4° Workshop on the theory and use of RCMs (March 3 -14, Trieste)

Aerosol Optical Depth (AOD) analysis over the Mediterranean basin by the RegCM model

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Objective

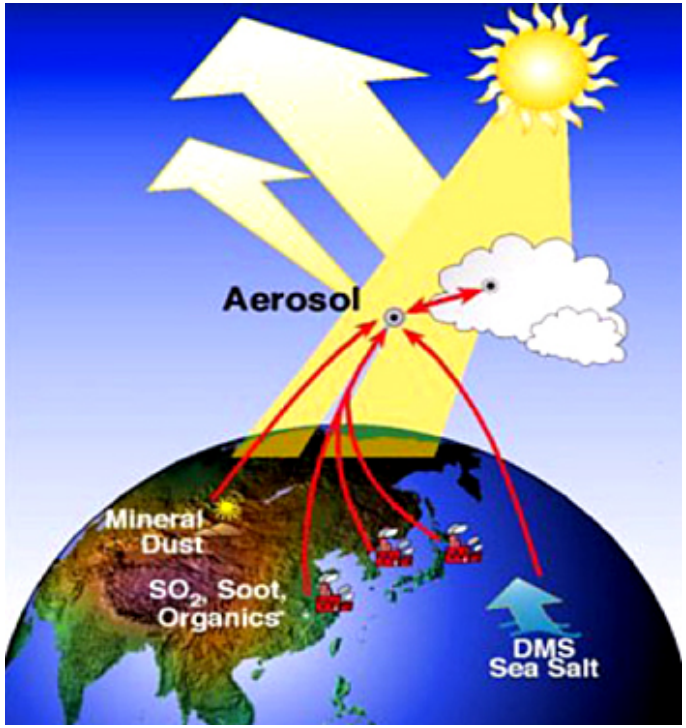
- To contribute to the RegCM model validation over the Mediterranean basin using comparisons between RegCM and experimental (satellite MODIS and AERONET) AODs values

Atmospheric aerosols

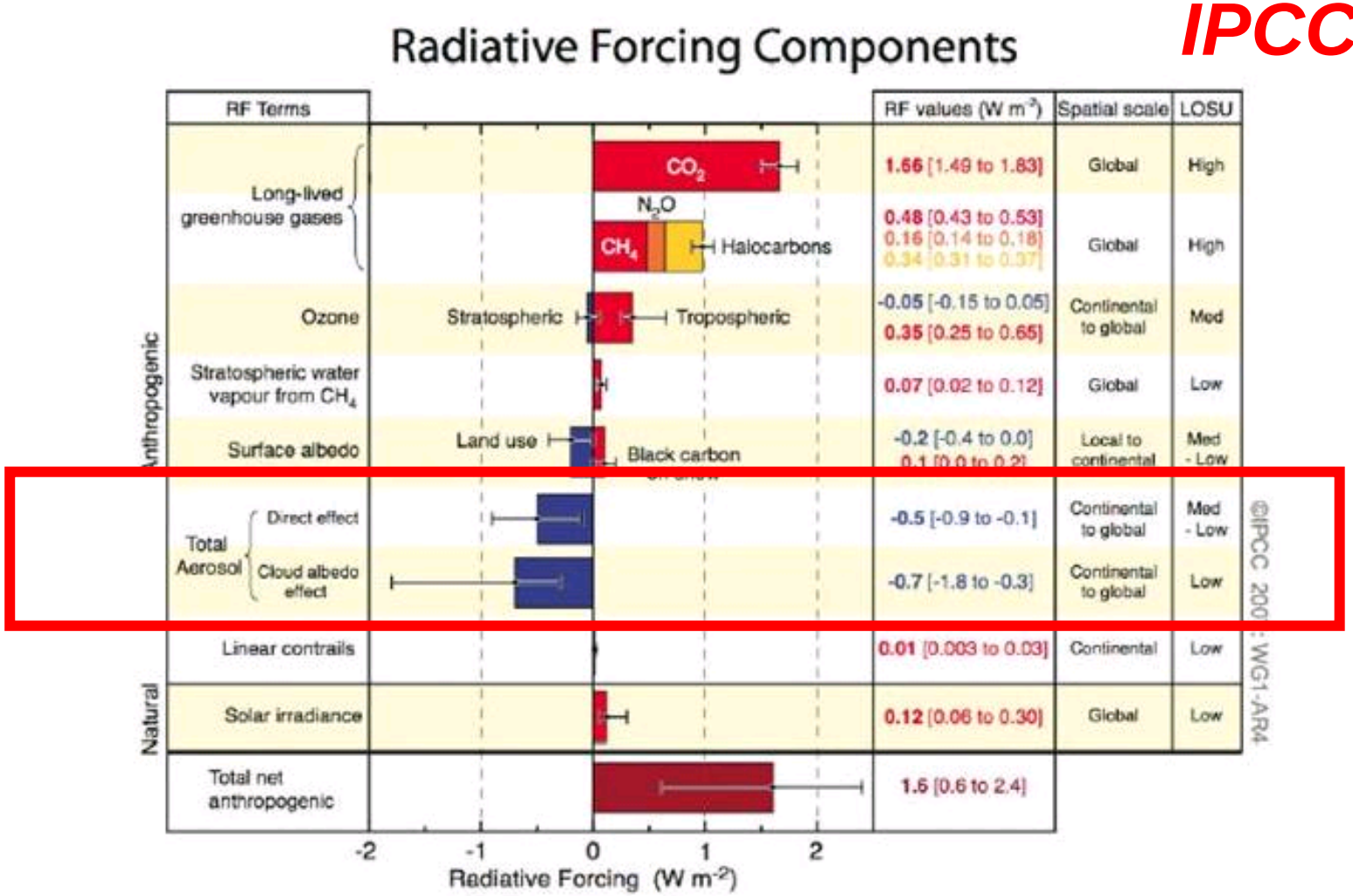
Aerosols influence the climate via two ways:

1. **Direct Effect by scattering and absorbing incoming solar radiation**

2. **Indirect Effect which modify the microphysical and hence the radiative properties, amount and lifetime of clouds.**



IPCC, 2007

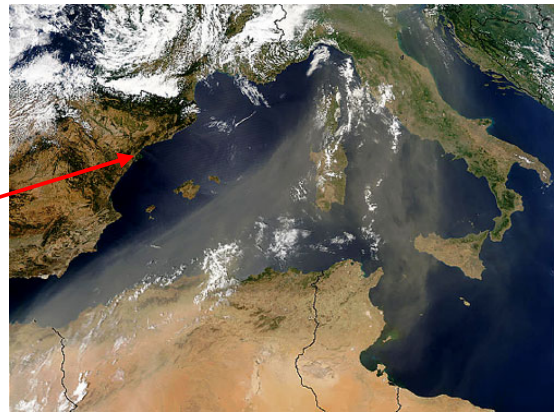


In accordance with the IPCC-WKGI 2007, anthropogenic contributions to aerosols produce a cooling effect with a total direct radiative forcing of -0.5 W/m².

The scientific understanding of the direct and indirect effects of aerosols obtained in the year 2007 is better than that reported in the year 2005, but the need to obtain a global characterization of the aerosol distribution represents one of the major challenges today

The Mediterranean is certainly one of the most interesting regions in terms of aerosols

The Mediterranean basin is largely affected by different classes of particles:



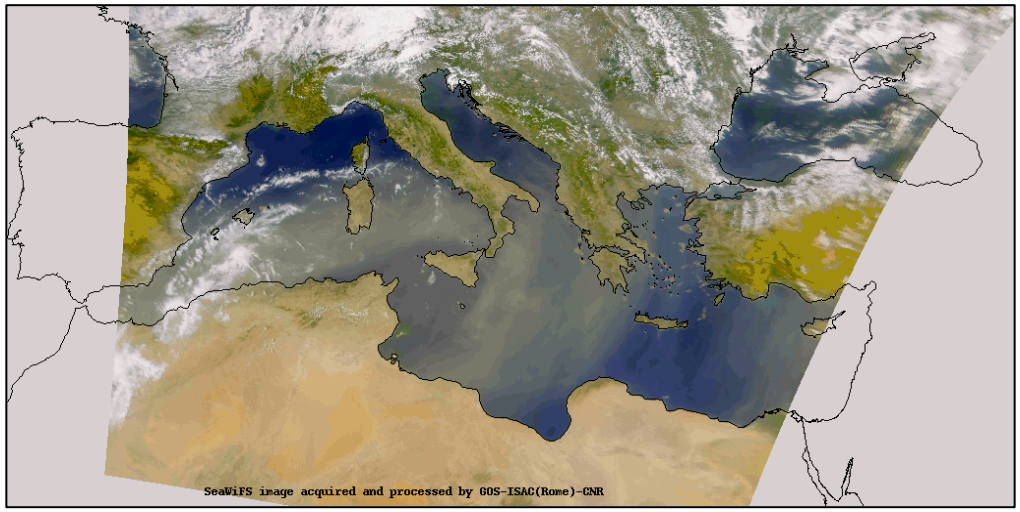
- **desert dust from Sahara desert and from surrounding arid regions**

- **Anthropogenic aerosols from urban and industrial areas of Europe**

- **Marine aerosol, from the Mediterranean or from the North Atlantic**

- **Biomass burning particles, produced in forest fires**

Case Study: Saharan dust event over the Mediterranean on July 2003

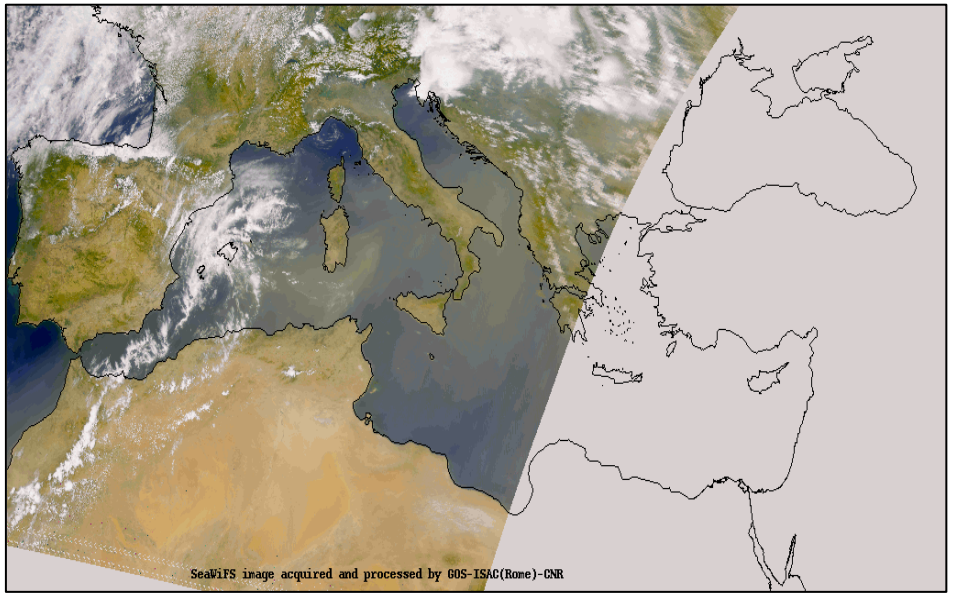


July 17 2003

11:40 UTC

July 23 2003

12:29 UTC



Method: 2 simulations over the same domain on July 2003:

1)Dust only (AERTYP: AER00D1)

2) 10 Aerosols (AERTYP: AER11D1)

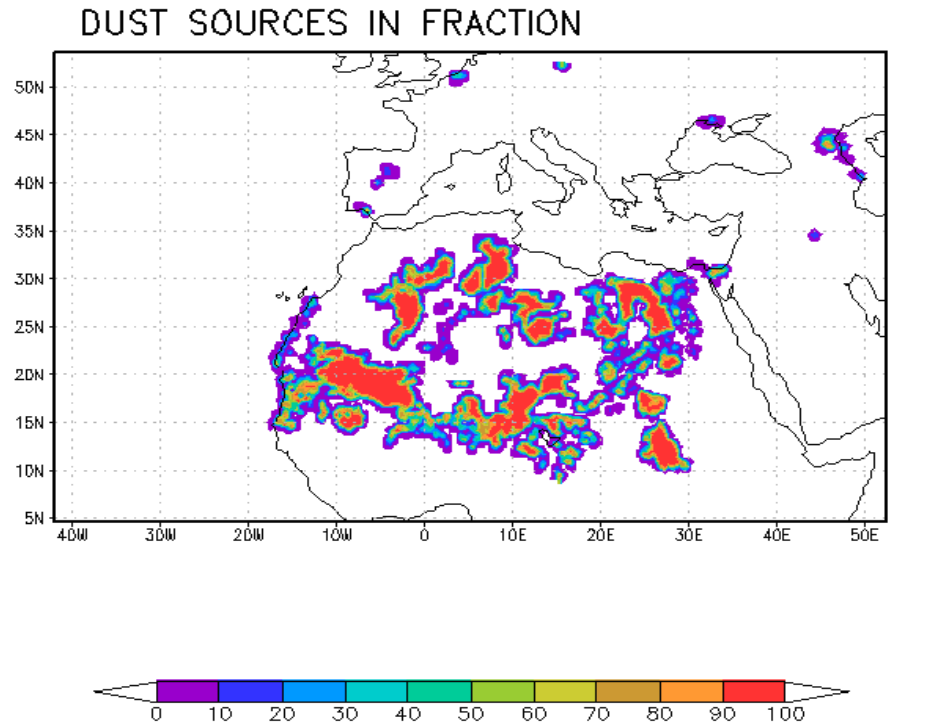
jy = 100; jx = 140

clat = 30°

clon = 5°

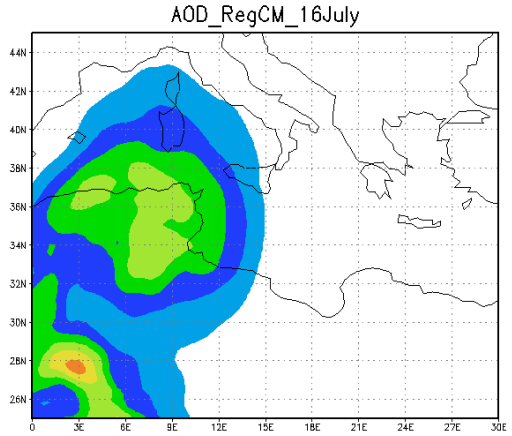
Ds = 50

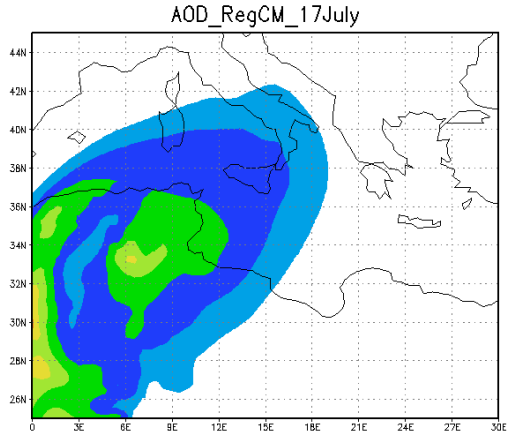
DATTYP = NNRP2

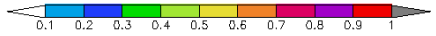


AOD MODIS and RegCM (550 nm)

RegCM DUST







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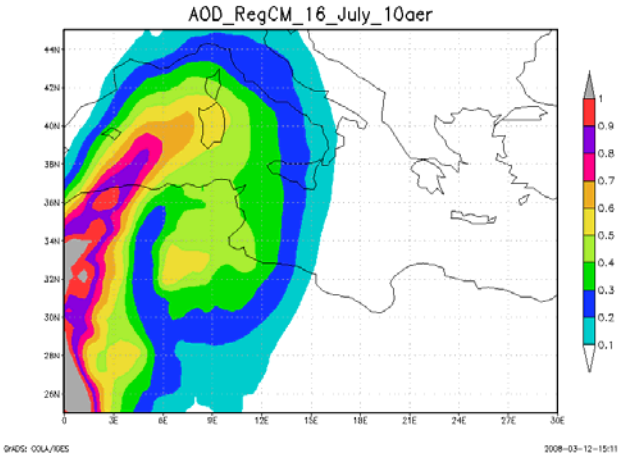
RegCM 10Aerosol



