CUT
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Record DUST outbreak towards CYPRUS September 2015

dust mass concentration over Limassol

Outline

Record DUST outbreak towards CYPRUS September 2015

- Limassol site and CUT's instrumentation
- Spatial temporal evolution of a dust event
- Satellite observations
- Surface monitoring
- Vertical structure
- Model simulations
- Conclusions

Eastern Mediterranean-Cyprus

ERATOSTHENES ARS station

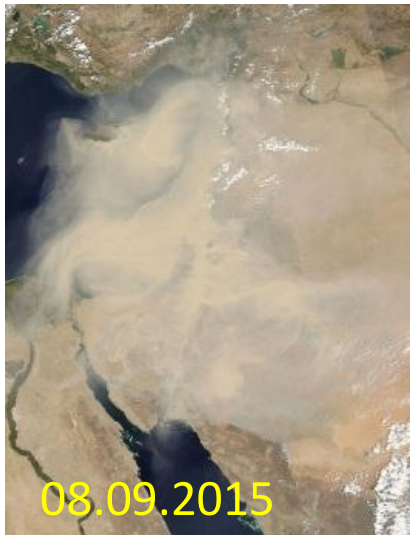
LM EARLINET
δ532nm
β532nm ,
β1064nm
a532nm

CUT-TEPAK #611
AERONET 8 channels
from 340 to 1640 nm
wavelength

MODIS aerosol product collection06

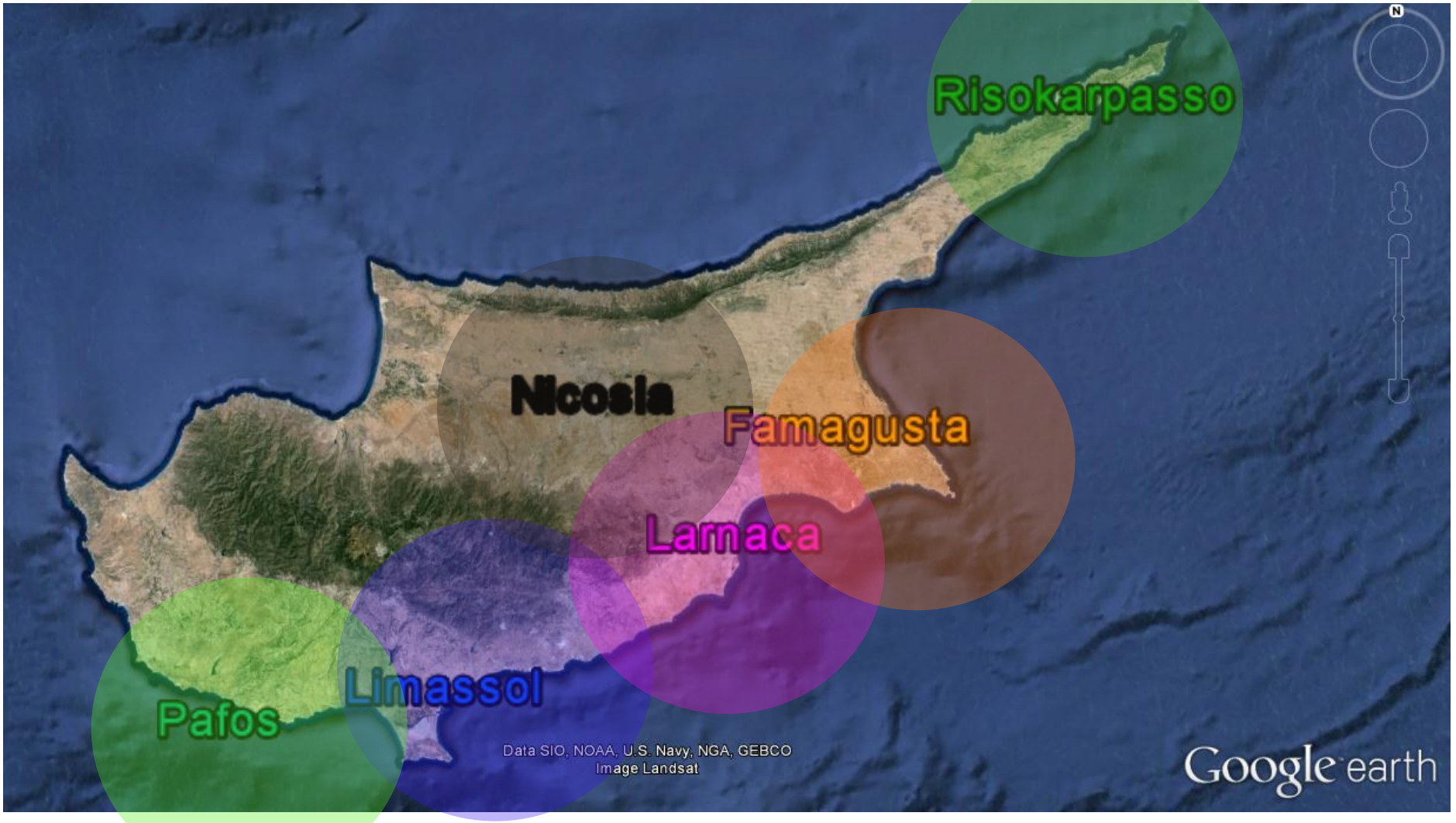
Satellite observations

MODIS overflights over EastMed



source: http://lance-modis.eosdis.nasa.gov/

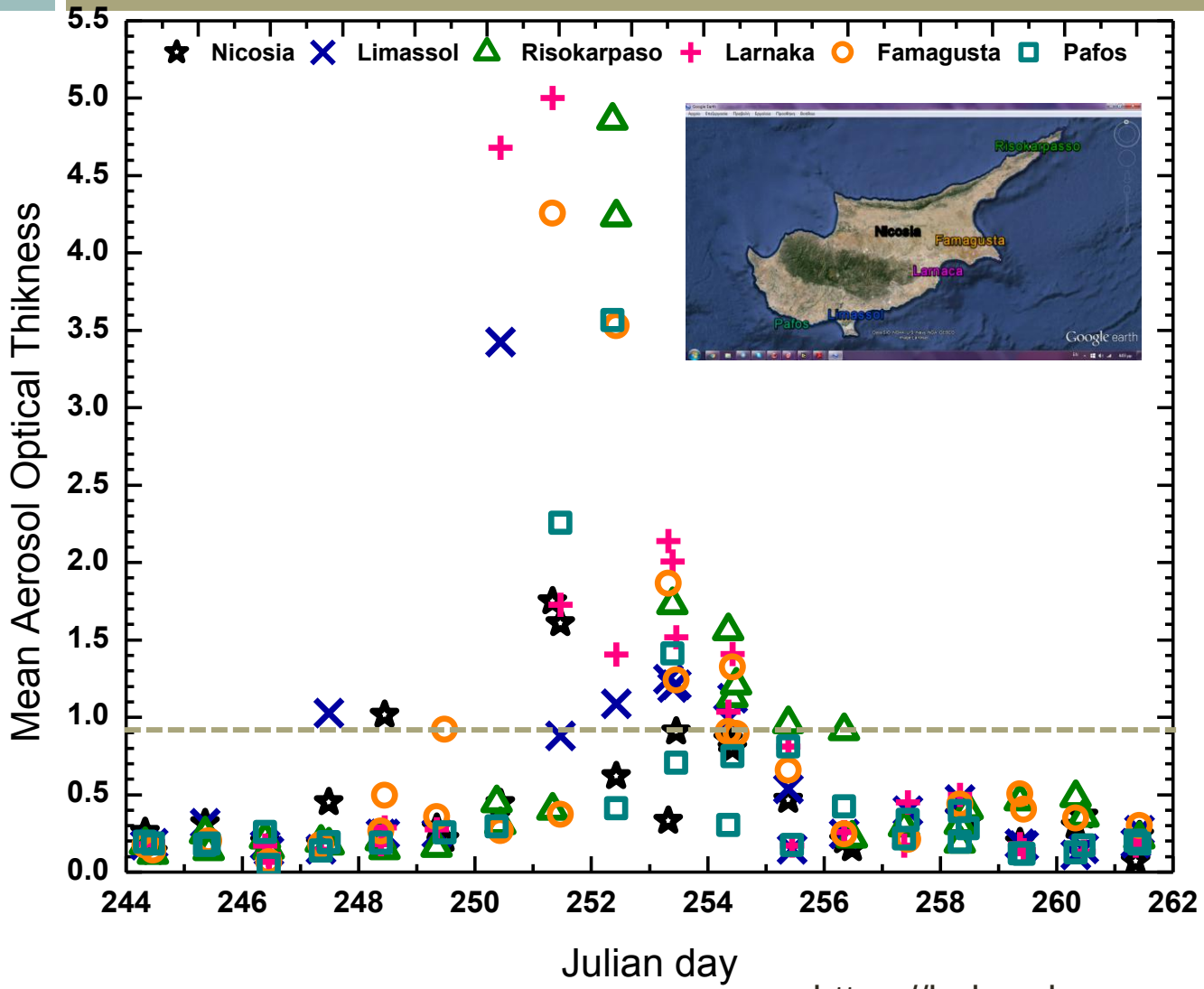
50km centered to Cy regions



50km radius mean AOT values

MODIS aerosol product collection06

MODIS collection 06



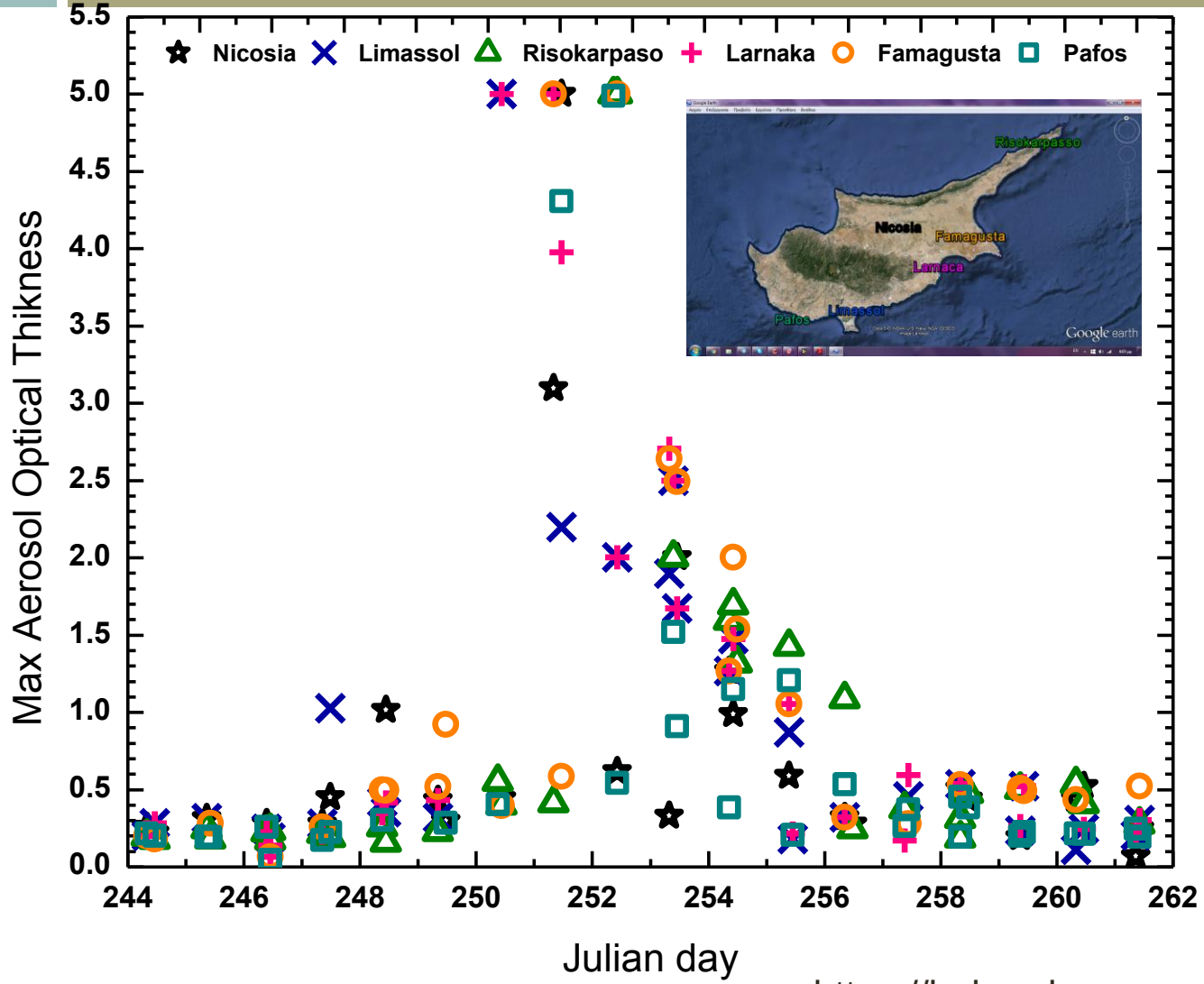
AOT mean values exceed 1.0 for more than 4 days

