

Proprietà ed effetti radiativi dell'aerosol desertico nel Mediterraneo

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Bilancio radiativo

Bilancio energetico alla superficie

Processi fotochimici

Processi di chimica eterogenea

Qualità dell'aria/effetti sulla salute

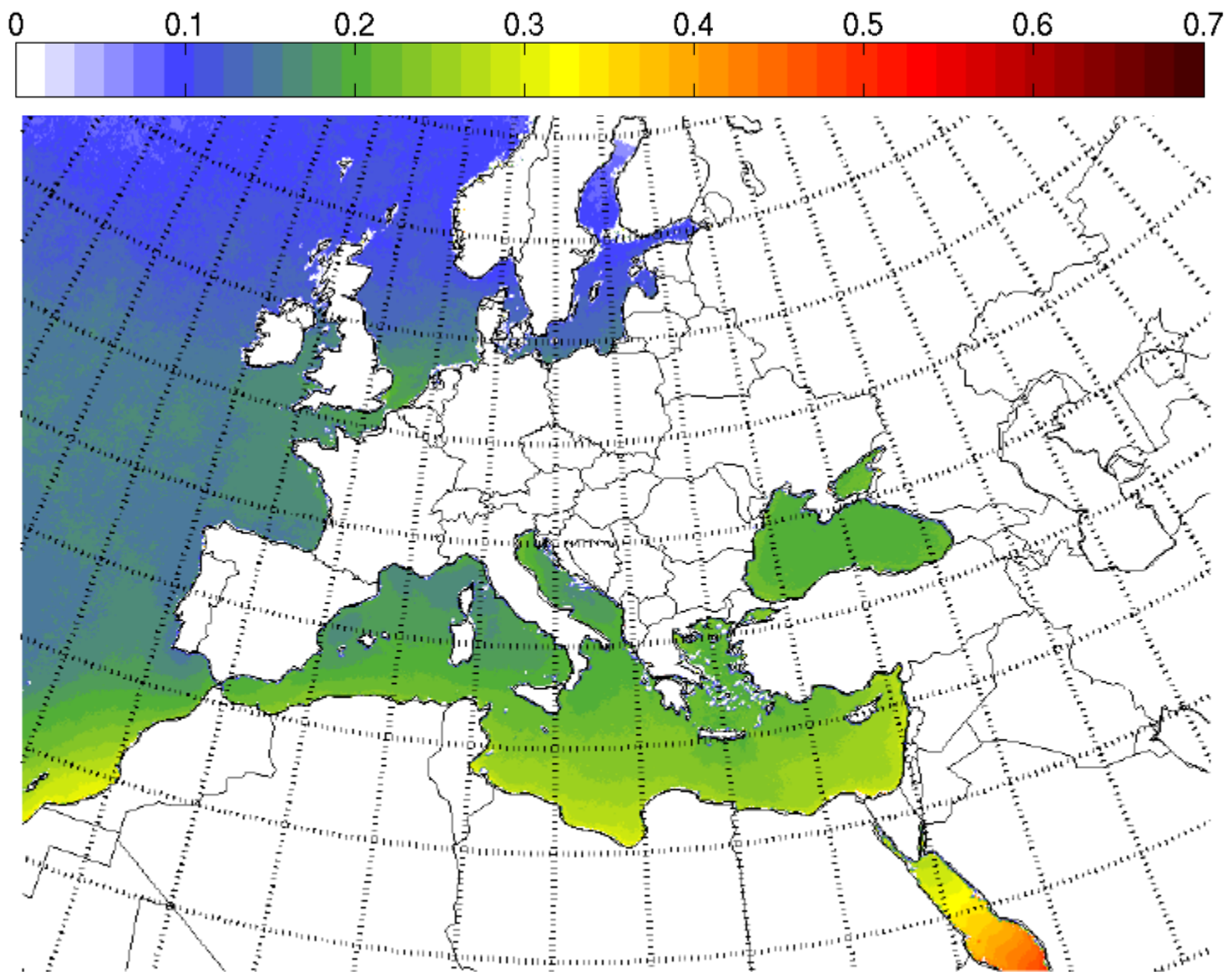
Fertilizzazione

Struttura termica e dinamica dell'atmosfera

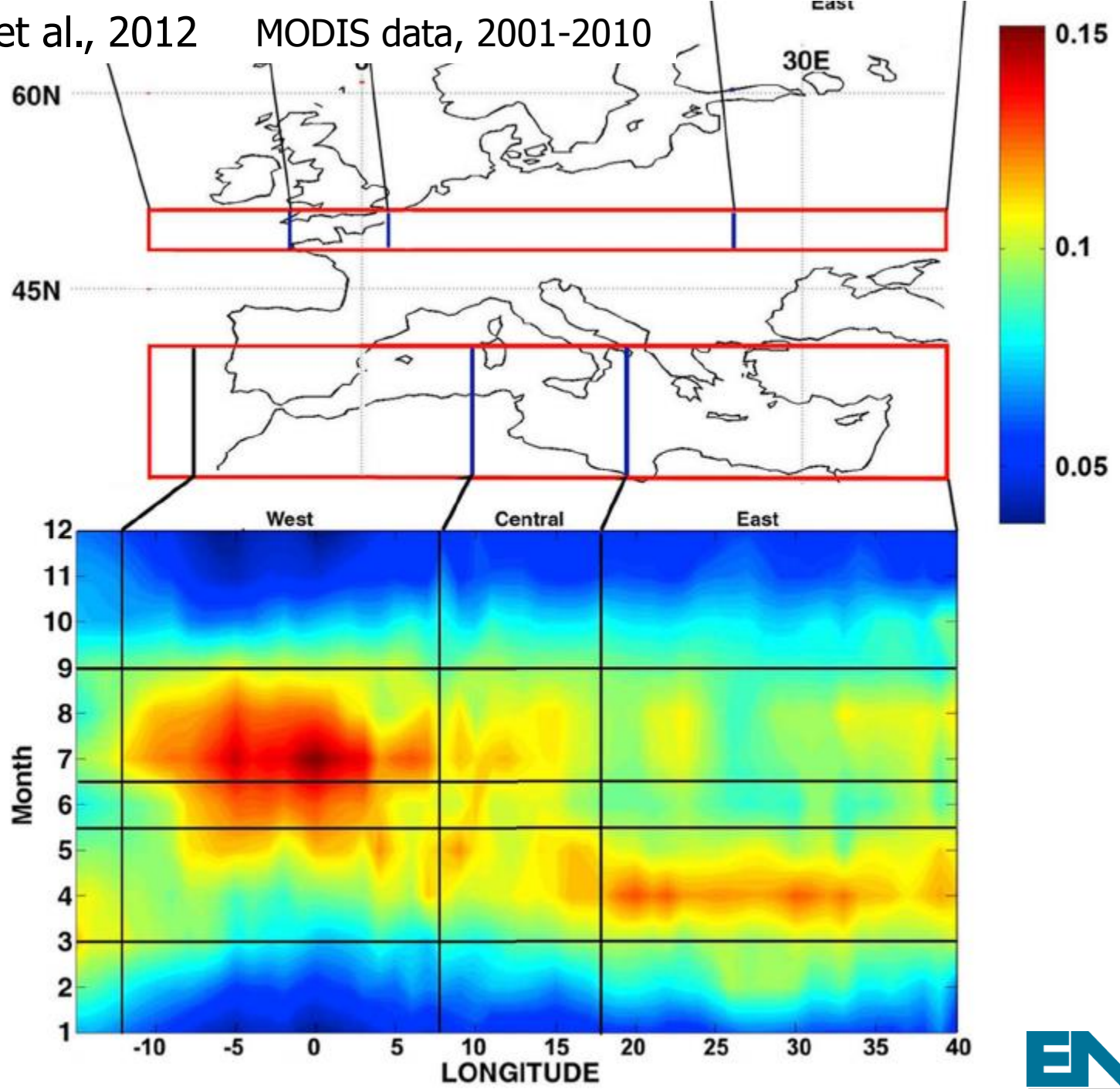
Proprietà delle nubi

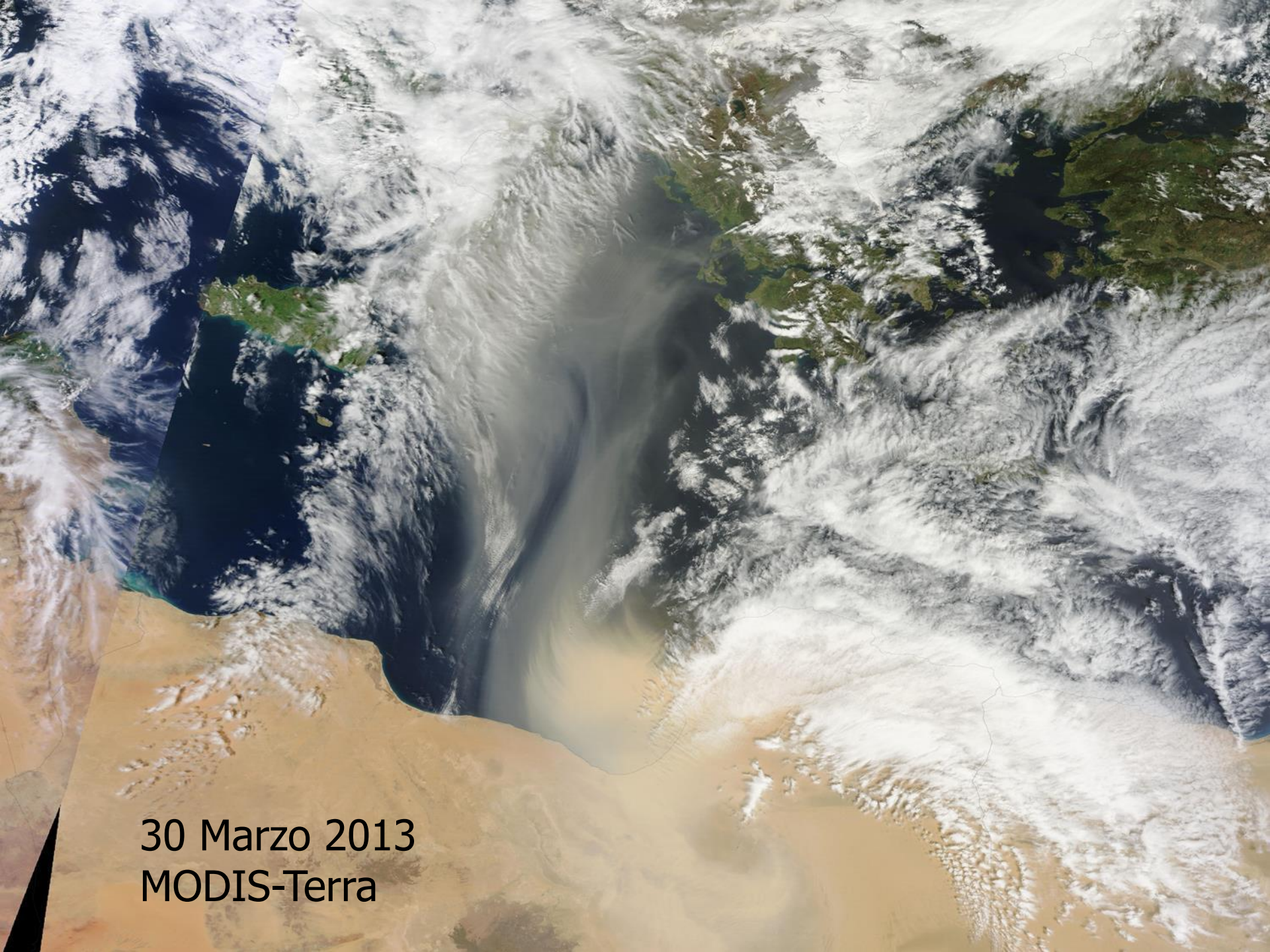
