الهيئة العامة للارصاد الجوية

Egyptian Meteorological Authority

DUST AND AIR QUALITY MODELS IN EMA

(Air Pollution and Numerical Weather Prediction Departments)

By:

Zeinab Salah Mahmoud

Numerical Models in EMA

Weather:

- WS-ETA
- MM5
- WRF
- COSMO

Marine:

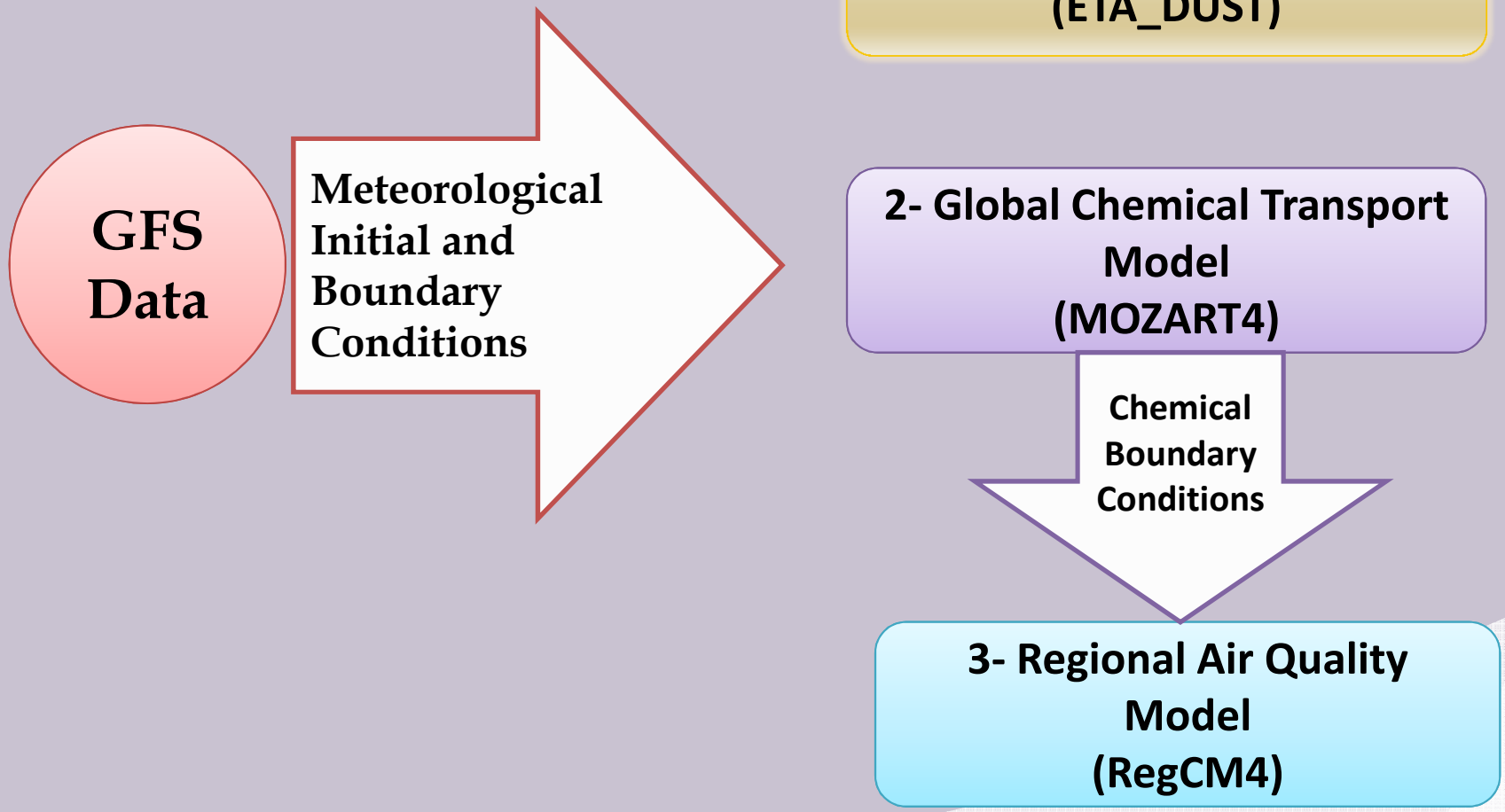
- WAM

Atmospheric Aerosols and Gases:

- WS-ETA (with dust module) (ETA_DUST)
- Mozart4 (global scale)
- RegCM4 (with gas-phase and aerosols, under test to use in daily forecast)

(www.nwp.gov.eg)