source: https://ladsweb.nascom.nasa.gov/data/search.html

maximum AOT values

MODIS aerosol product collection06

MODIS collection 06



AOT maximum values reached the up limit of 5.0 of MODIS for 3 days

source: https://ladsweb.nascom.nasa.gov/data/search.html

PM concentrations
Visibility

Surface observations

From visibility to mass concentration

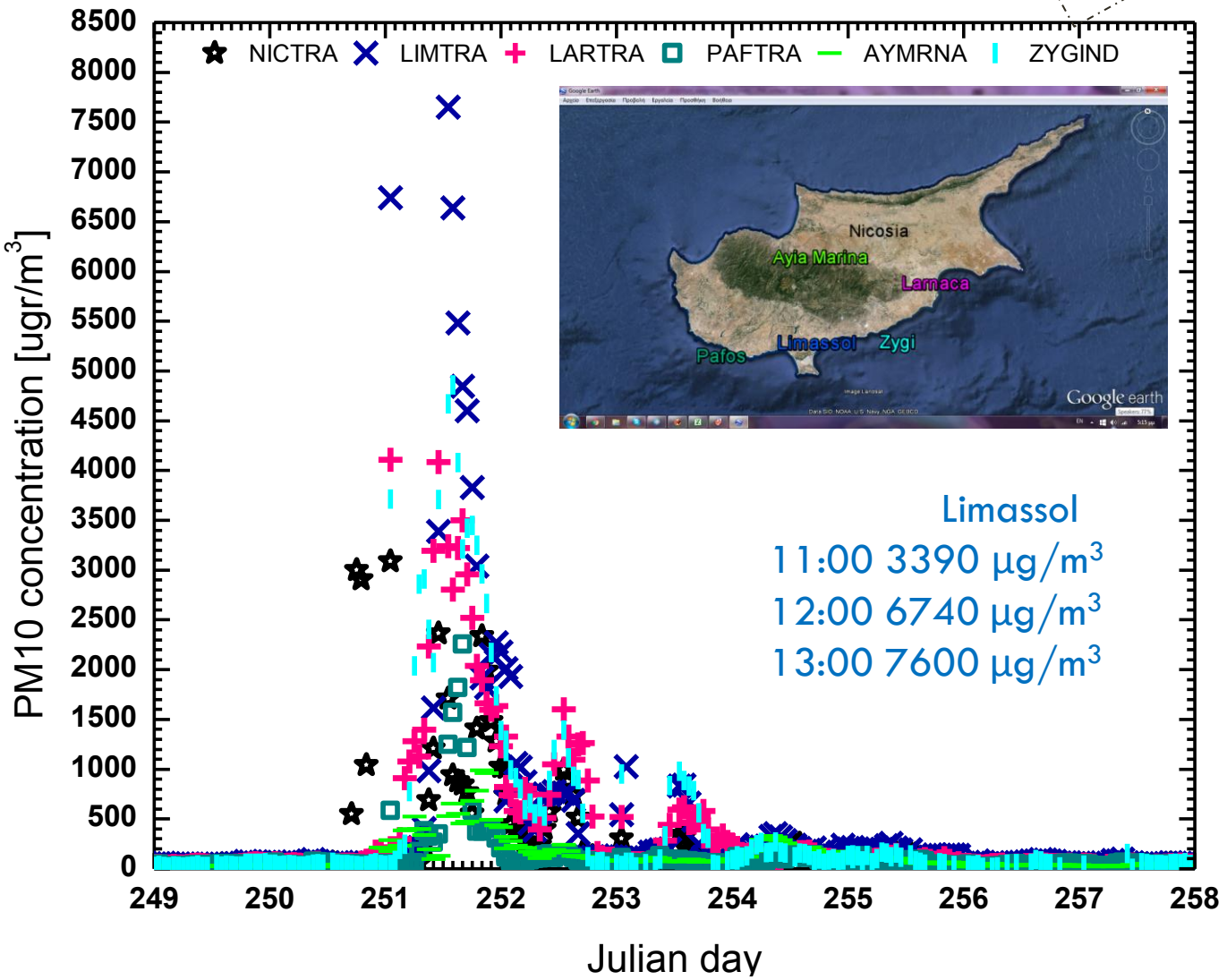
Roof of CUT building

Visibility: 500m Extinction coef.: 6000 Mm^{-1} Mass conc.: >10000 $\mu g/m^3$

Air Quality stations – DLIcy

Air Quality stations – DLI$_{CY}$

PM_{10} concentrations
6 stations of DLI



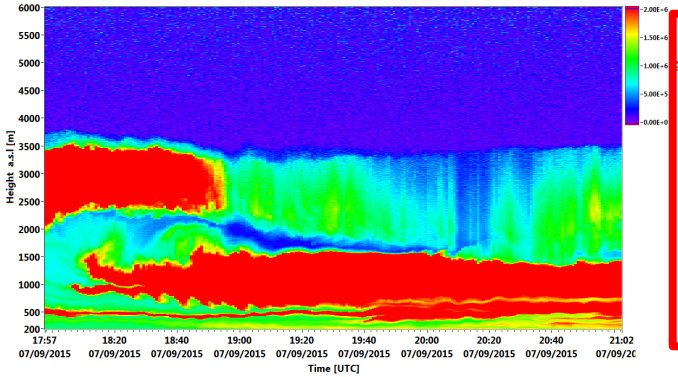
source: http://www.airquality.dli.mlsi.gov.cy/

