}\text{N}$ - $60^{\circ}\text{N}$  band



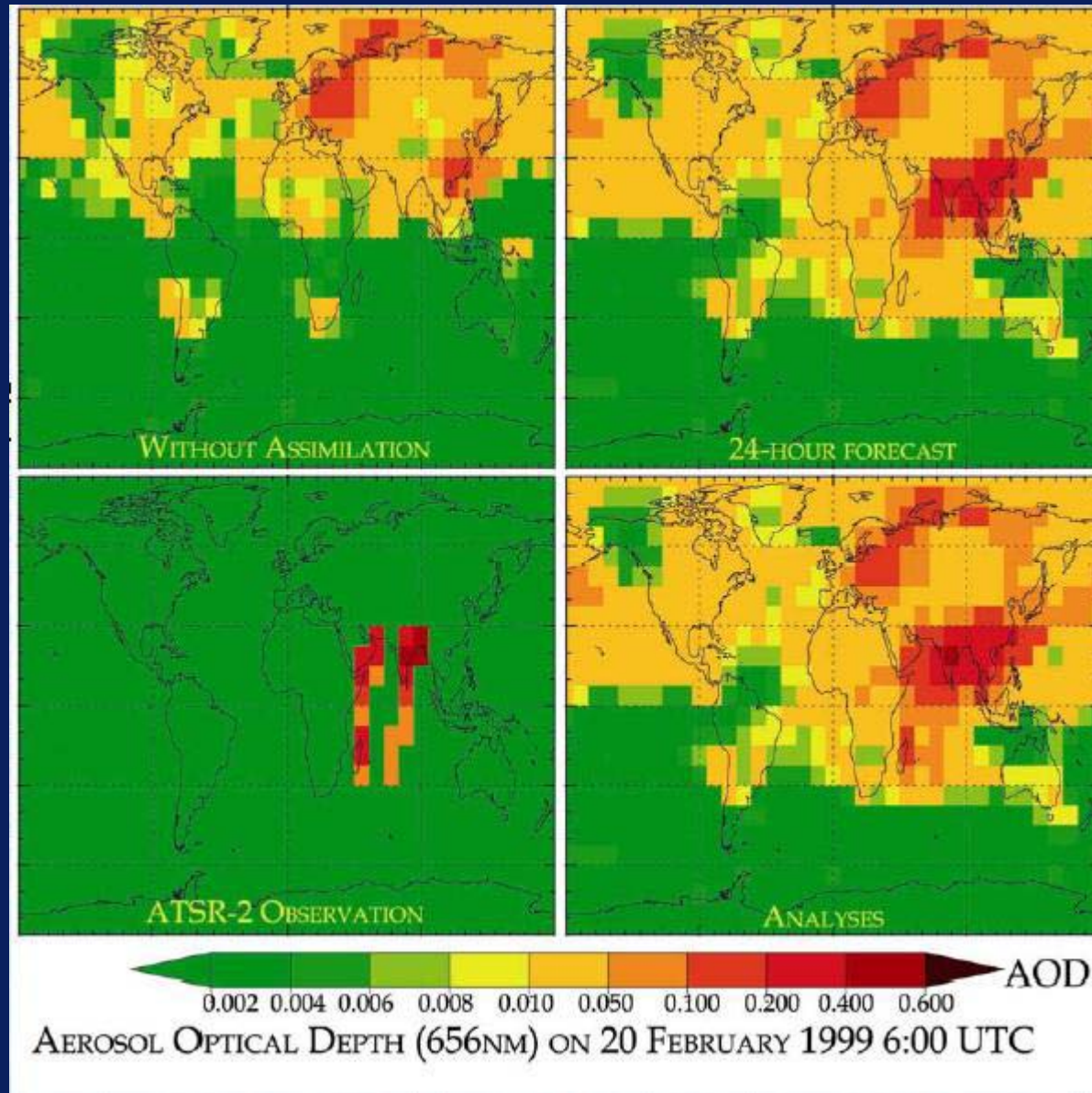
Mean profile of mode radius in  $\mu\text{m}$  versus time for SAGE II in the  $50^{\circ}\text{S}$ - $60^{\circ}\text{S}$  band



Archiving AOD data from the GAW Precision Filter Radiometer (PFR) Network and the German National Aerosol Optical depth Network, which uses different radiometers (IES JRC through the GAW WDCA).



# Demonstration system of aerosol data assimilation

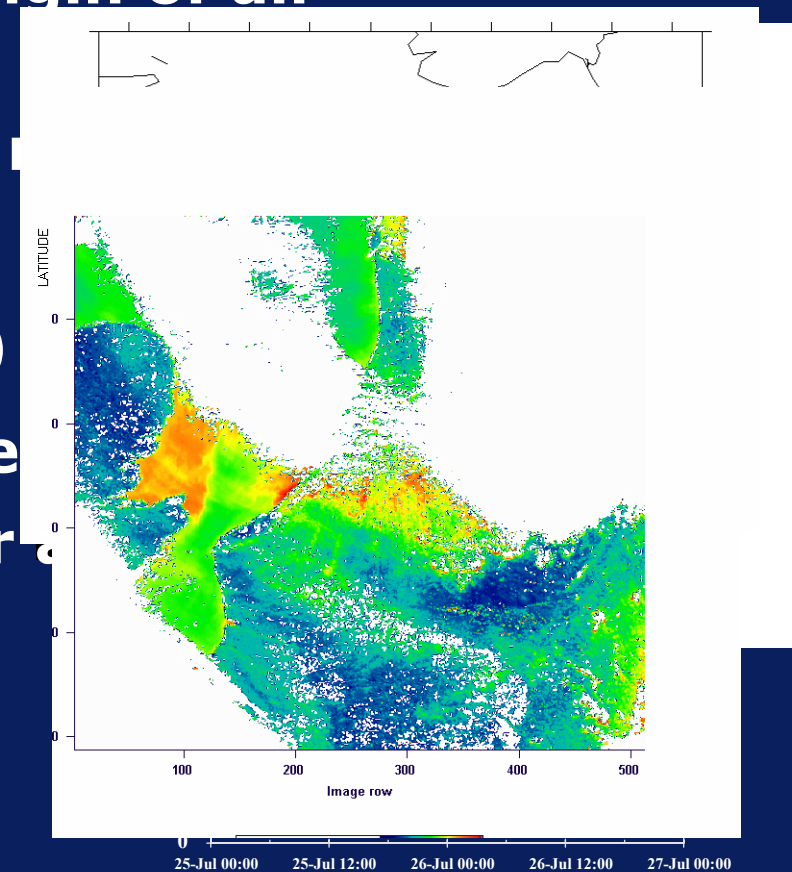


P. van Velthoven, KNMI



# User requirements

- Location and strength of emissions, e.g. hot spots
- Transport processes and origin of air pollution
- Verification of air pollution
- Trends in air pollution
- Temporal resolution (daily)
- Data availability (days, weeks)
- High spatial resolution over a region
- Reliability
- Representativeness
- Continuity



## Some concluding thoughts and conclusions

- Meeting part of the user's requirements achievable during GMES
- Need for improved linkages between more research oriented programmes and Regulatory Monitoring Networks – CREATE and DAEDALUS Projects will help enable this, through involvement of EMEP and WMO GAW for example
- Need for improved coordination between observational stations
- Improvement of existing stations and networks and development of new ones (Presently: decreasing observational capacity)
- Standardization of data
- Improve access to data and data products
- Validation of satellite derived products through ground truth and vertical data
- Gaps between available aerosol data products and users requirements need bridging – a thrust of GMES





## Some concluding thoughts and conclusions

- CREATE and DAEDALUS initiate activities and provide proposals for future implementation of integrated, standardised, harmonised and quality controlled aerosol observations and provision of users data products, however:
  - No actual integration
  - No service will be provided
- Hence these activities need to be carried on in other projects:
  - Integration observational data
  - Validation
  - Transition science results into operational services



# Future activities

- FP6: Atmospheric composition
  - ACCENT (Fuzzi)
  - BACC-TO-BACC (O'Dowd) (focus on aerosols)
- FP6: GMES (Global Monitoring for Environment and Security)
  - AIROS (de Leeuw)
- ESA:
  - DUP > TEMIS (van der A)
  - GSE > PROMOTE (Goede)
  - DUE > GLOBAER (TNO?)