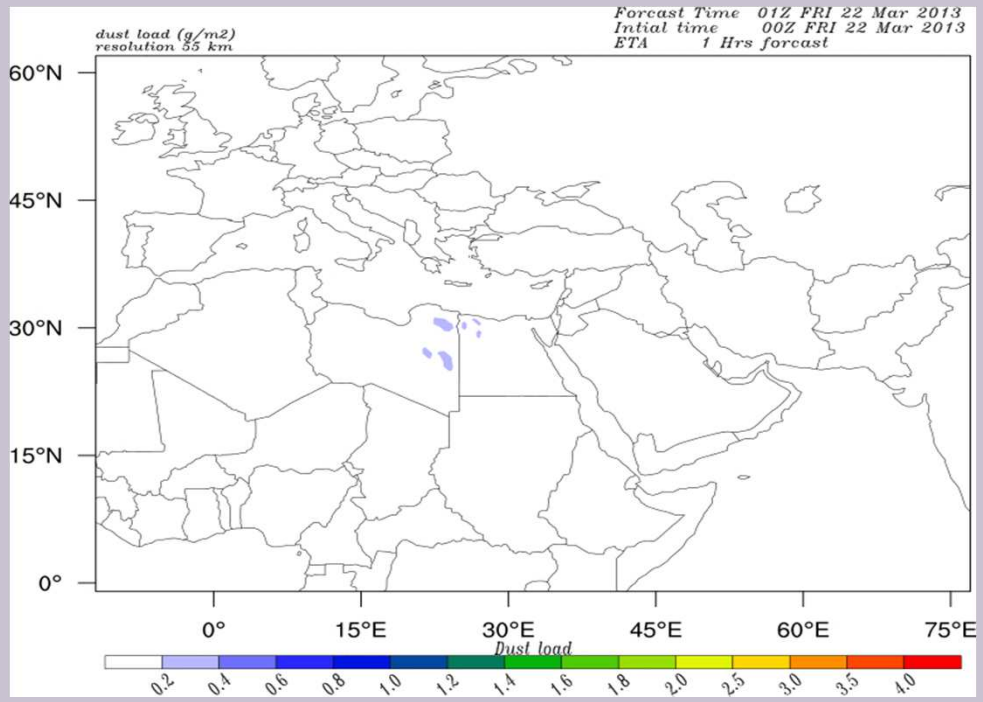
Atmospheric Aerosols and Gases



1- WS-ETA (with dust module)

This module is based on scheme developed by S. NICKOVIC (from Athens University).
The coverage area is (1 S to 62 N, and 12 W to 77E with resolution 0.5 degree)

Forecast of 22 March 2013, for 4 days, every 1 hr
For Dust Load (g/m2)