EARLINET Limassol lidar station

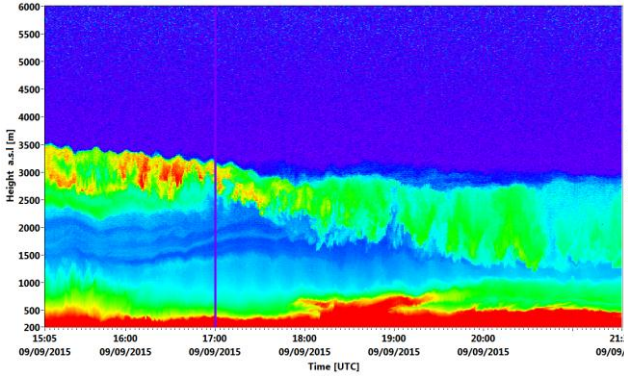
Dust profiling

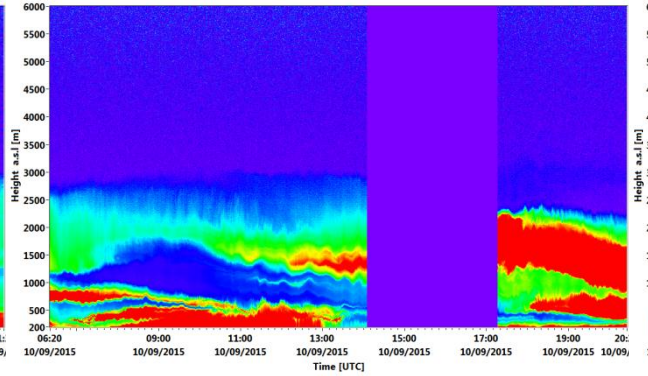
Vertical structure over Limassol

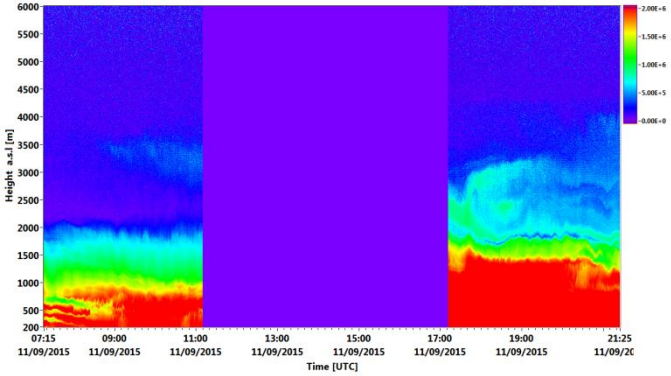
Limassol lidar station



8 SEPTEMBER 2016*

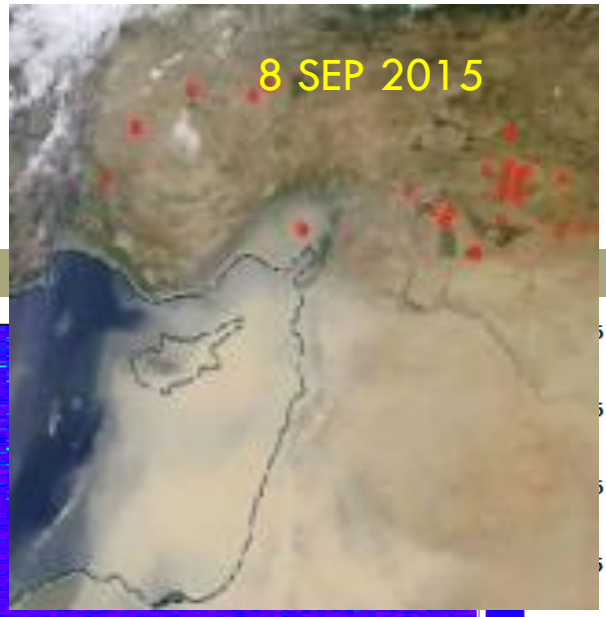