# Aerosol Retrieval

CREATE/TEMIS:

An 'operational' (A)ATSR algorithm  
for retrieval of

- AOD maps with **10 km x 10 km** resolution
- Regional and local AOD maps with **1 km x 1 km** resolution

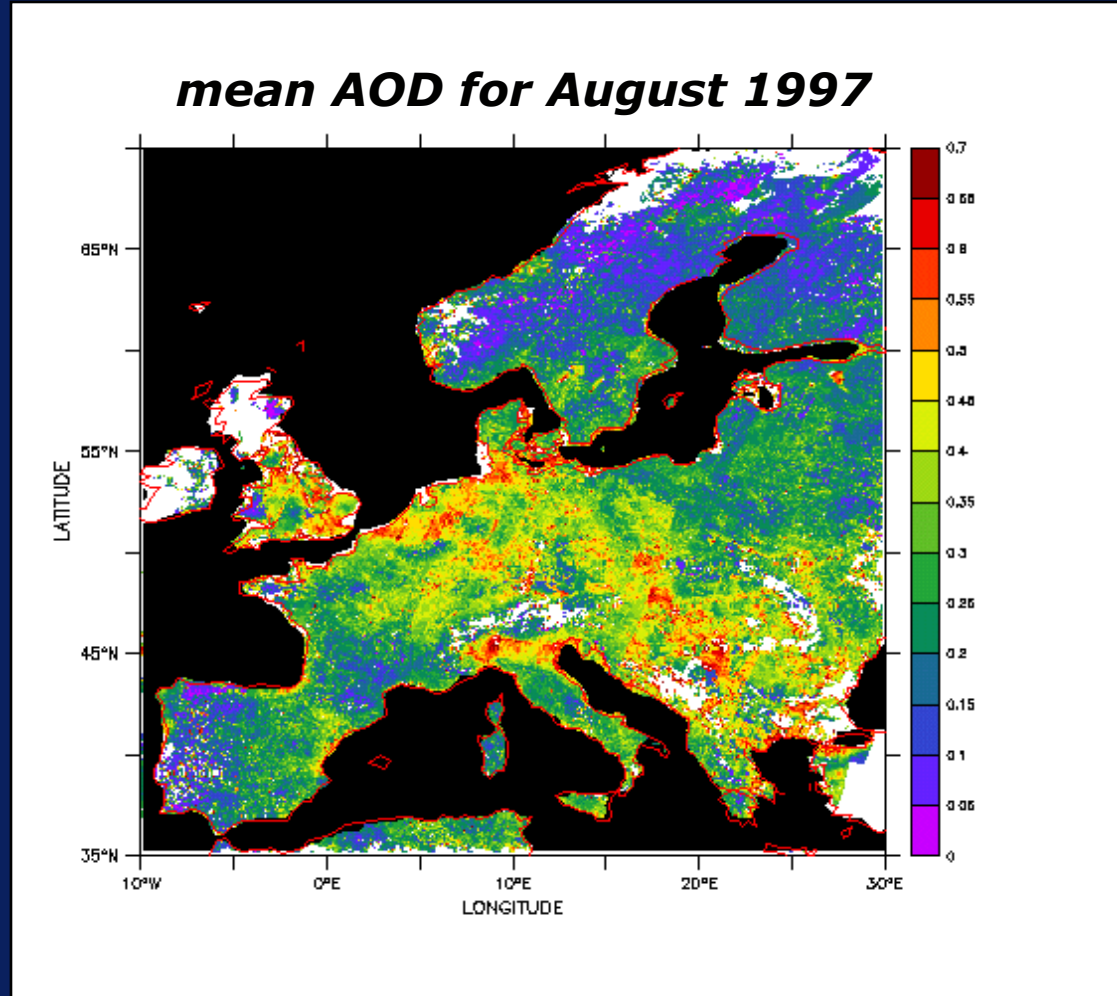


# Aspects of the 'old' algorithm

- **ATSR-2**
- **FORTRAN 77 approach**
- **Separate algorithms for**
  - Land (dual view) retrieval
  - Sea (single view) retrieval
  - Cloud screening (semi and auto)
  - Two aerosol types: Marine and Continental
  - Several computer systems involved
- **Many manual operations required; time consuming, yet very suitable for scientific study of aerosol retrieval**



# Aerosol Optical Depth over Europe *over land*



C. Robles Gonzalez, J.P. Veefkind and G. de Leeuw, *GRL* **27**, pp. 955-959, 2000.

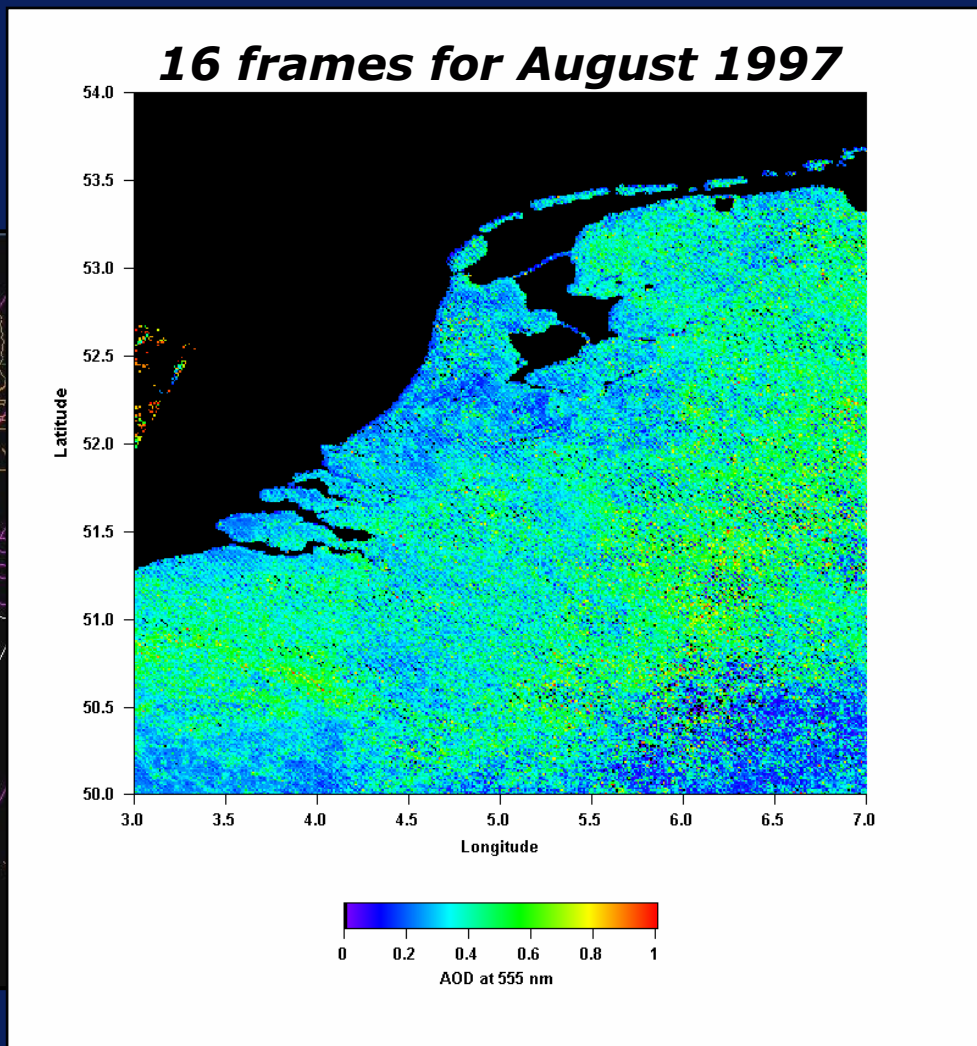
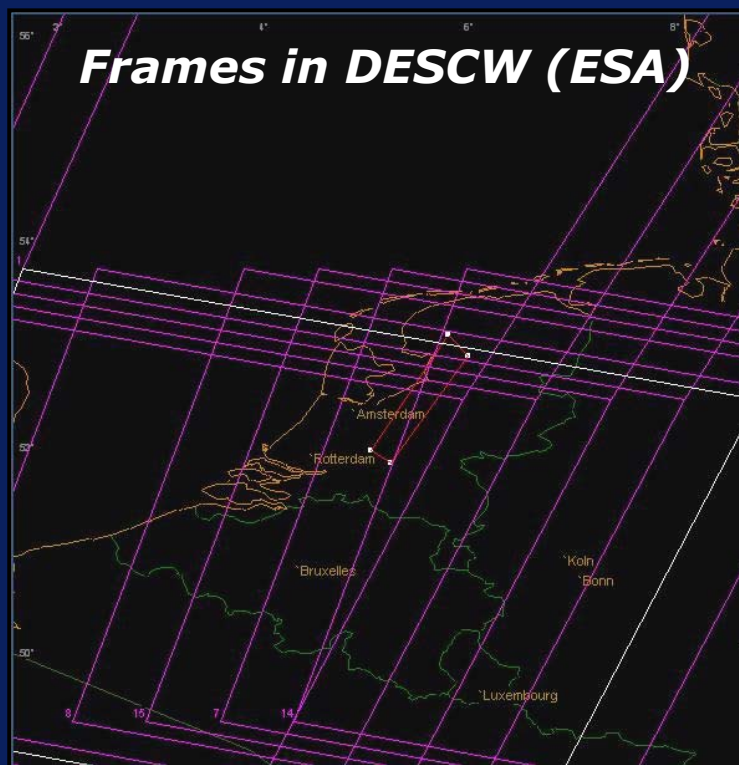