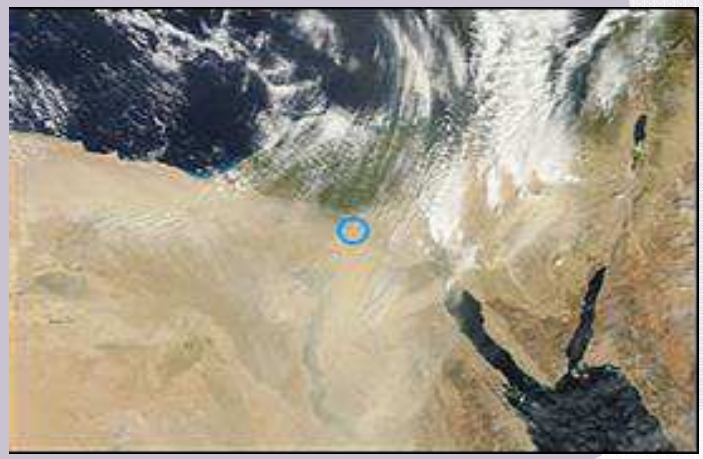
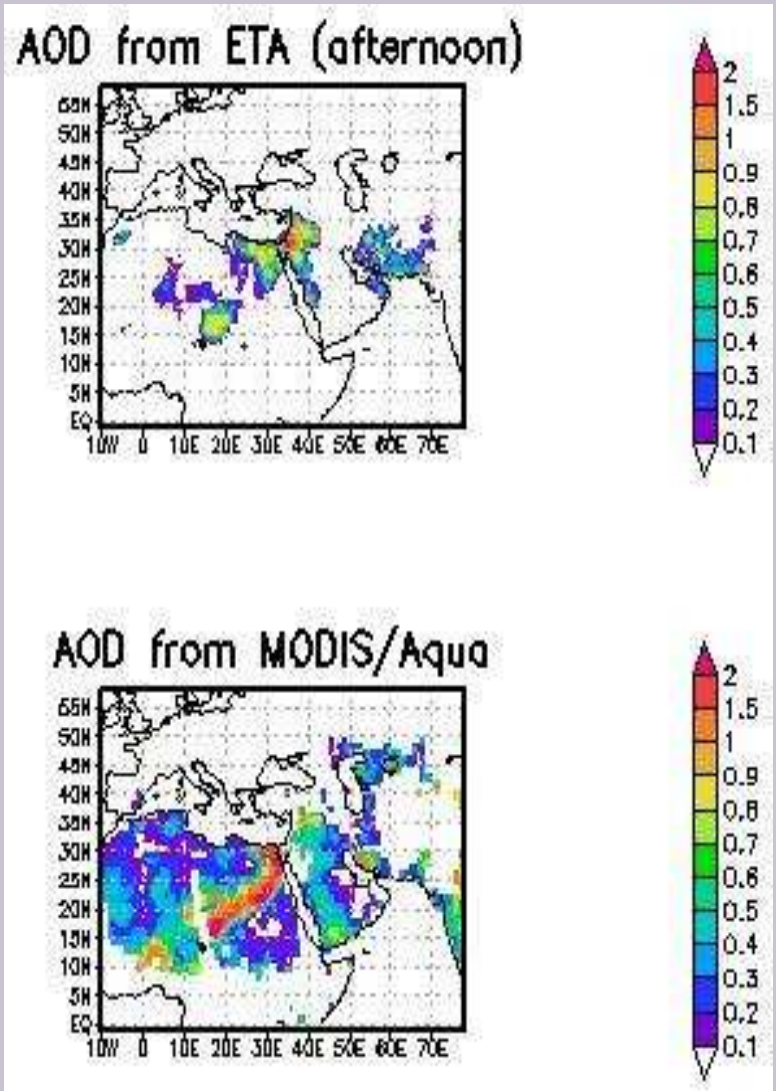
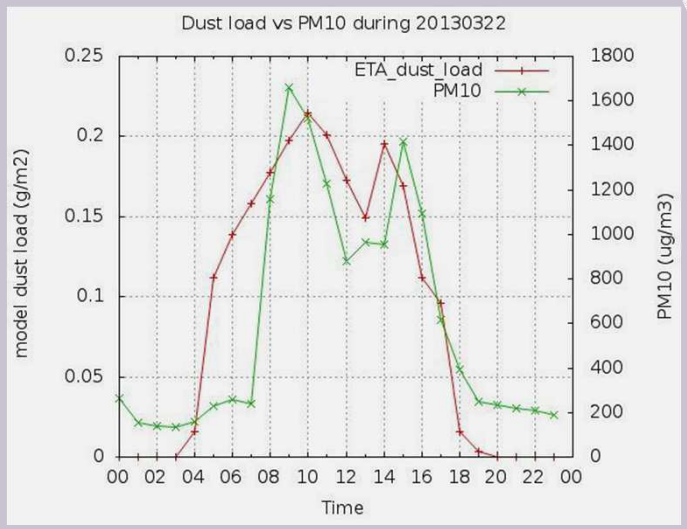


Image from MODIS/Terra (from AERONET)