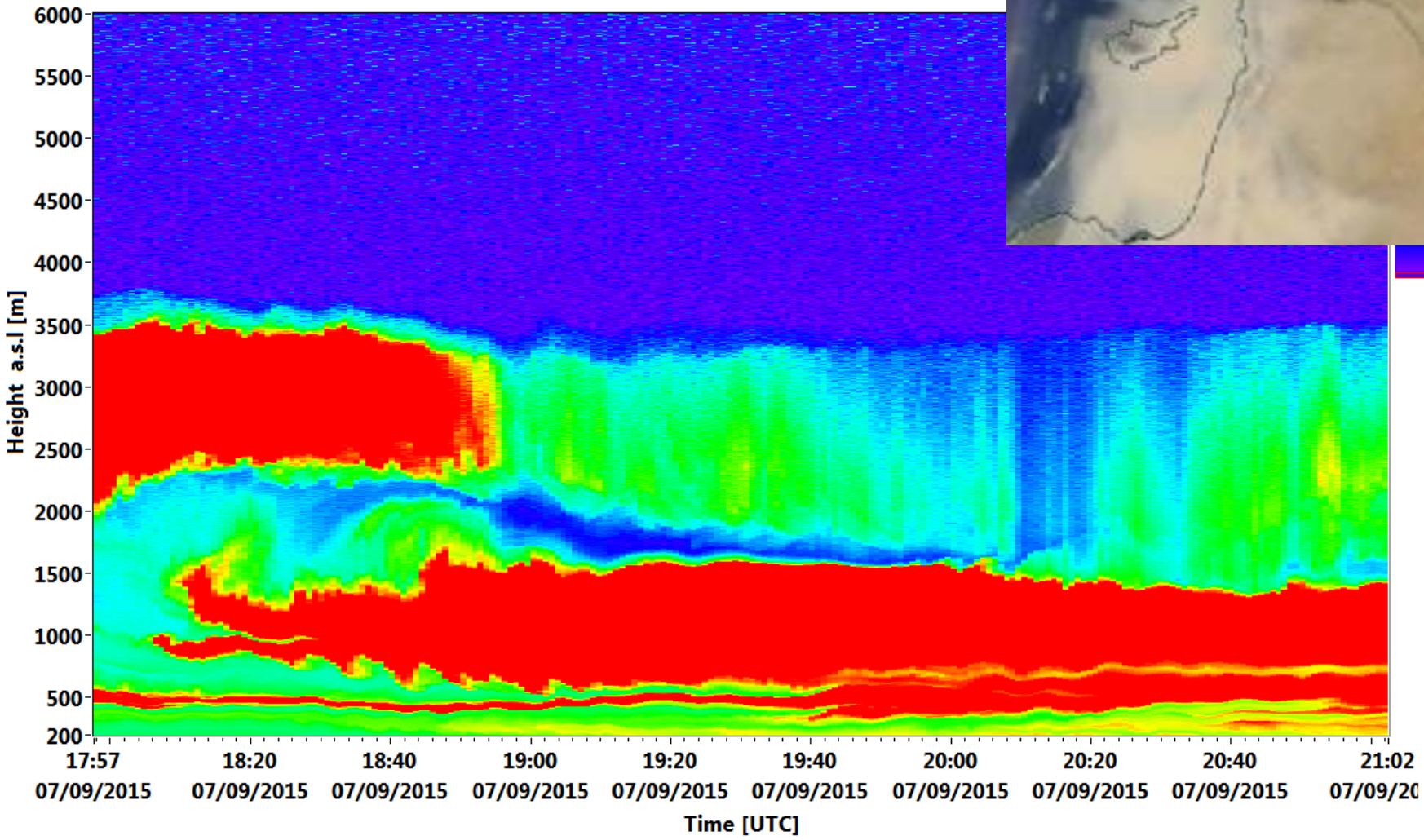




*NO LIDAR MEASUREMENTS to avoid damage of optics and overload of detectors

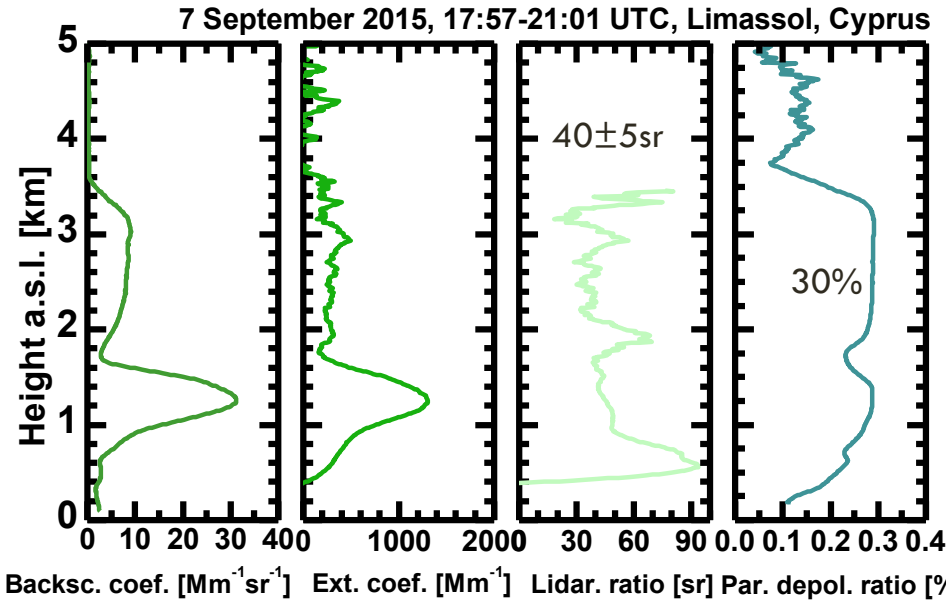
Pick of event

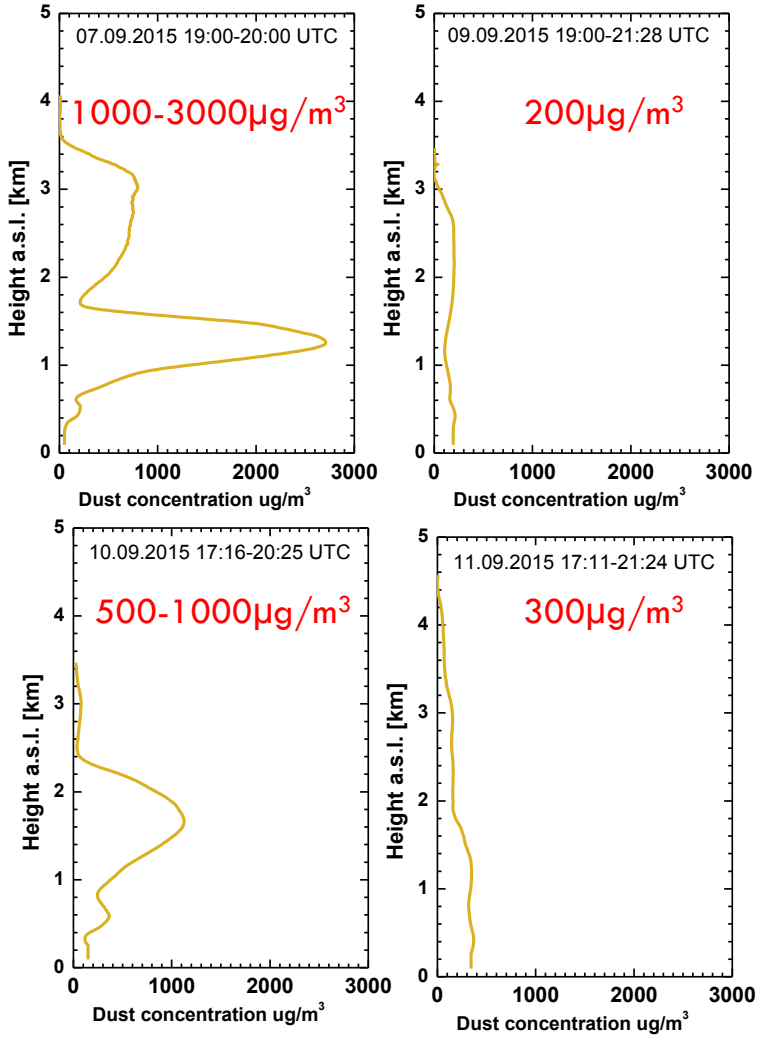




Vertical profiles of dust optical properties and mass concentration

From typical lidar optical products to dust mass concentrations