# Aspects of the 'operationalised' algorithm

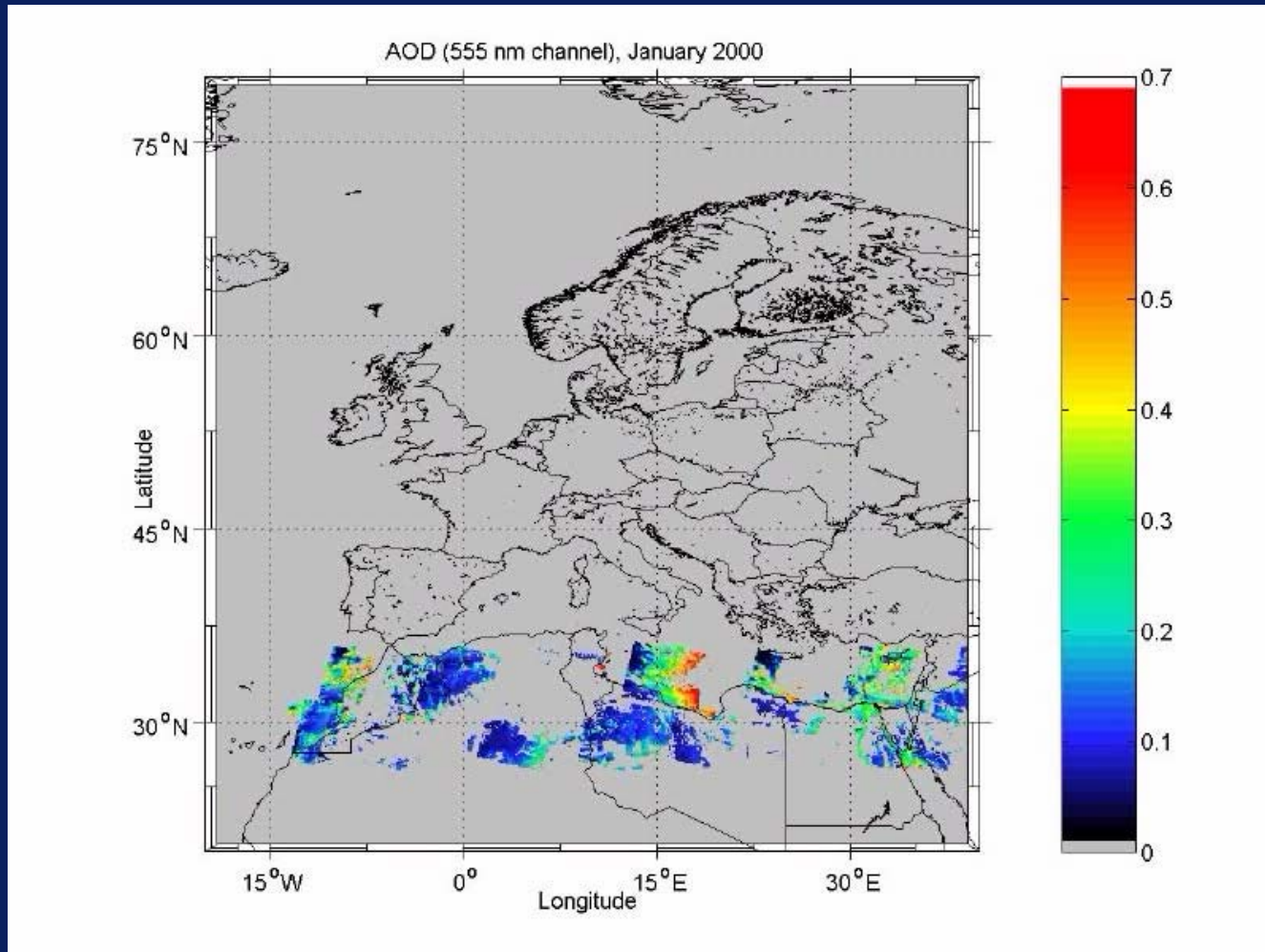
- **ATSR-2 & AATSR**
- **Modular FORTRAN 90/95 approach**
- **One algorithm :**
  - **Input** : List of (A)ATSR GBT Reflectances
  - Automated cloud-screening
  - Corrections for ocean and land
  - Both land (dual view) and sea (single view) retrieval of AOD at 4 wavelengths, but also Ångström parameter, mixing ratio, ....
  - Prepared for 23 aerosol types (among which are *dust, black carbon, biomass aerosol, organic, etc*) ; 3 to be used in one retrieval step
  - **Output** : HDF and ASCII files
- **(Semi)-automatic operations; input through user**