AOD calculated from on 22 March 2013 used ETA_DUST



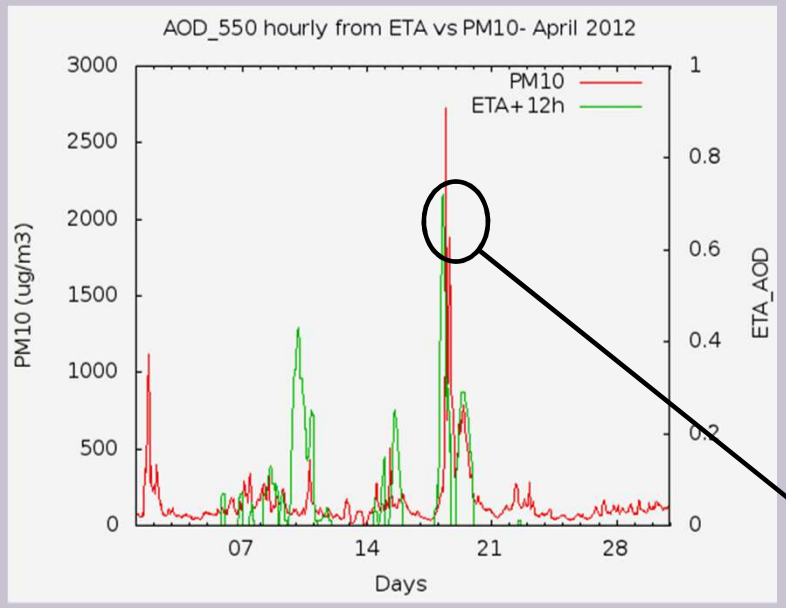


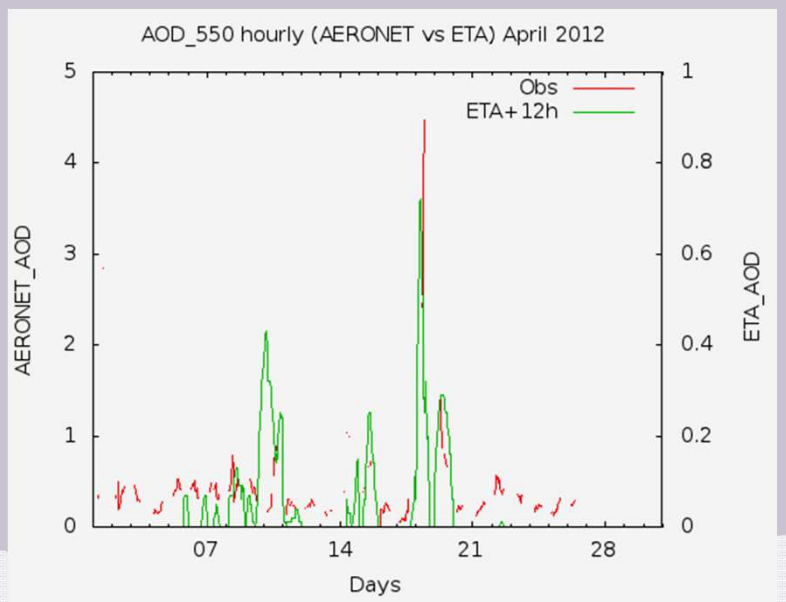
Output of ETA_DUST is only dust load

AOD = (3 * M * Q) / (4 * rho * r) (Tegen and Lacis, 1996)

Where M is dust load, r =1.5, Q=2.345, and rho = 2.6

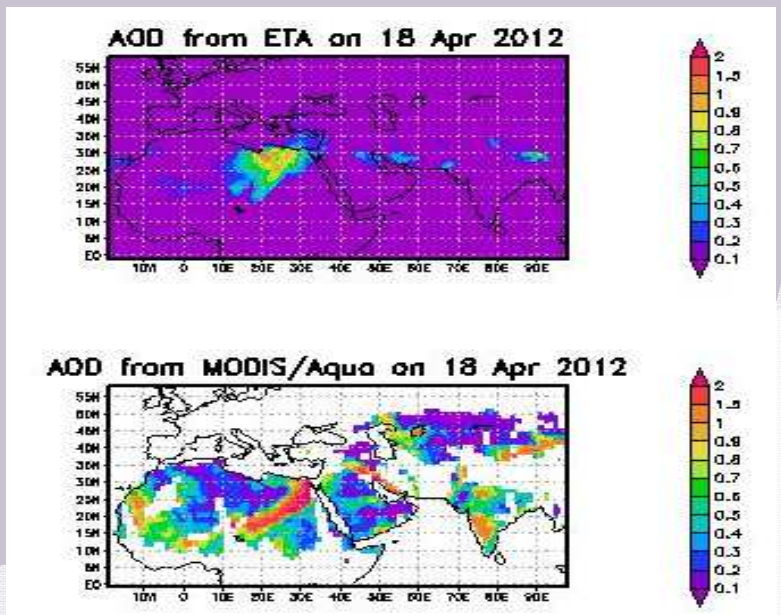
Validation of AOD calculated from ETA during April 2012 – over Cairo station





Output of ETA is hourly and started at 12 Z.