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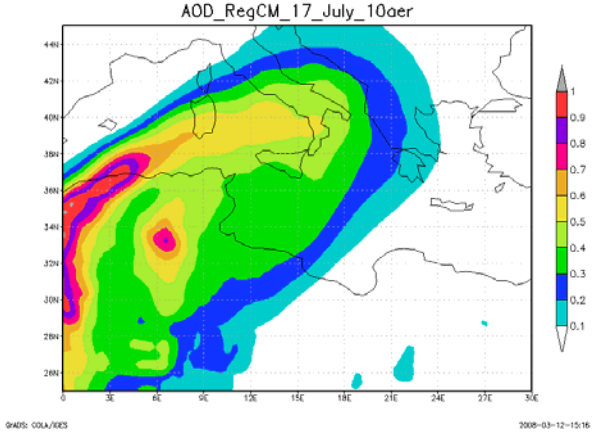

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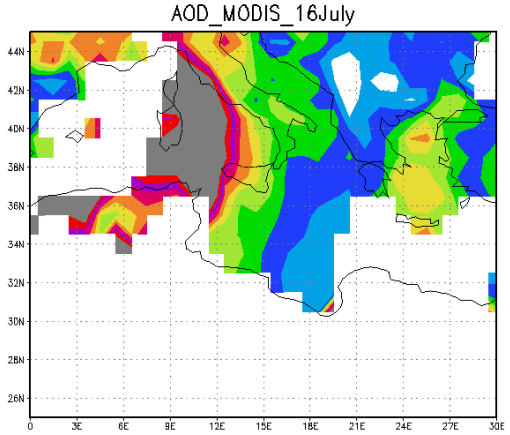
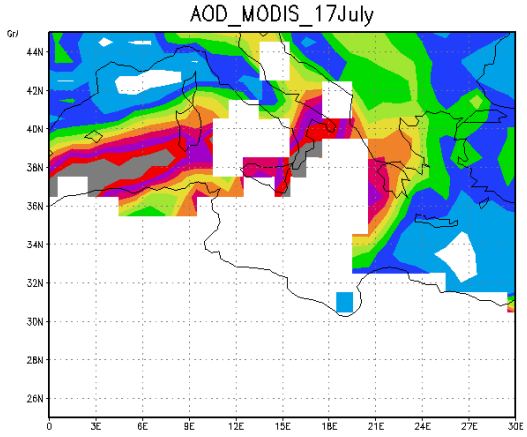
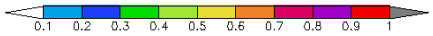
MODIS







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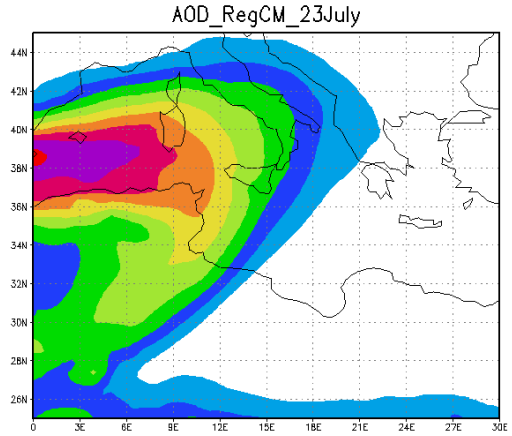
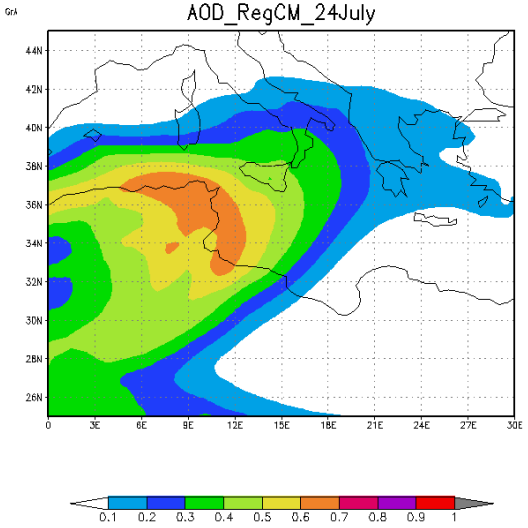
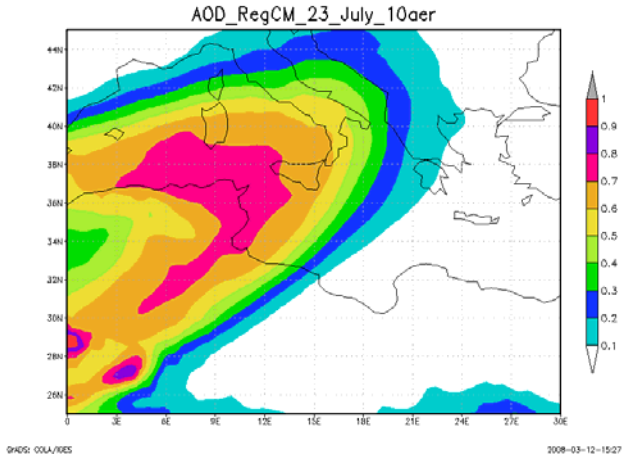
AOD MODIS and RegCM (550 nm)