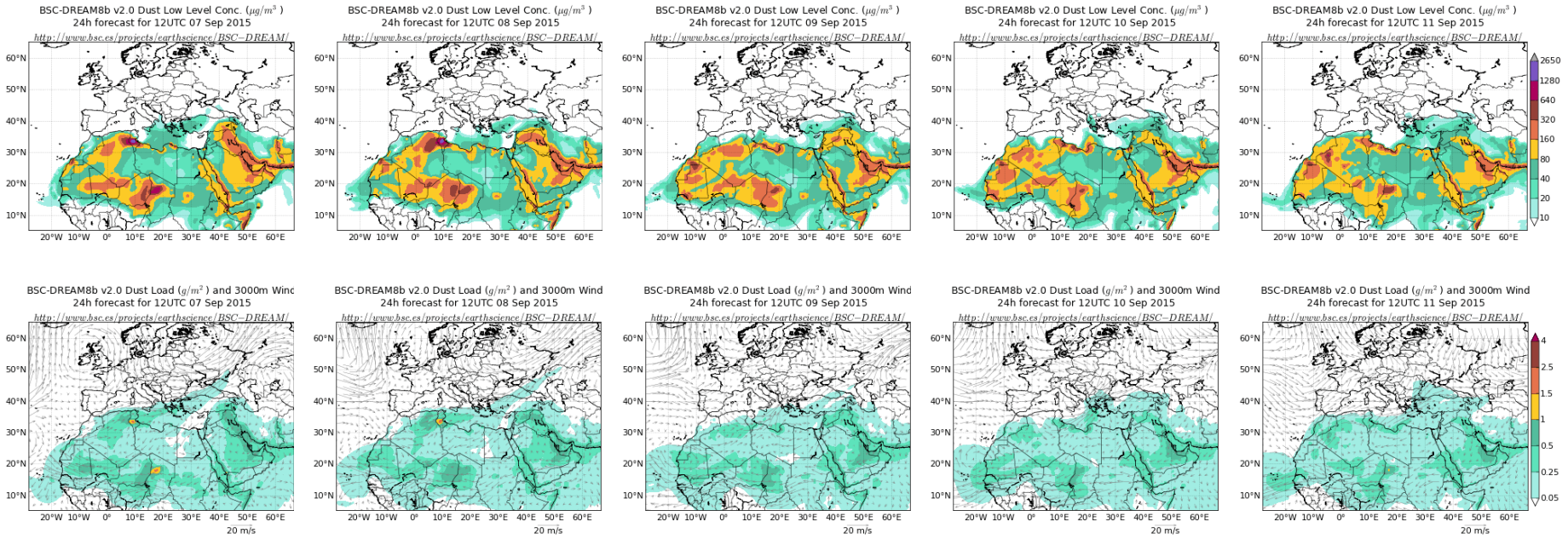


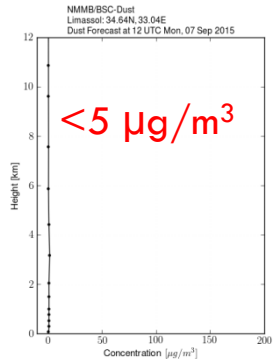


Based to the methodology presented by
Mamouri, R. E. and Ansmann, A.
Fine and coarse dust separation with polarization lidar, Atmos. Meas. Tech., 7, 3717-3735, doi:10.5194/amt-7-3717-2014, 2014.