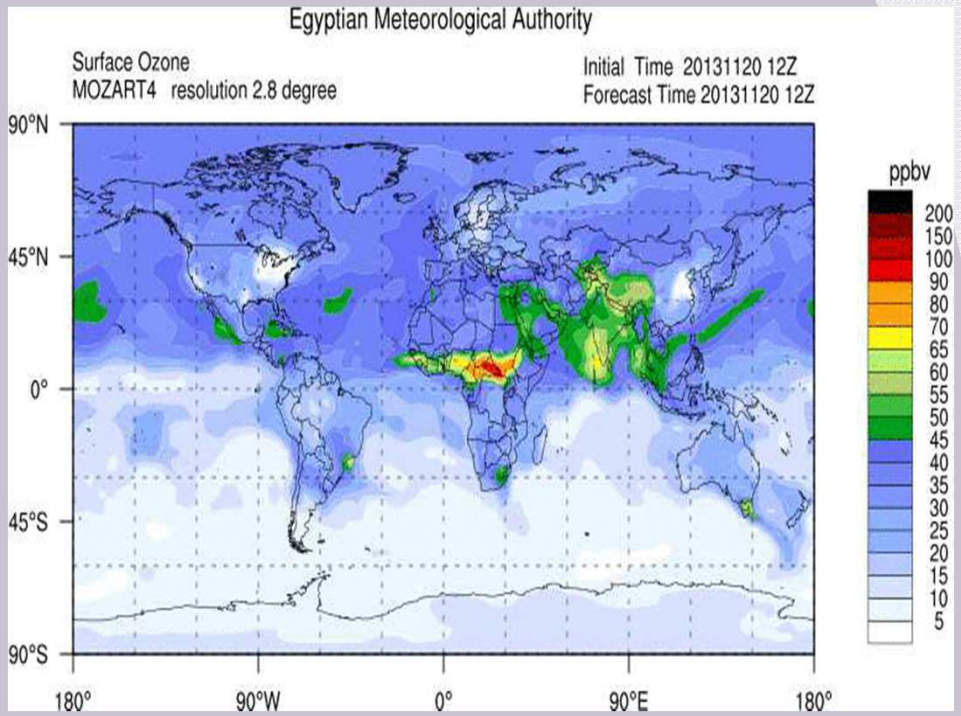
For these figures:
the first 12 hours are excluded and plot the next 24 hours, for each day.



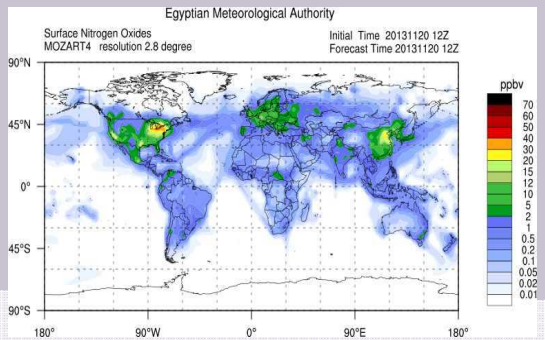
2- The Model for Ozone and Related Chemical Tracers (MOZART4)

Forecast of 20 Nov. 2013,
for 3 days – every 6 hr,
with resolution of 2.8 degree

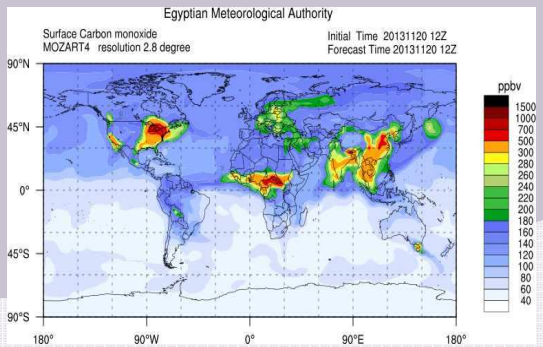
concentration of surface ozone (ppb)



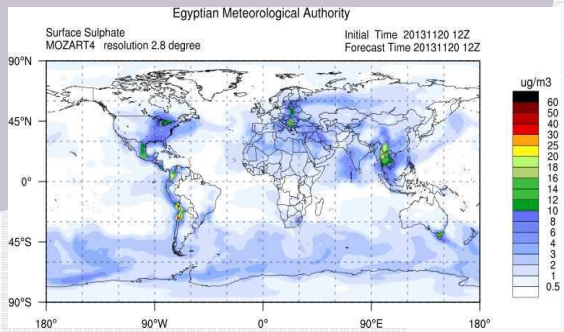
NOx (ppb)



CO (ppb)



SO4(µg/m3)