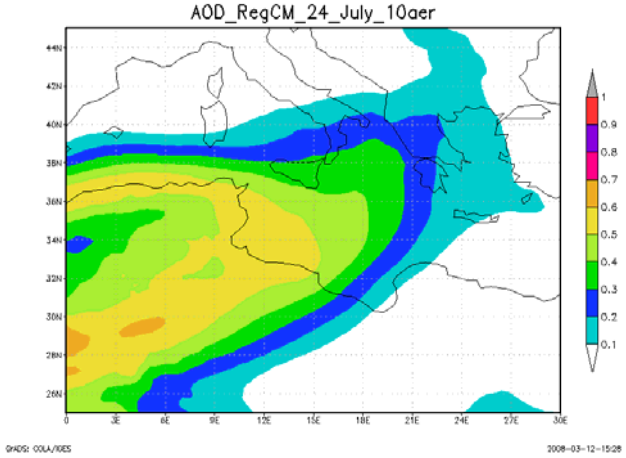
RegCM dust



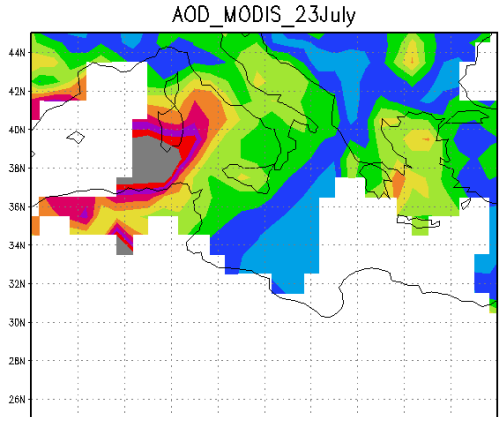


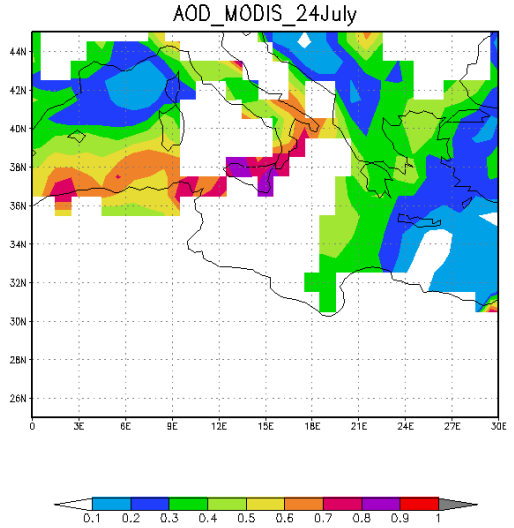
RegCM 10aerosol

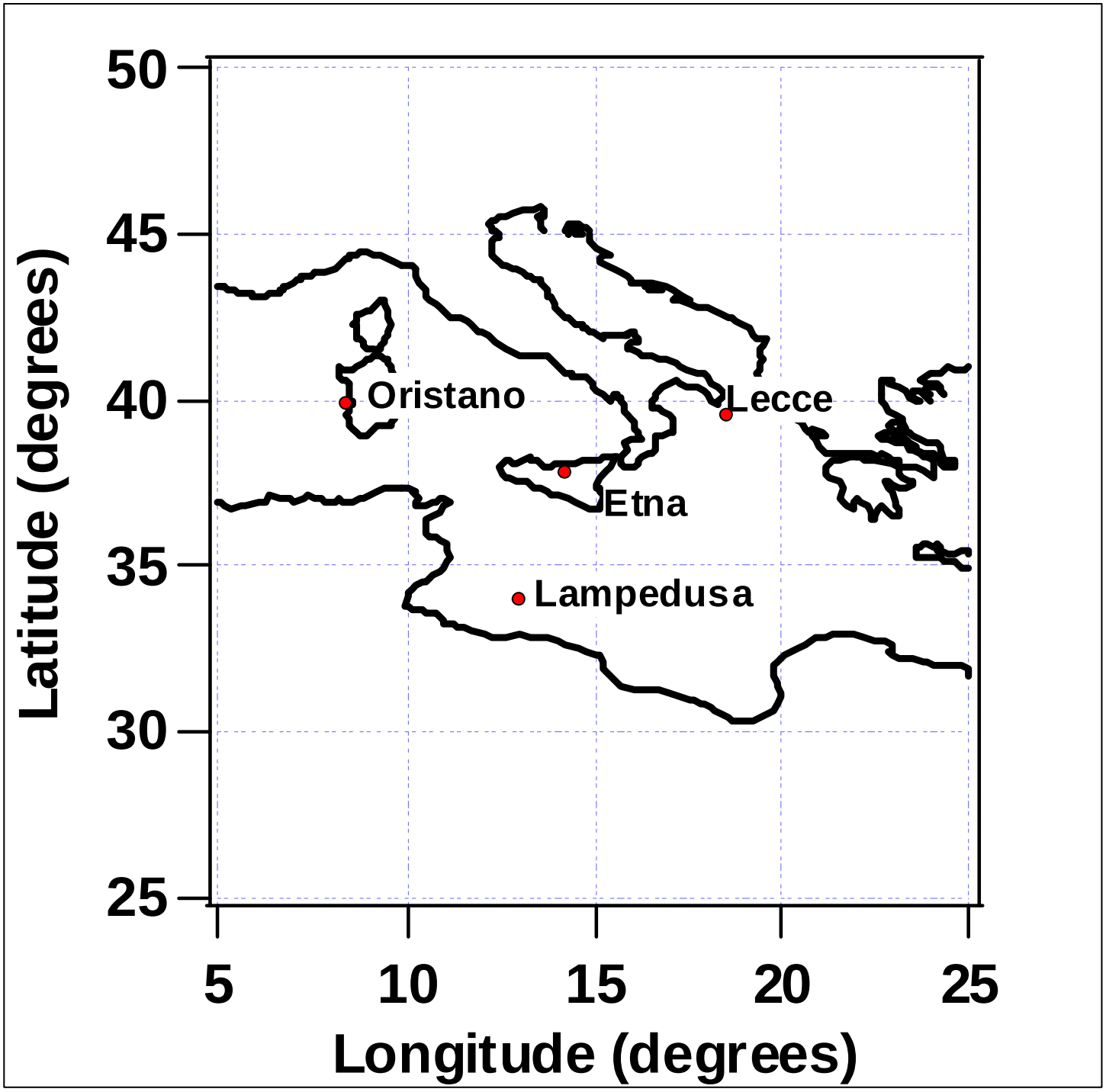




MODIS

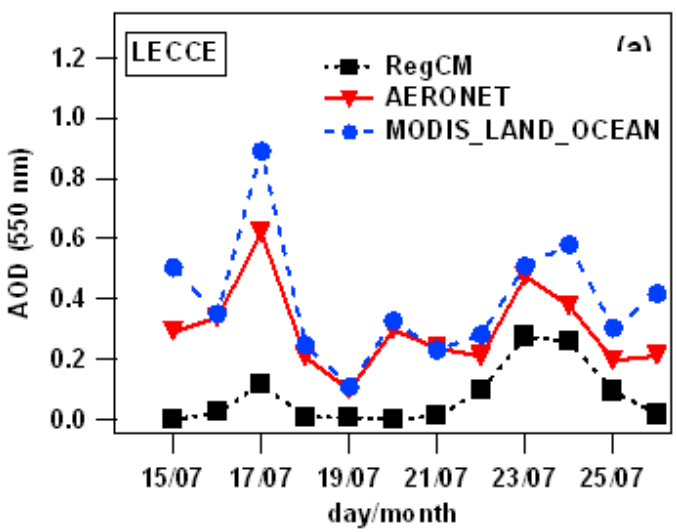