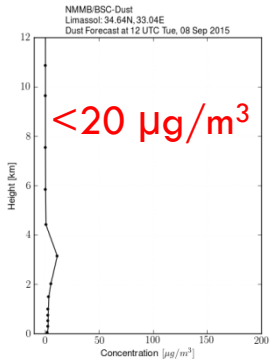
Dust forecast

BSC-DREAM8b
http://www.bsc.es/earth-sciences/mineral-dust-forecast-system/bsc-dream8b-forecast

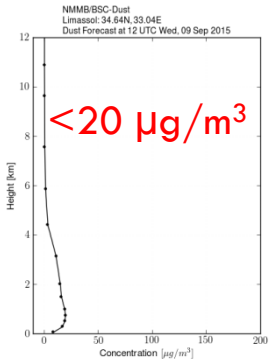




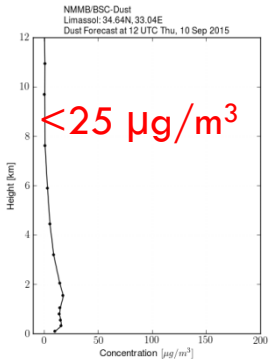
<5 µg/m³



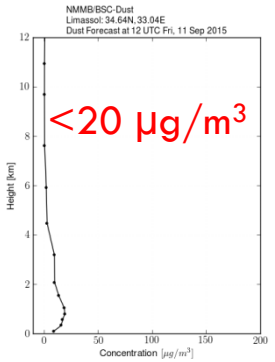
<20 µg/m³



<20 µg/m³



<25 µg/m³

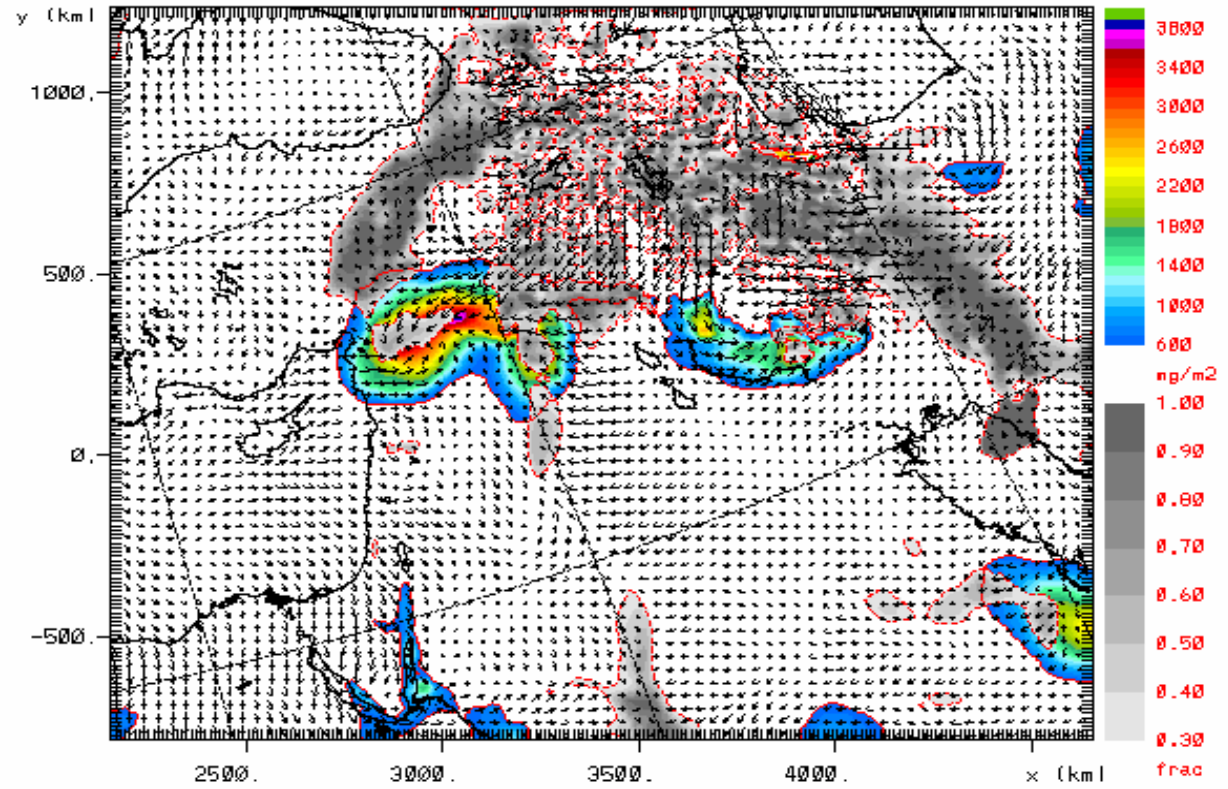


<20 µg/m³

source: http://www.bsc.es/earth-sciences/mineral-dust-forecast-system

RAMS/ICLAMS simulation

6 September 17:00 UTC – 7 September 00:00 UTC



AM&WFG		grid 1			
	2015-09-06-1700.00 UTC	min	max	inc	lab*
contours	cloud cover (frac)	0.000	1.000	0.1000	1e 0
contours	dustload post (mg/m2)	0.000	5869.	100.0	1e 0
vectors -	3 m/s horiz	0.1410E-01	45.82		