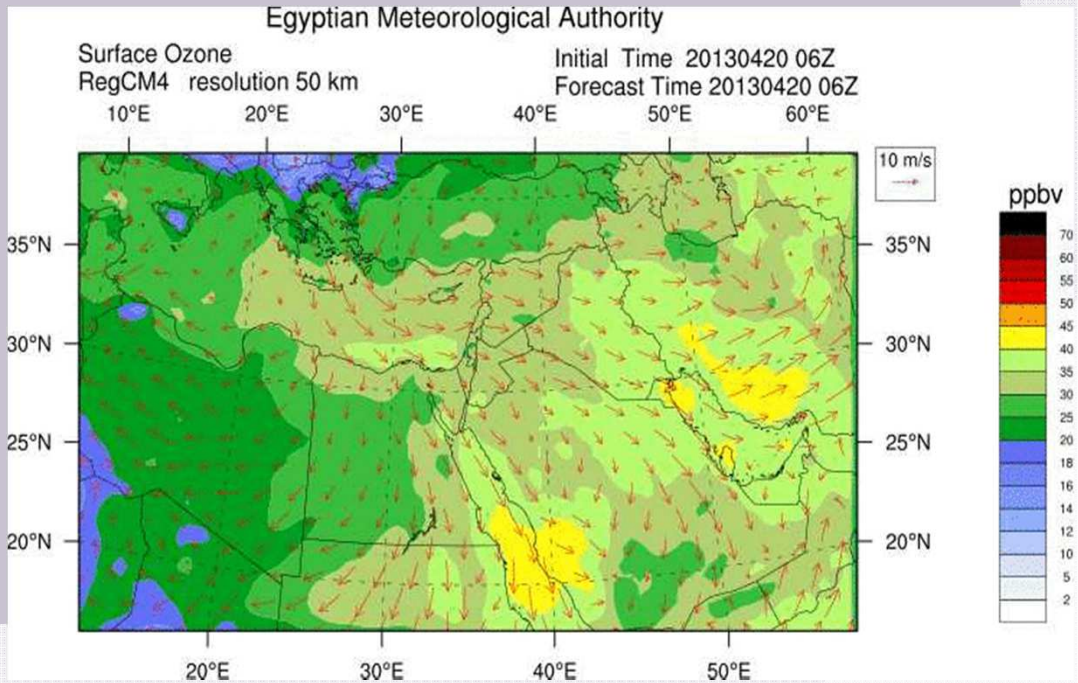
3- ICTP Regional Climate model (RegCM4)

A) For daily forecast

A developed version to make daily forecast for the concentrations of atmospheric gases and aerosols including dust, (under test).

The aerosols include : SO4, BC, OC, and four size bins of dust and sea salt, in addition to AOD, dust load, Radiative forcing, SSA, and asymmetry parameter.

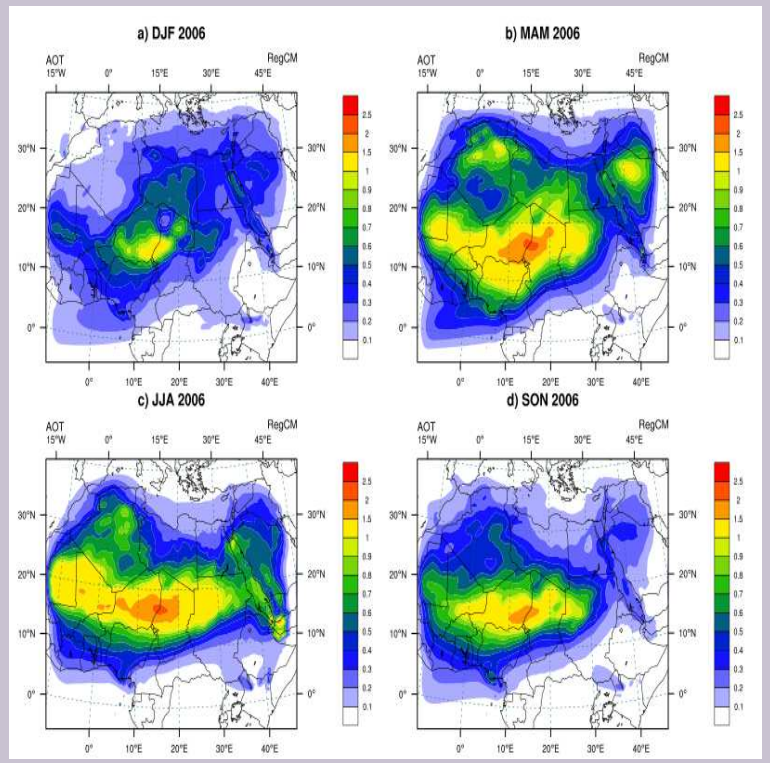
It needs high computational power to run with full chemistry, for 3 days- every 6 hr, with resolution of 50 Km.