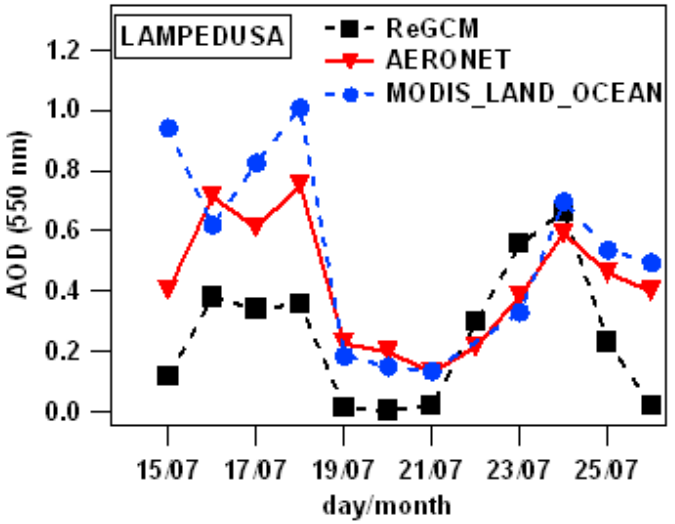



50
45
40
35
30
25
Latitude (degrees)
Oristano
Lecce
Etna
Lampedusa
5
10
15
20
25
Longitude (degrees)

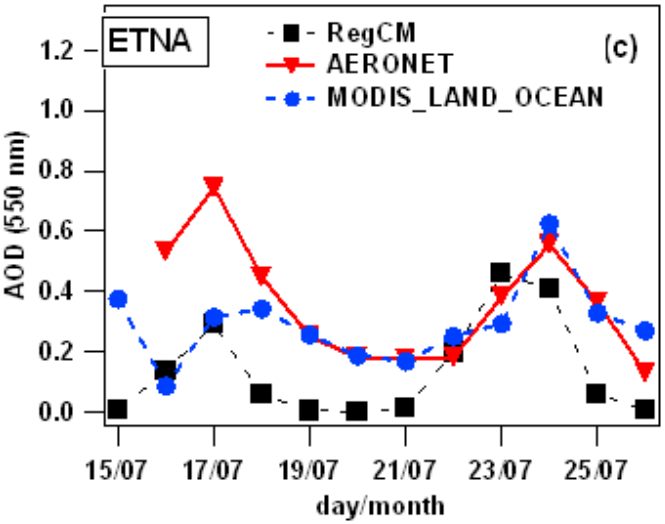
Temporal evolutions of MODIS, AERONET and RegCM AODs a 550 nm