# Example of hi-res averaged AOD map by new algorithm (The Netherlands + parts of Belgium and Germany)

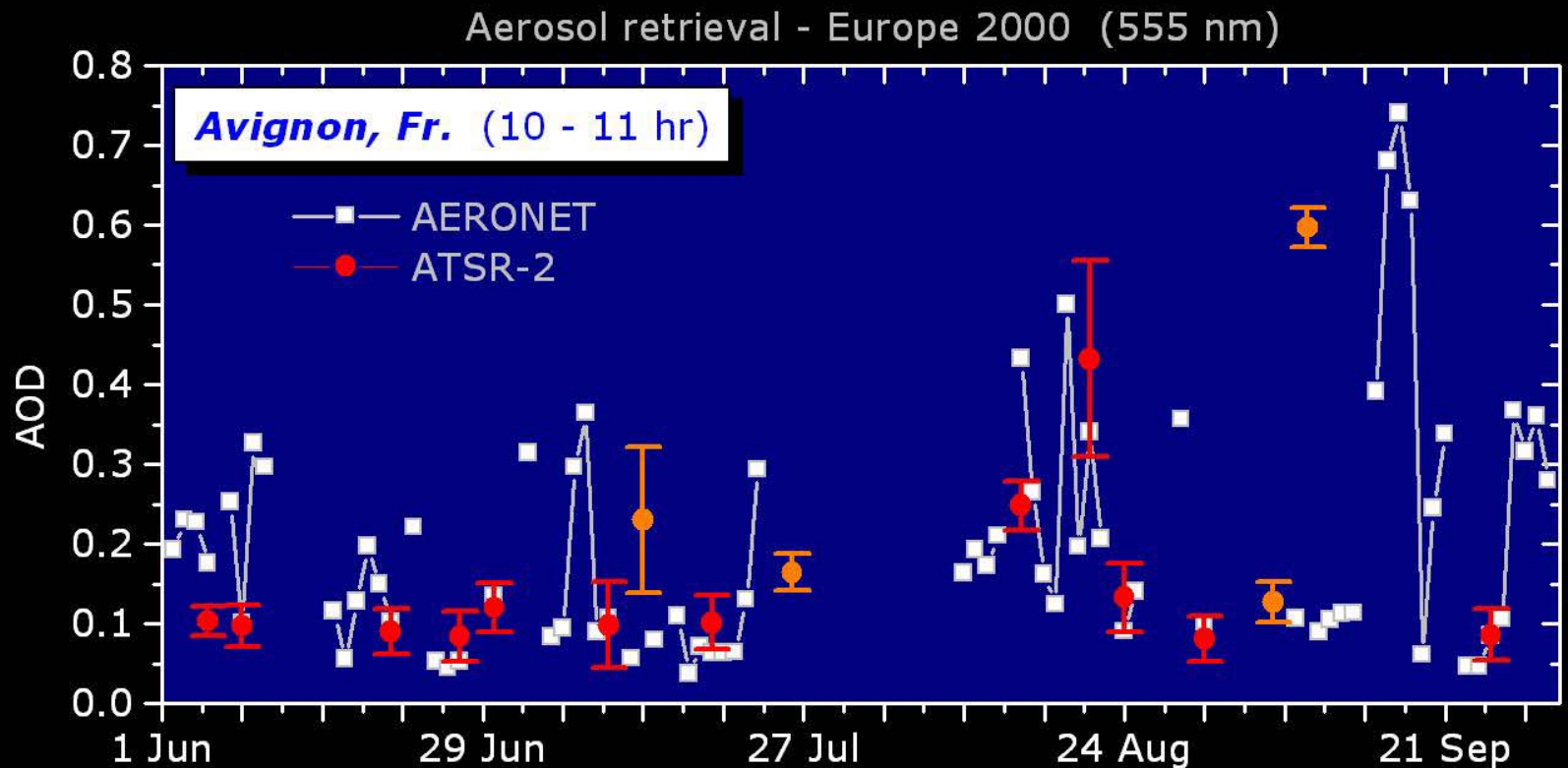


# Recent results for Europe: AOD map (555 nm) for the year 2000

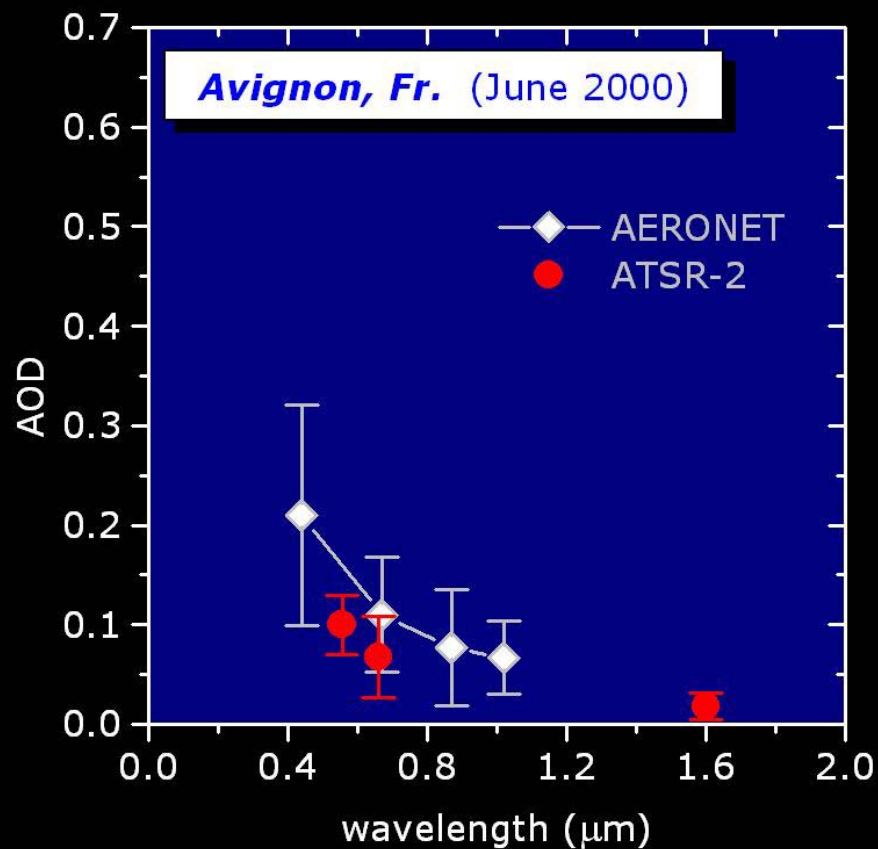
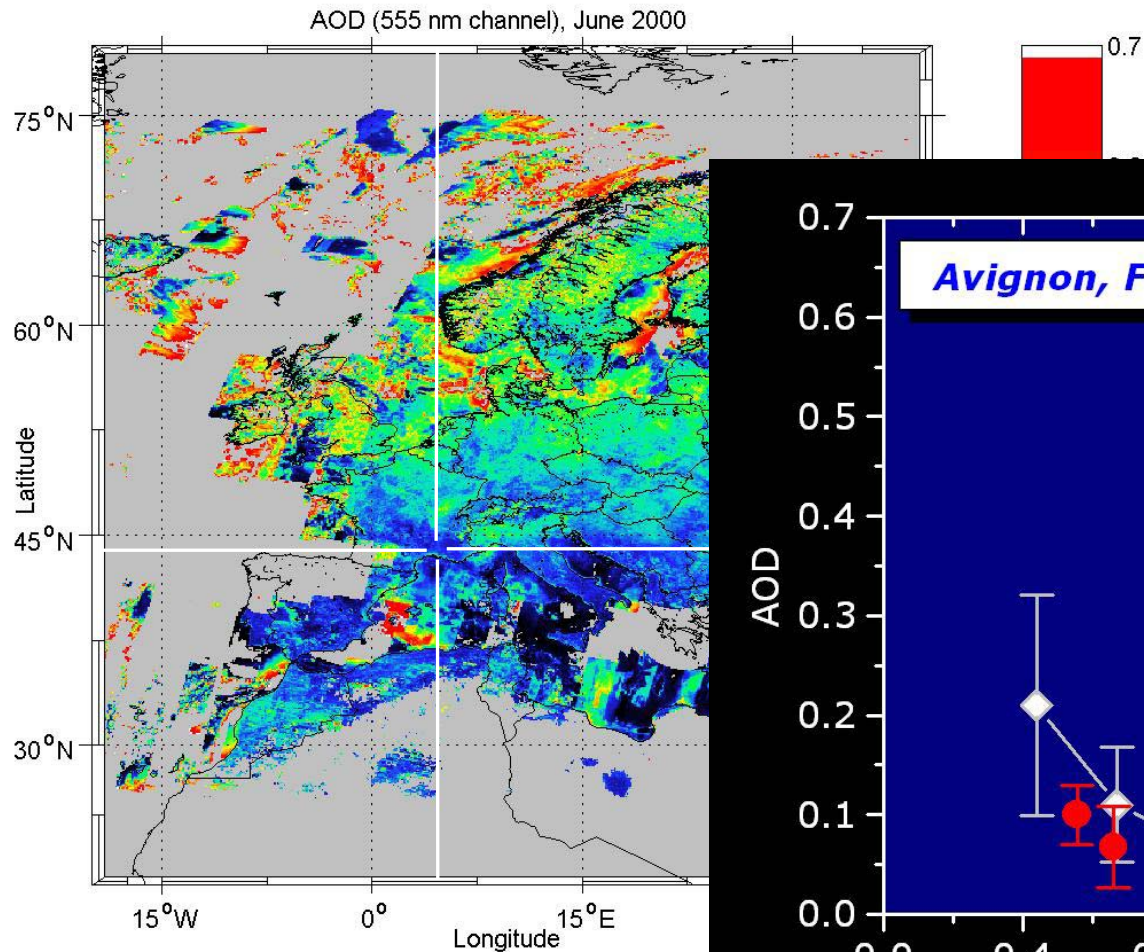




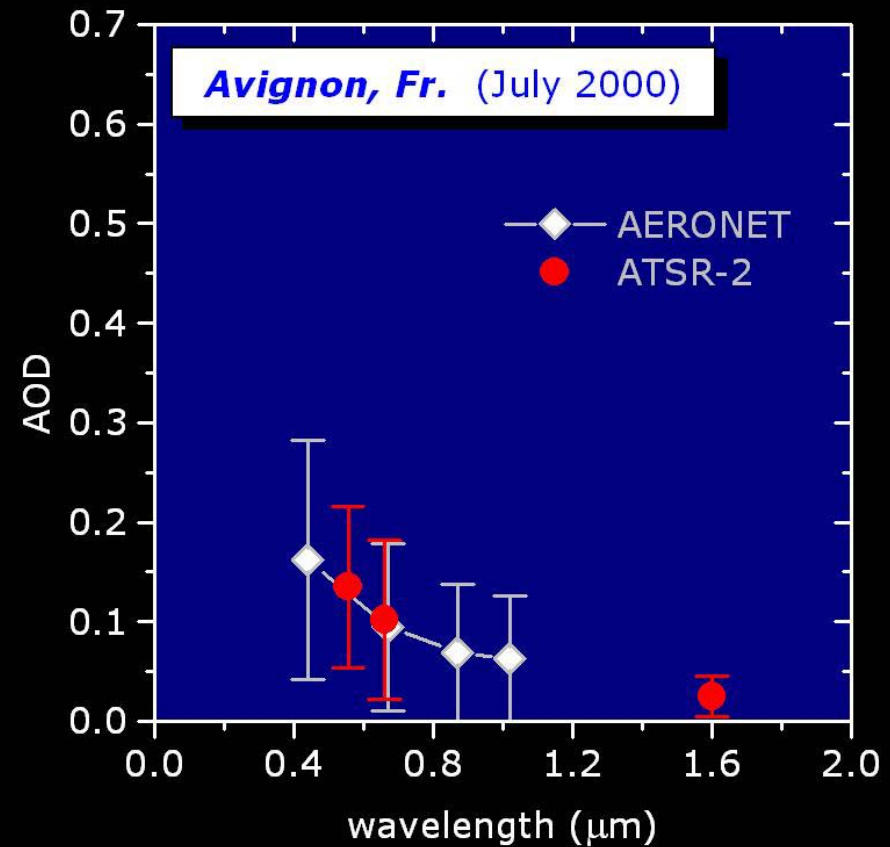
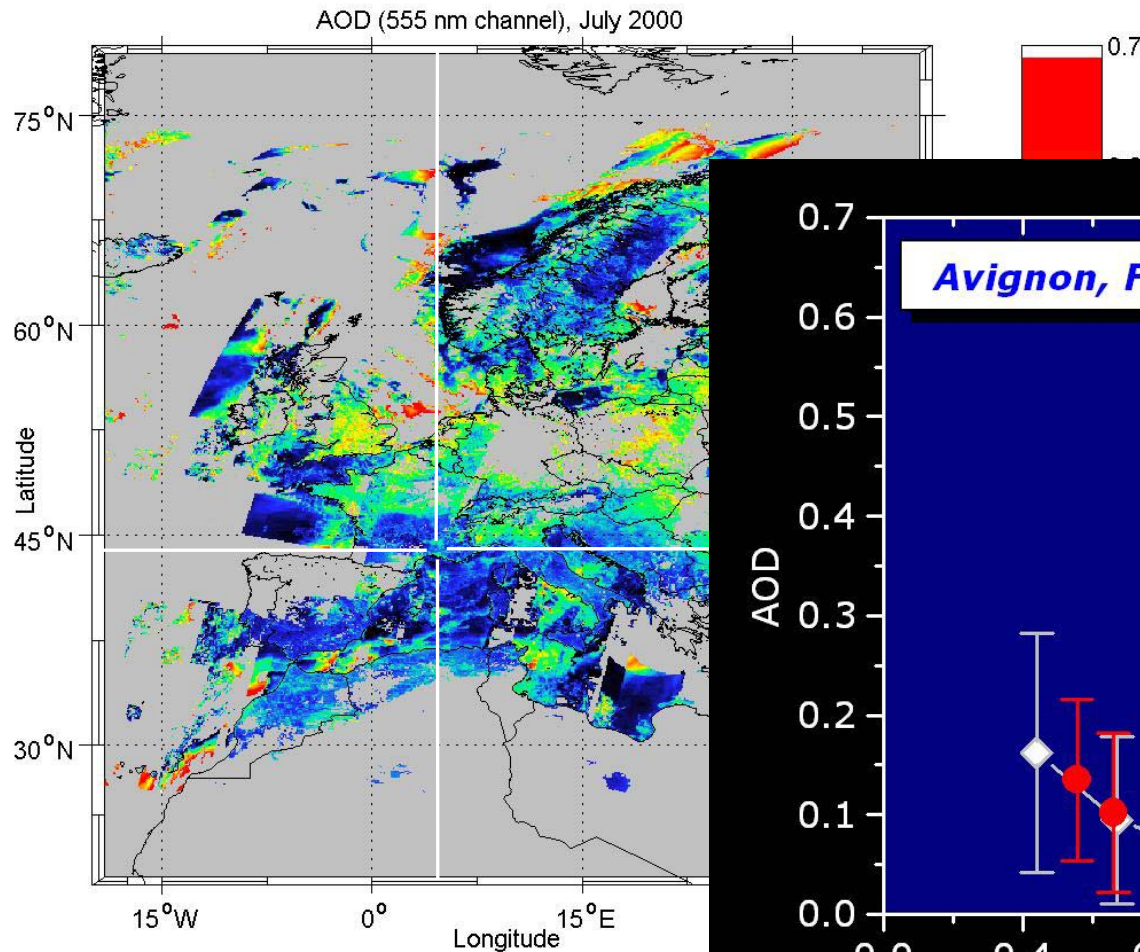
# AERONET comparisons for Avignon, Fr. June-September 2000 timeframe