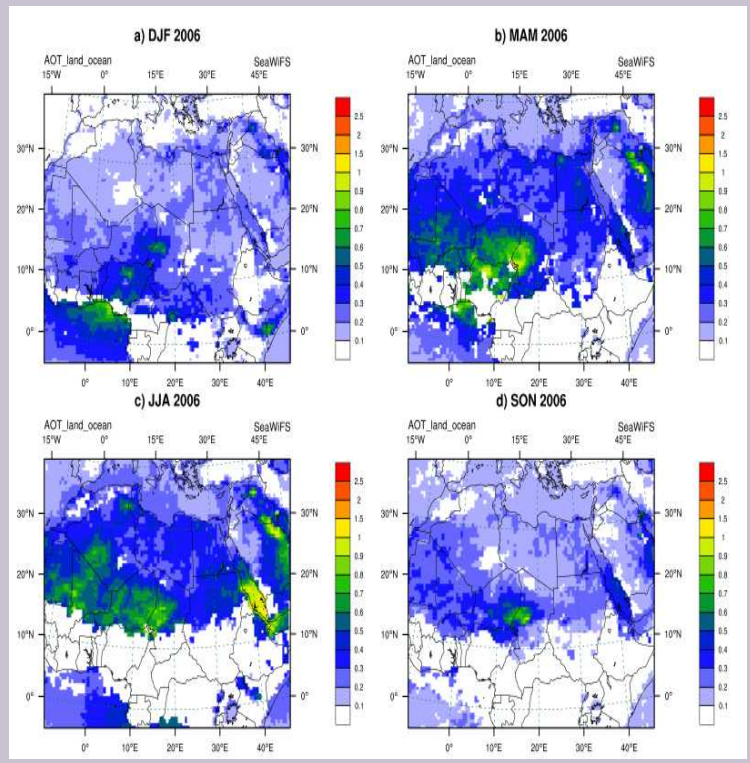
Forecast for concentration of surface ozone (ppb) on 20 April 2013

B) RegCM4 for climate simulations

Monthly mean of AOD simulated by RegCM4 during 2005 , (Aerosols include SO4, BC, OC, and dust).