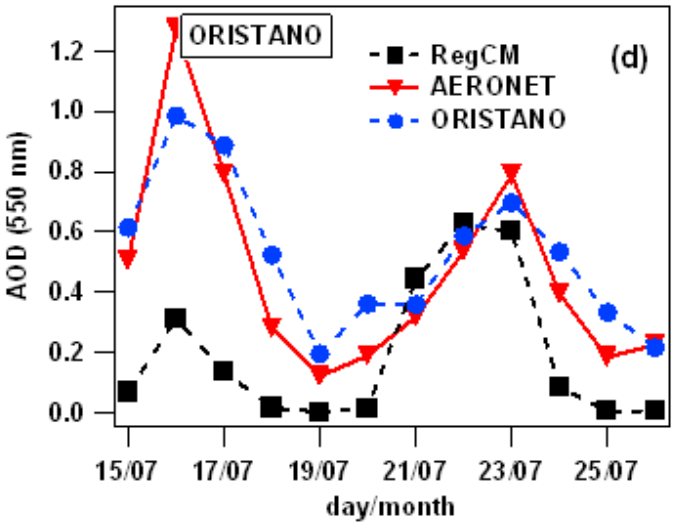
1° simulation : RegCM_DUST





MODIS and RegCM data averaged over 50x50 km² boxes around the four sites

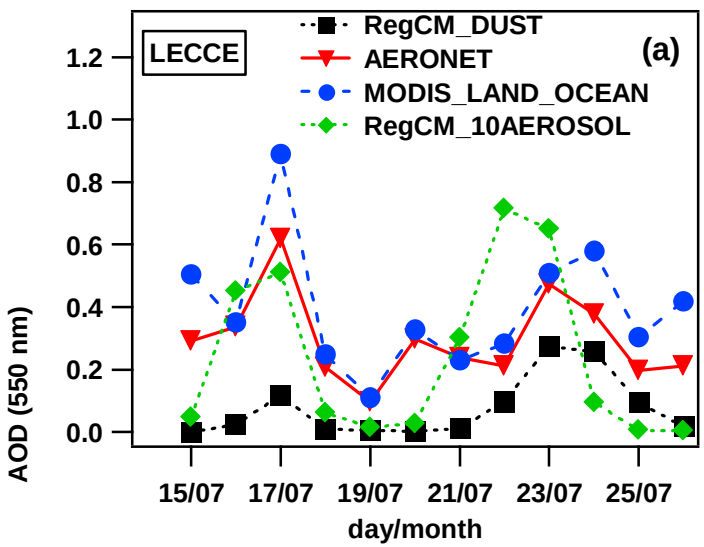


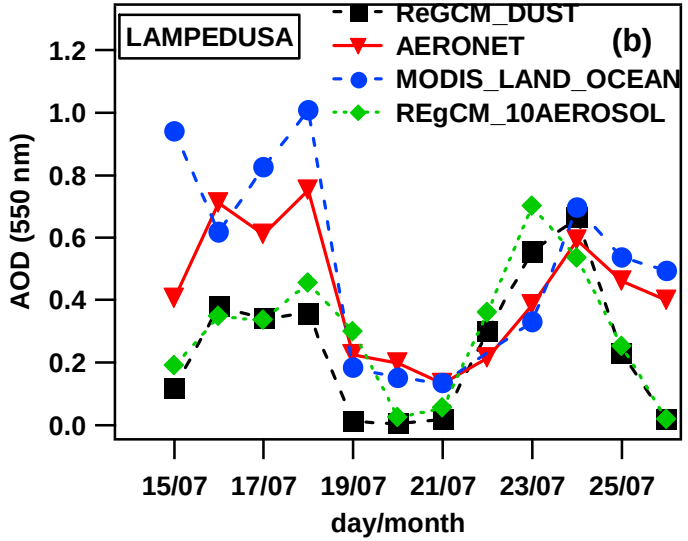


RegCM_DUST understimates AOD during the dust event of July 17, but demonstrates a good accordance on July 24

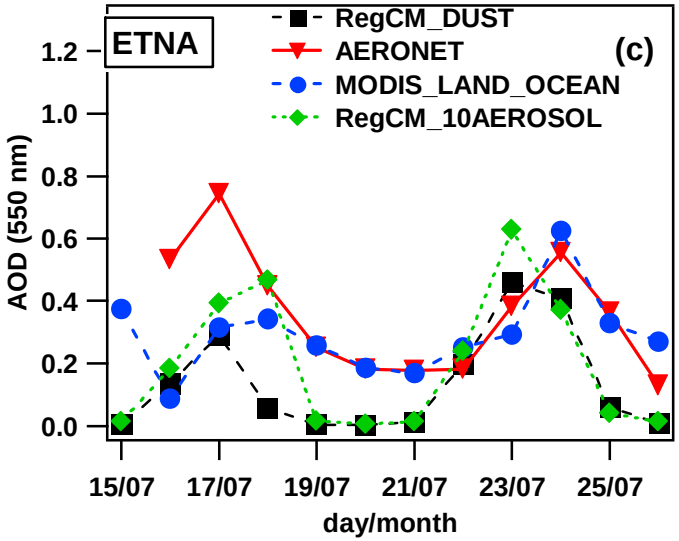
Temporal evolutions of MODIS, AERONET and RegCM AODs a 550 nm