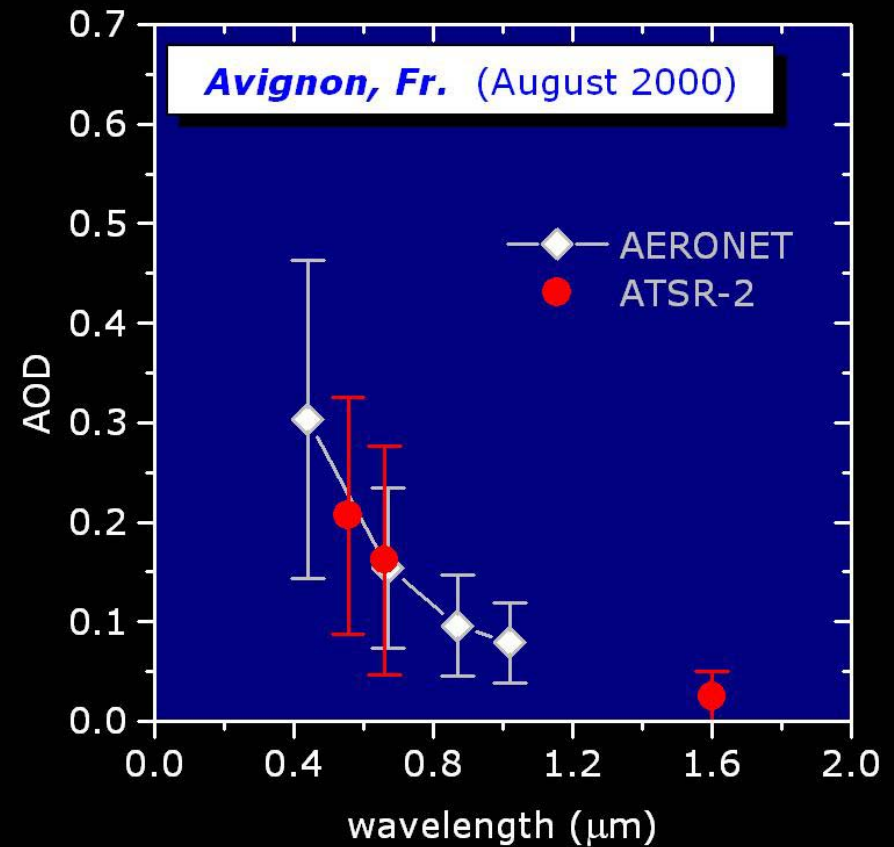
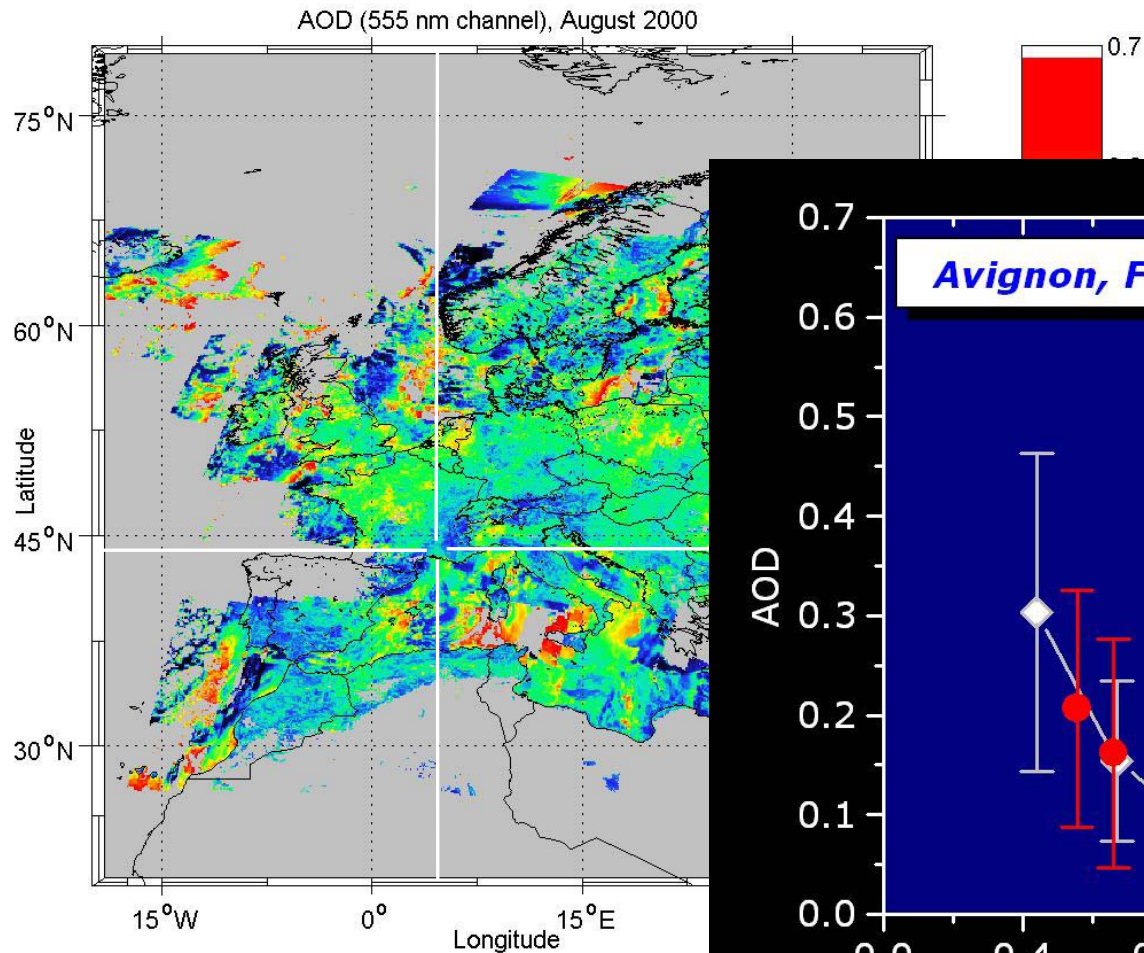
# AERONET vs. ATSR-2 (June average)