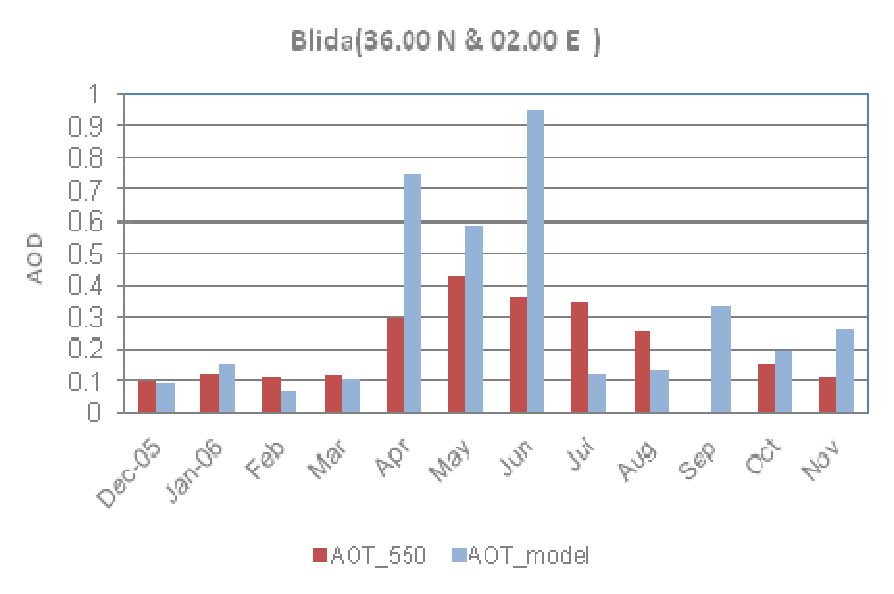


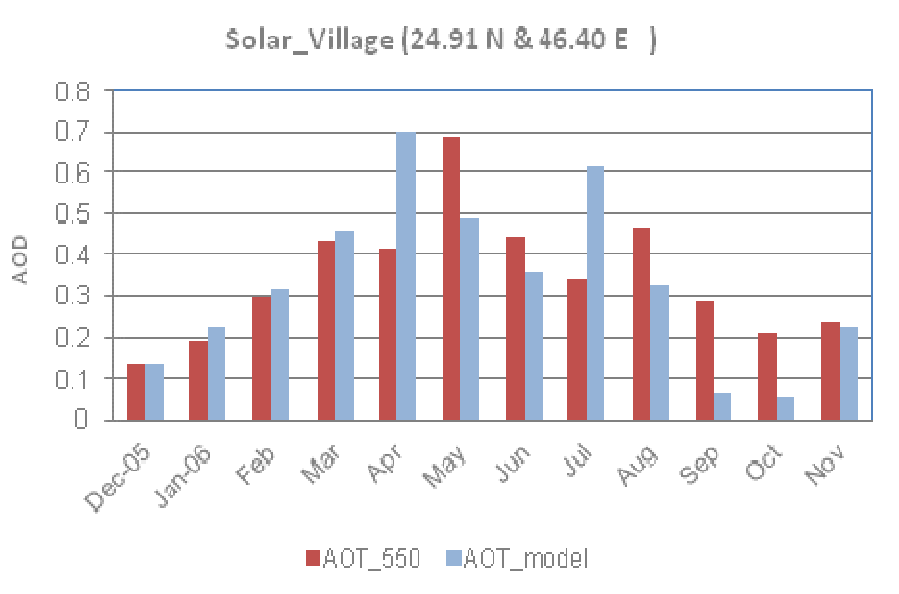
AOD simulated by RegCM4

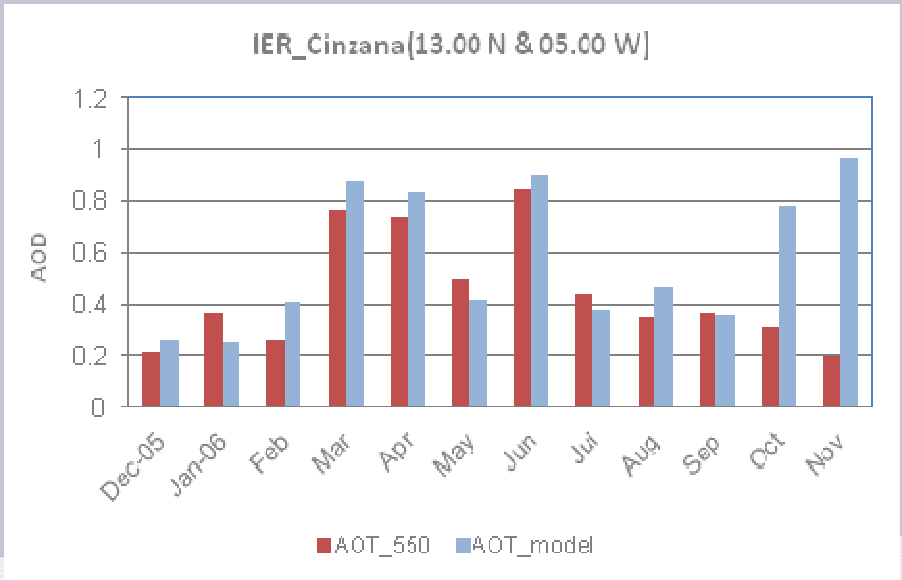


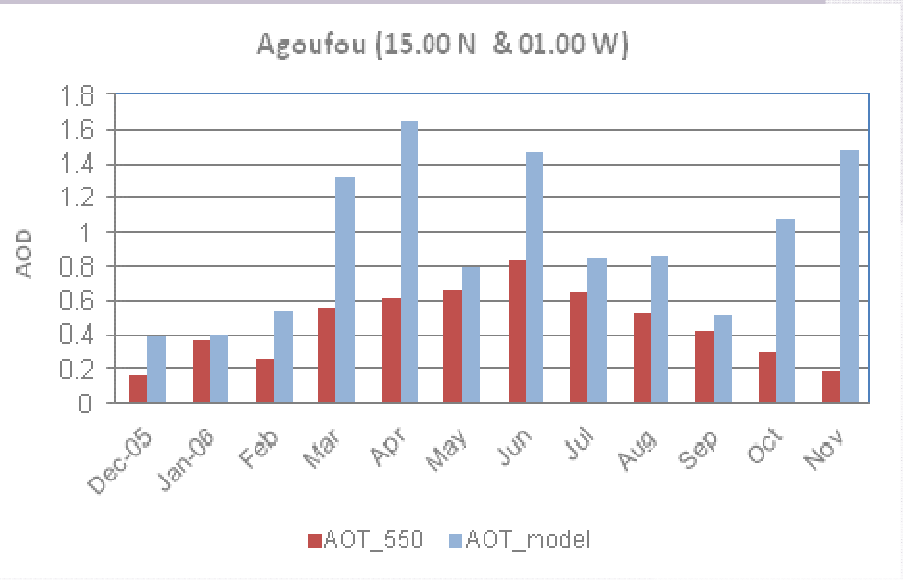
AOD from SeaWiFS

Monthly mean of AOD simulated by RegCM4 vs. observed by Aeronet at some stations









Thank you