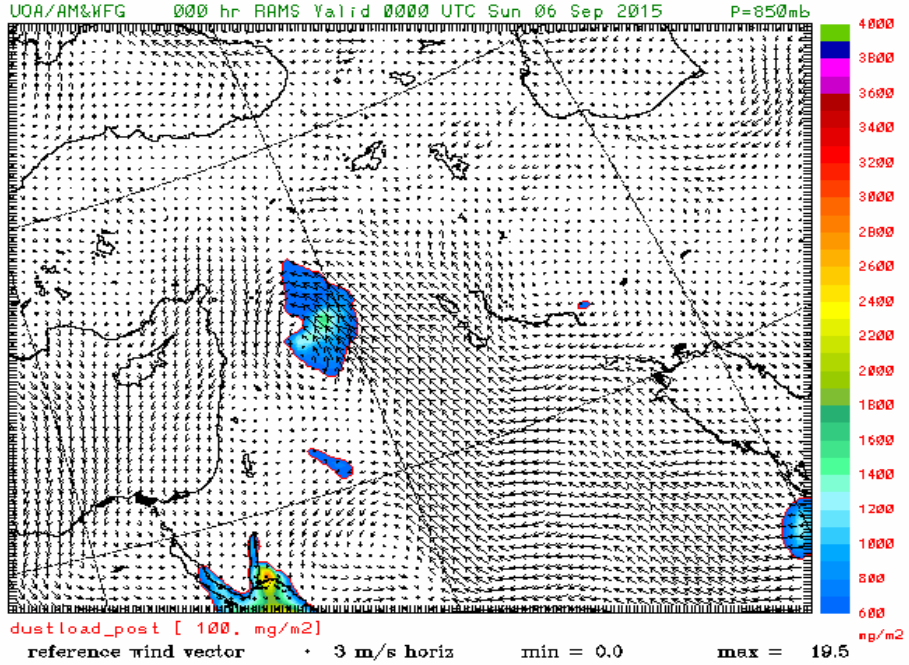
Convective clouds generate wind downdrafts and mobilize **dust**

clouds

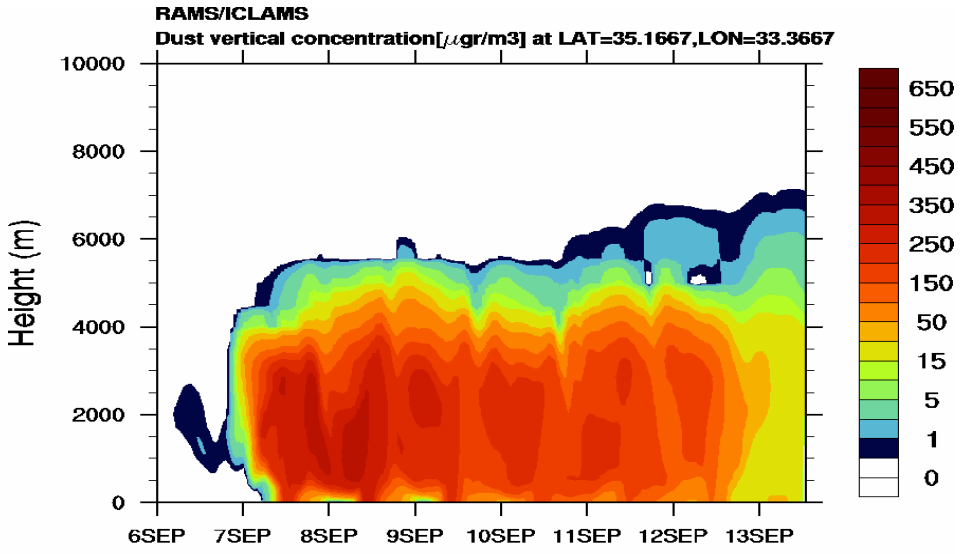
dustload

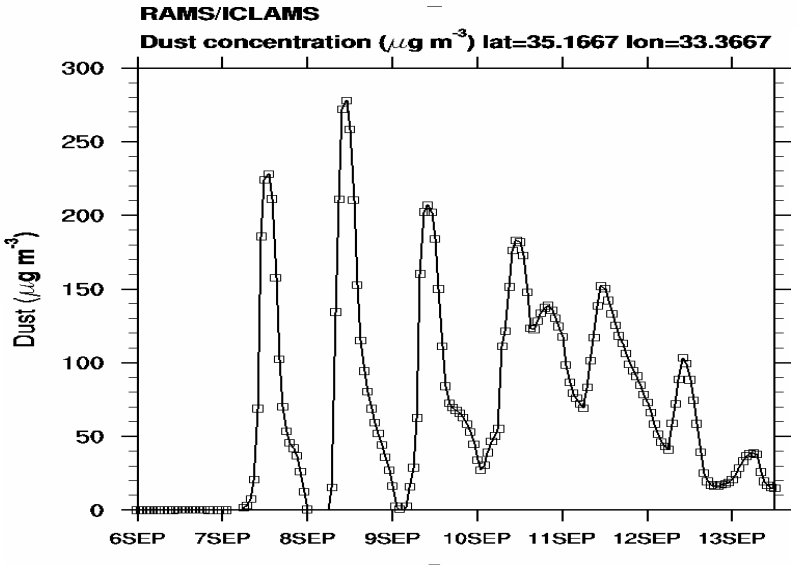
>3000 µg/m^3

RAMS/ICLAMS simulation



Transport of dust over
east Mediterranean.
Dustload (mg/m²) color scale.





Conclusions

Record DUST outbreak towards CYPRUS September 2015

- A unique dust outbreak documented using satellite, lidar and surface observations;
- Extreme dust event with AOT values of the order of 5-10 occurred in the Eastern Mediterranean region;
- True maximum dust load (>10000μg/$m^{3)}$ estimated from visibility observations;
- Under extreme conditions in situ PM_{10} observations considerably underestimate dust load (due to presence of particles with diameter larger than 10μm;
- Dust transport modelling can be improved when convective clouds formation is taken into account.

THANK YOU FOR YOUR ATTENTION

ΕΥΧΑΡΙΣΤΩ ΓΙΑ ΤΗΝ ΠΡΟΣΟΧΗ ΣΑΣ

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BSC/DREAM8b and NMMB/BSC-Dust model simulations