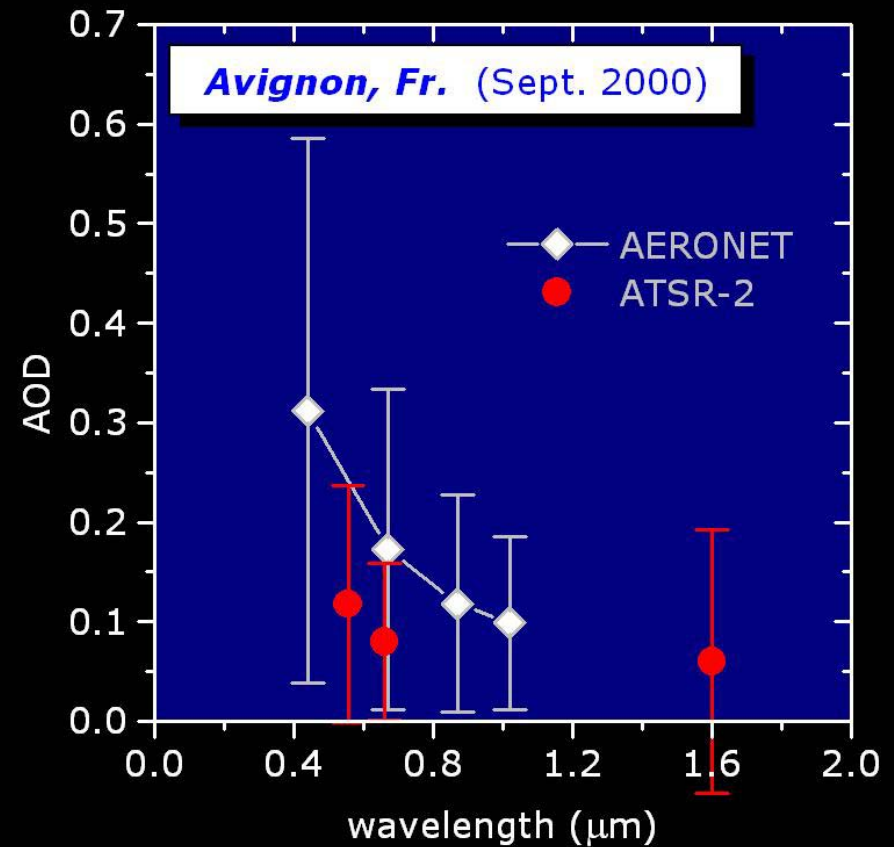
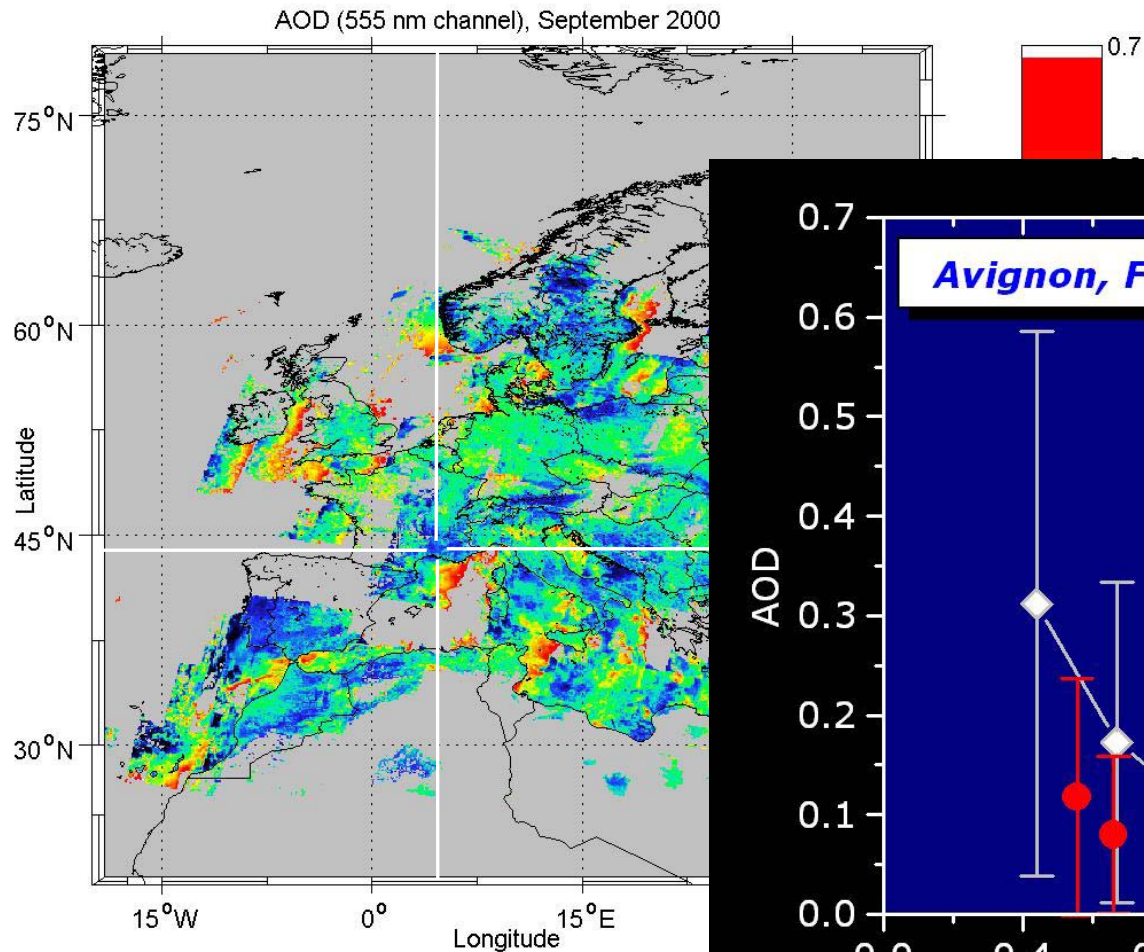
# AERONET vs. ATSR-2 (July average)



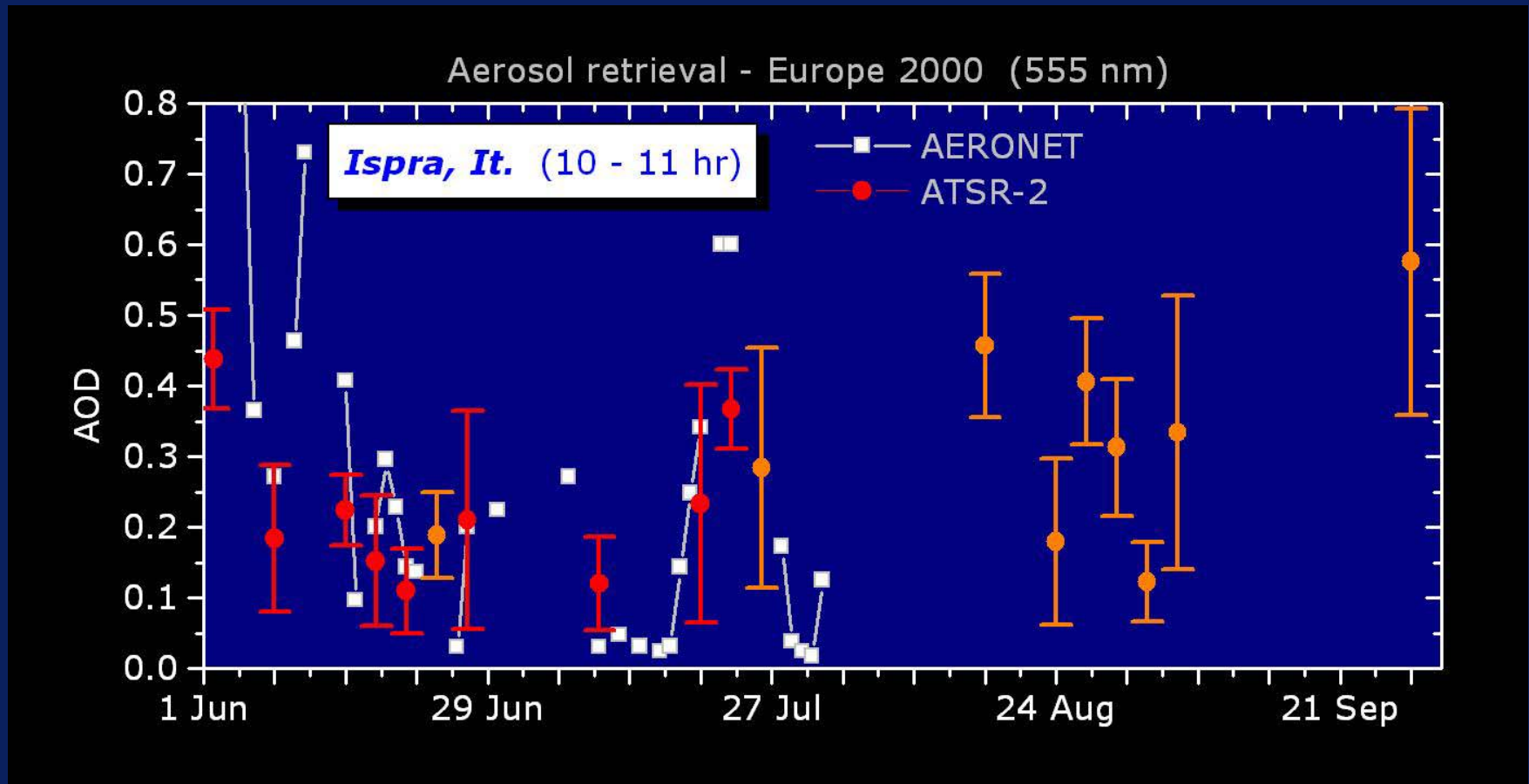
# AERONET vs. ATSR-2 (August average)