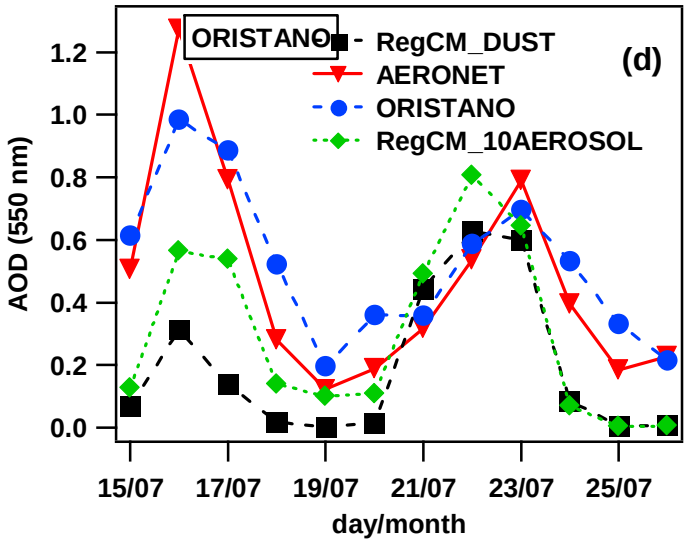
2° simulation : RegCM_10Aerosols





RegCM_10Aerosols assumes higher values than RegCM_DUST on July 17





On 17 July there is an higher contribution of no dust aerosols

Conclusions

- The results obtained have demonstrated that the RegCM model is able to simulate the occurrence of strong dust outbreaks over the Mediterranean.

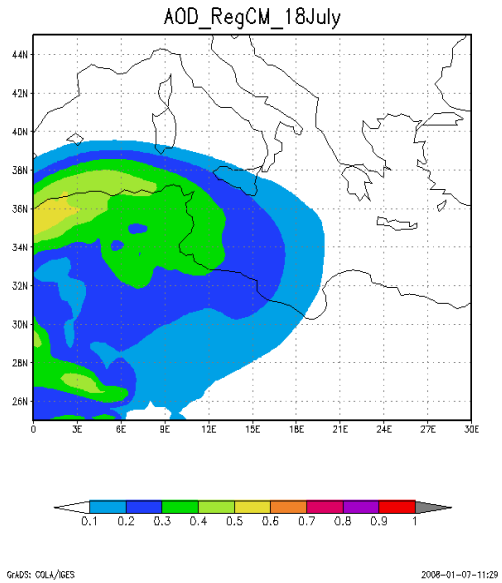
- The comparison with AERONET and MODIS AOD show that AODs intensities obtained by the 1°simulation (only dust) are not always represented.

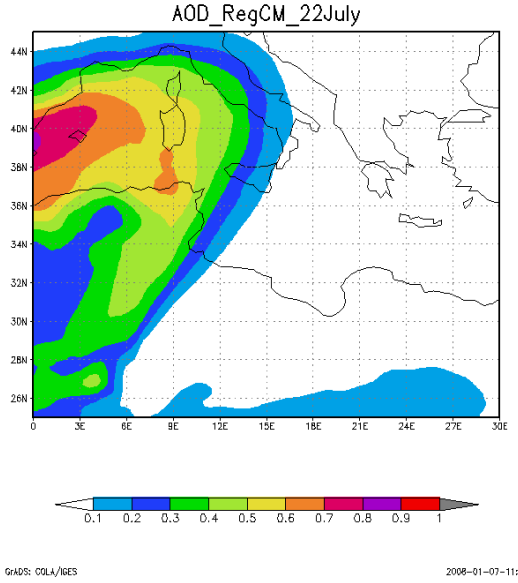
- The comparison between experimental and RegCM AODs obtained by the 2°simulation (10 aerosols) shows that the accordance is better: this is due the fact that AERONET and MODIS are representative of the total aerosol load.

Thank you

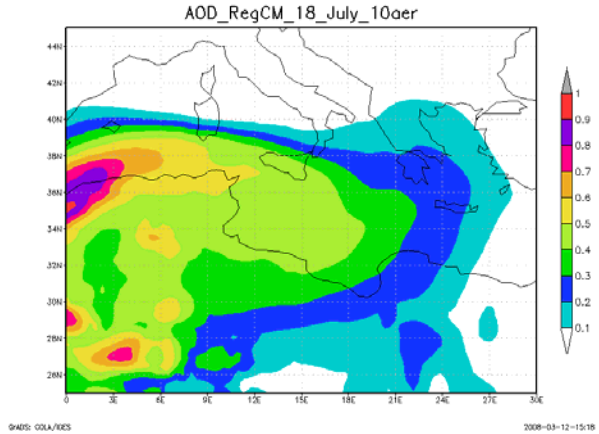
AOD MODIS and RegCM (550 nm)

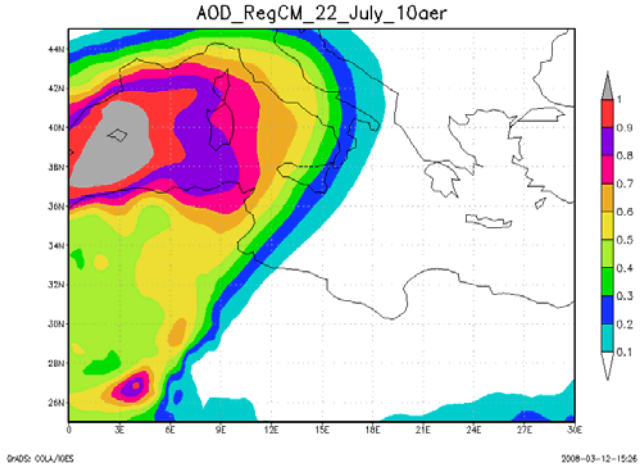
RegCM dust





RegCM 10Aerosol





MODIS