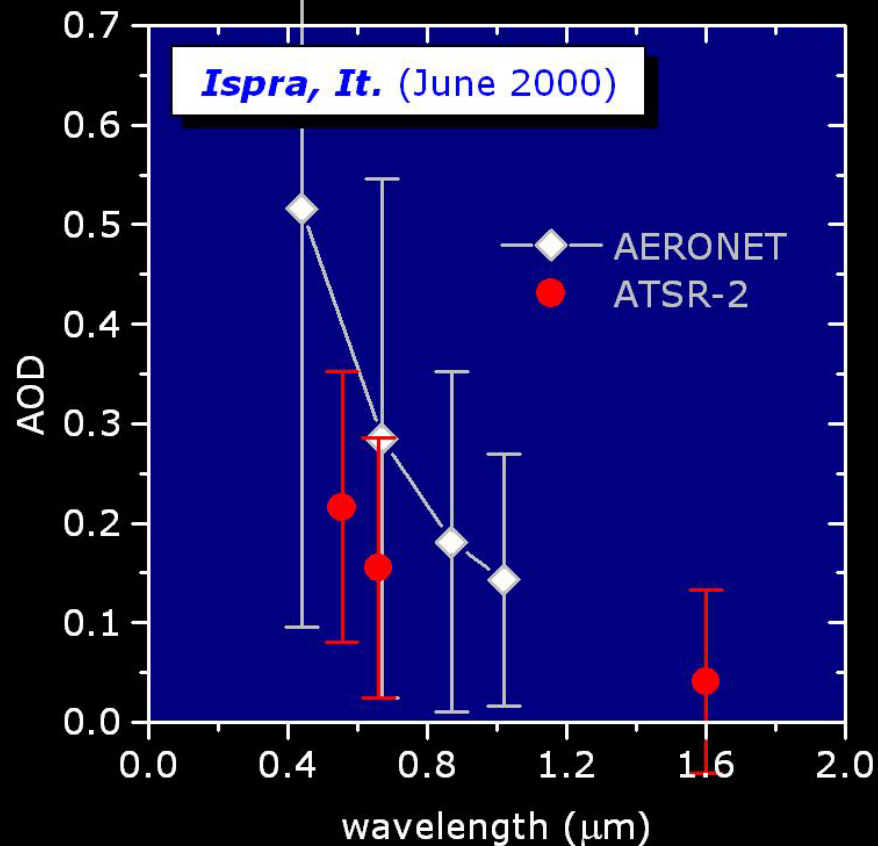
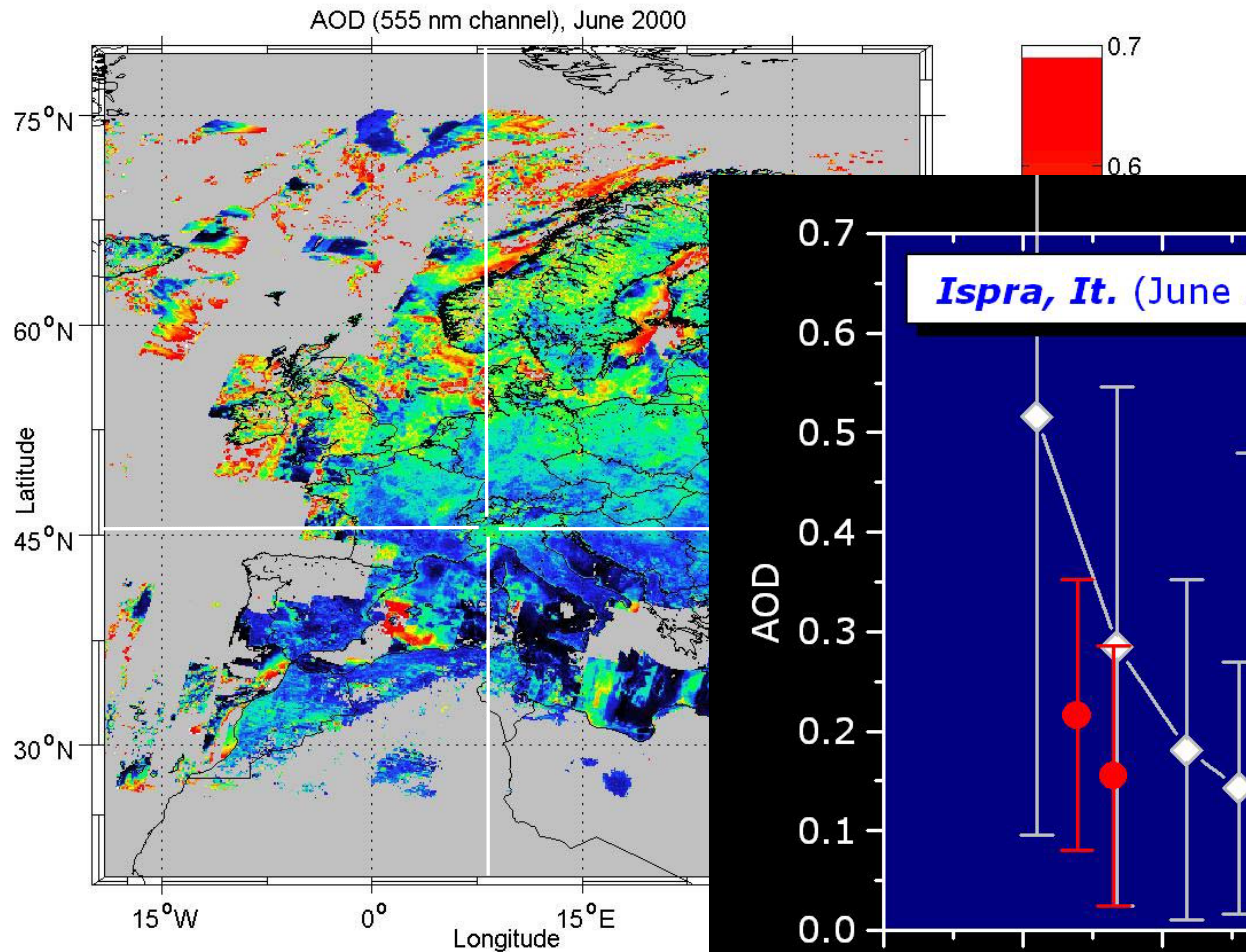
# AERONET vs. ATSR-2 (Sept. average)



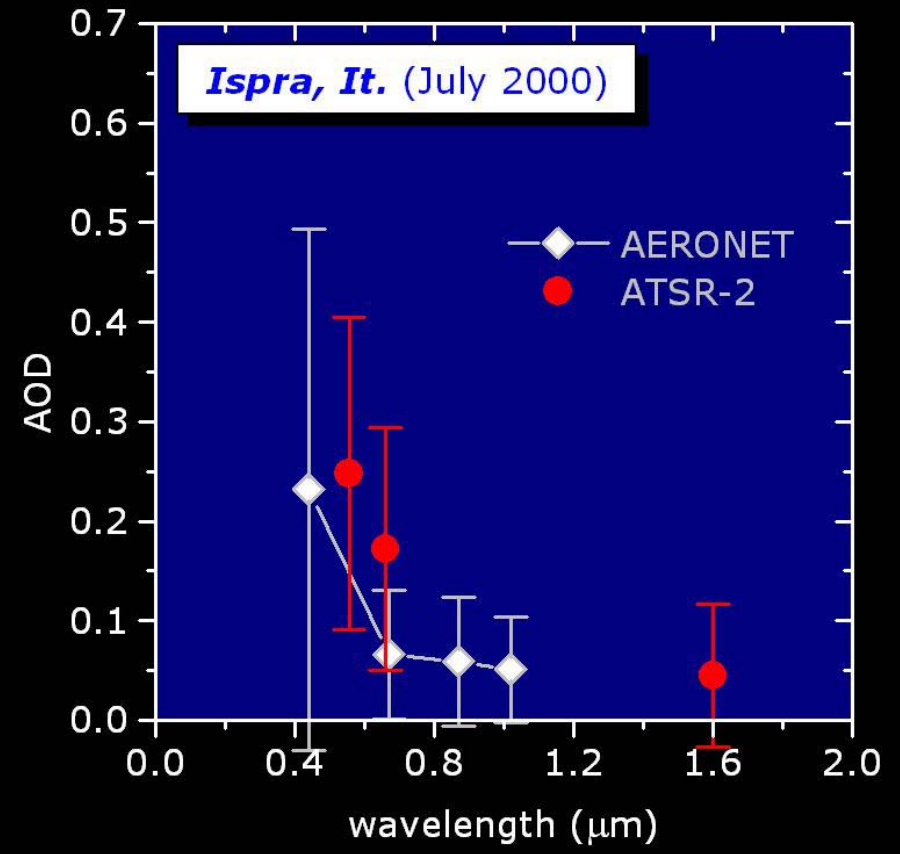
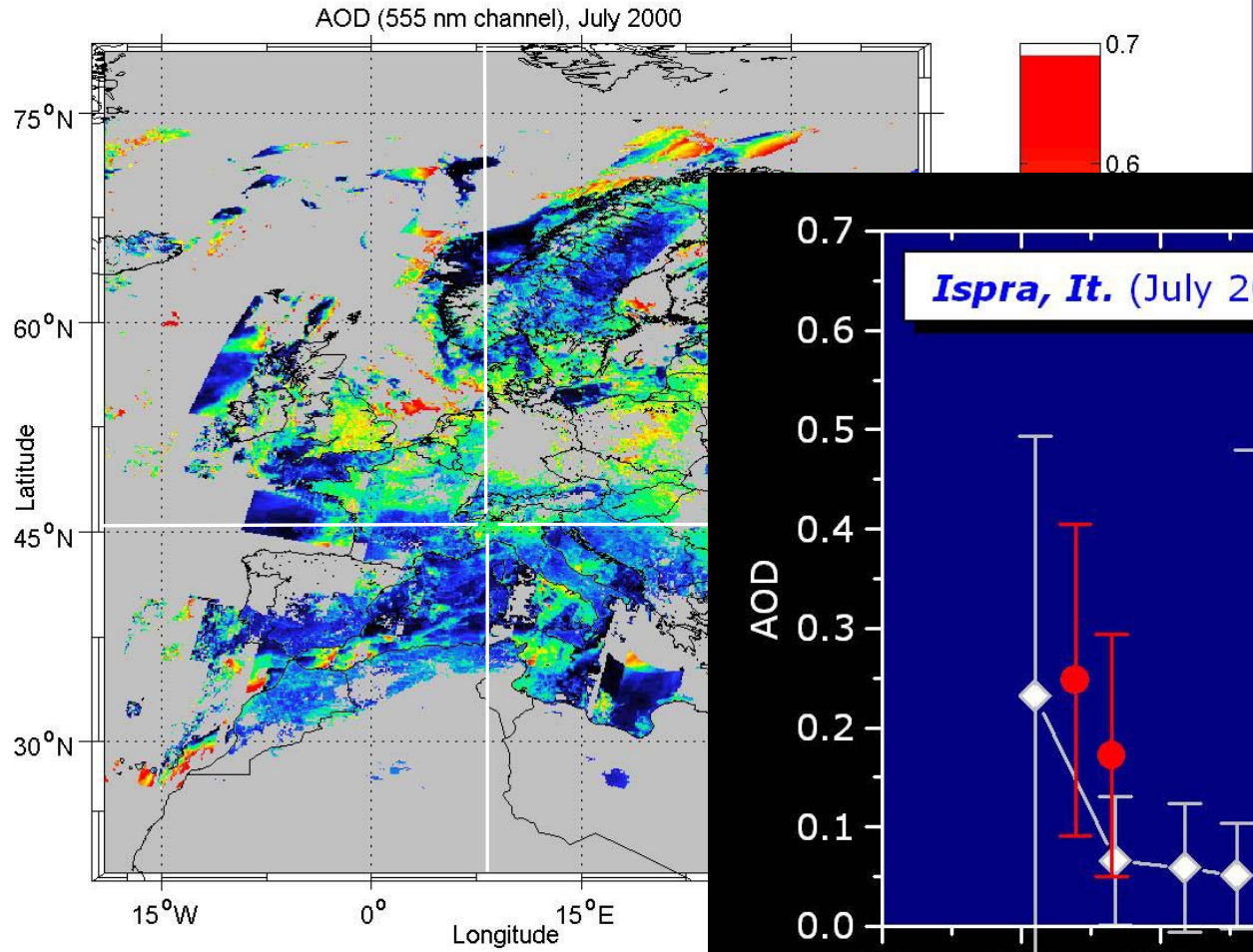
# AERONET comparisons for Ispra (It.) June - July 2000



# AERONET vs. ATSR-2 (June average)

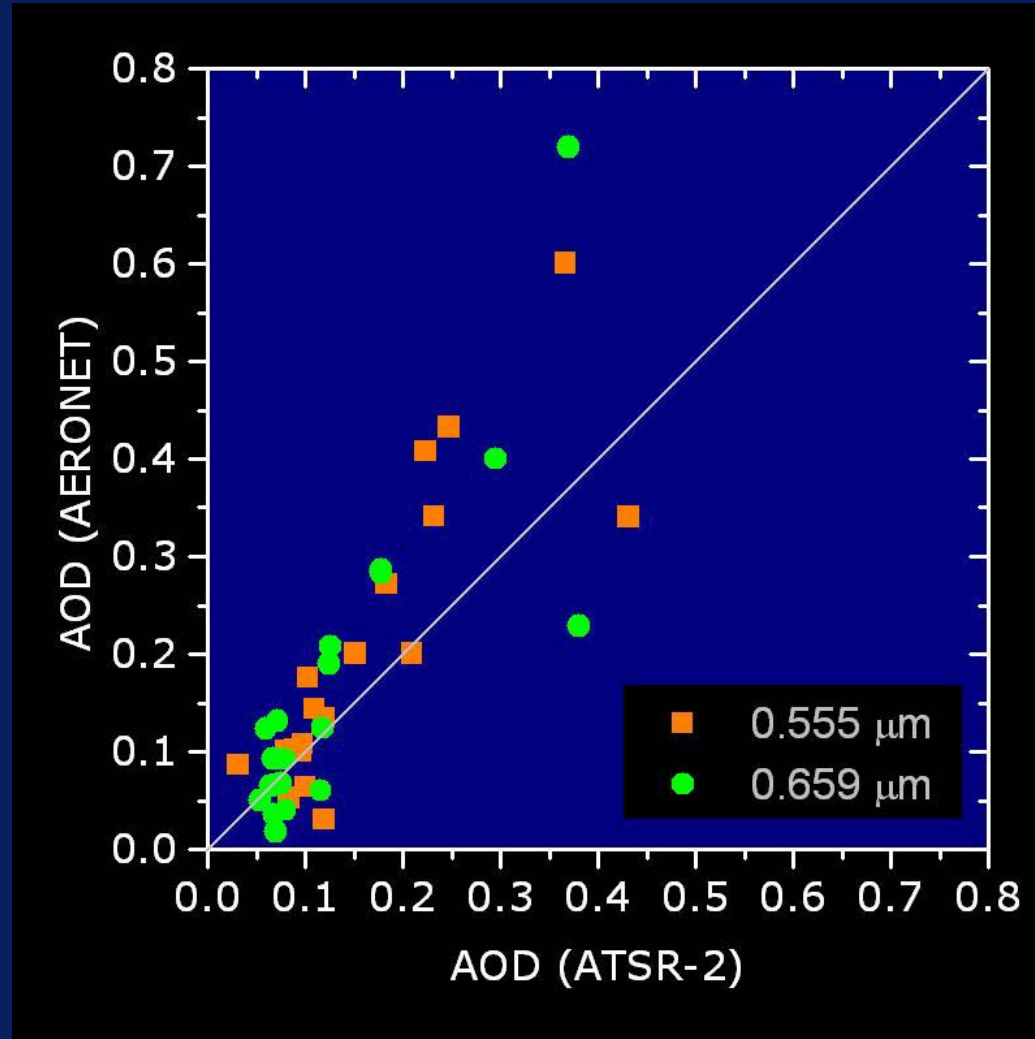


# AERONET vs. ATSR-2 (July average)

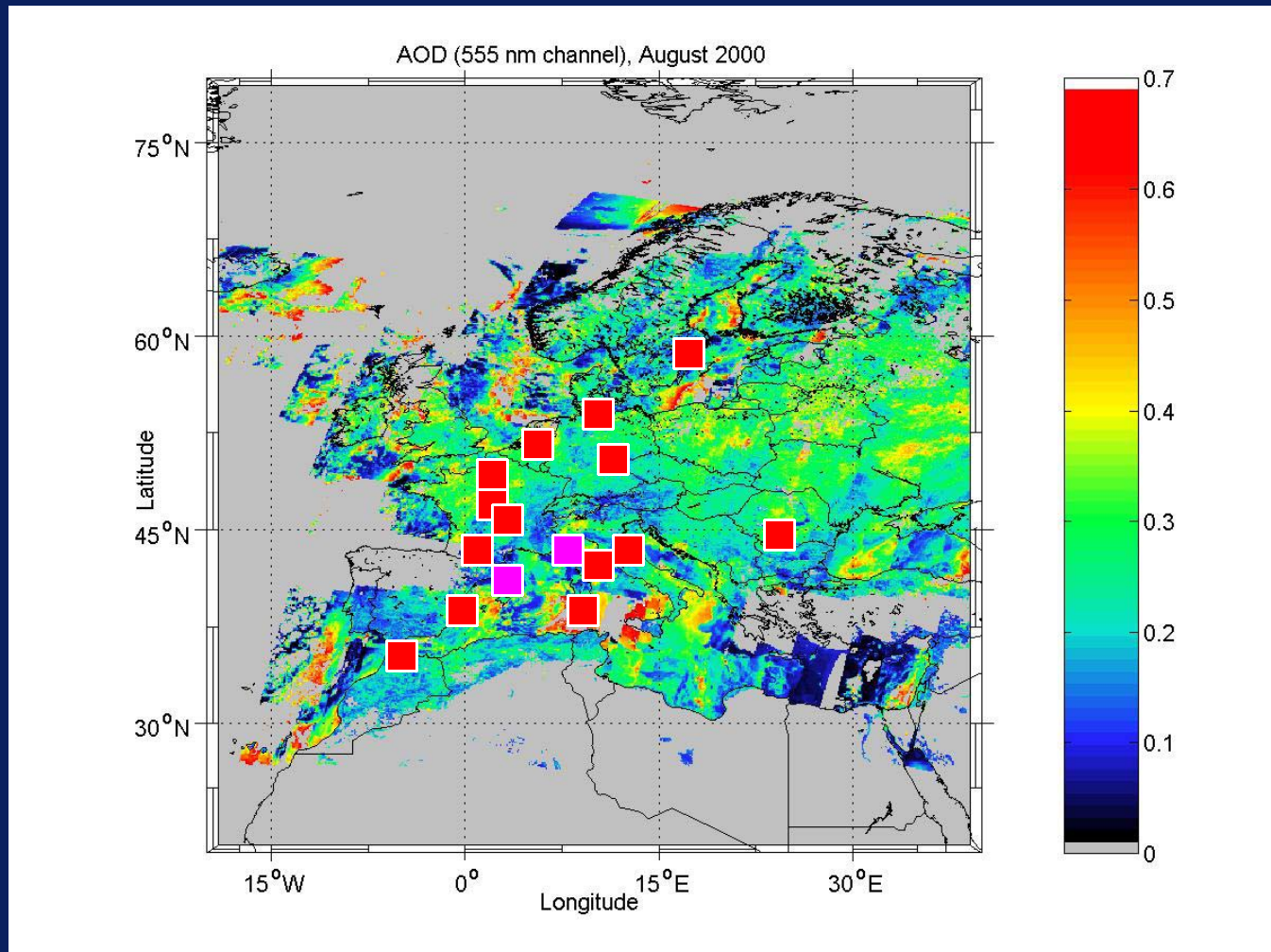




# AOD scatter plot (Avignon & Ispra) June - September 2000 timeframe



# Comparisons with other sites are underway...



# Contact and Information

<http://loacli.univ-lille1.fr/Daedalus/>

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