Sistemi convettivi/uragani

...



(h) - MSG/SEVIRI (2006-2010)



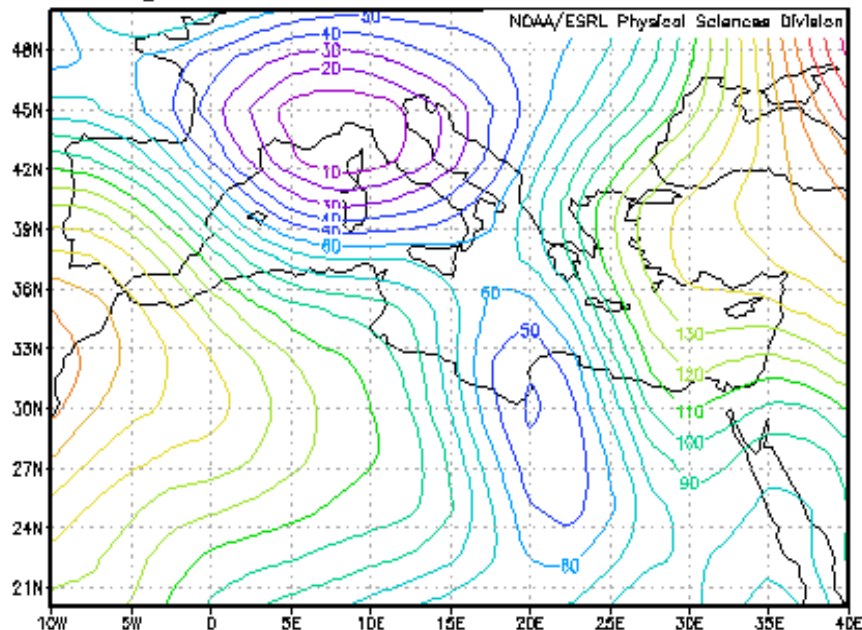


30 Marzo 2013
MODIS-Terra

lon: plotted from -10 to 40.0
lat: plotted from 20.00 to 50.00
lev: 1000.00
t: Mar 30 2013

1000 mb

Mean hgt m

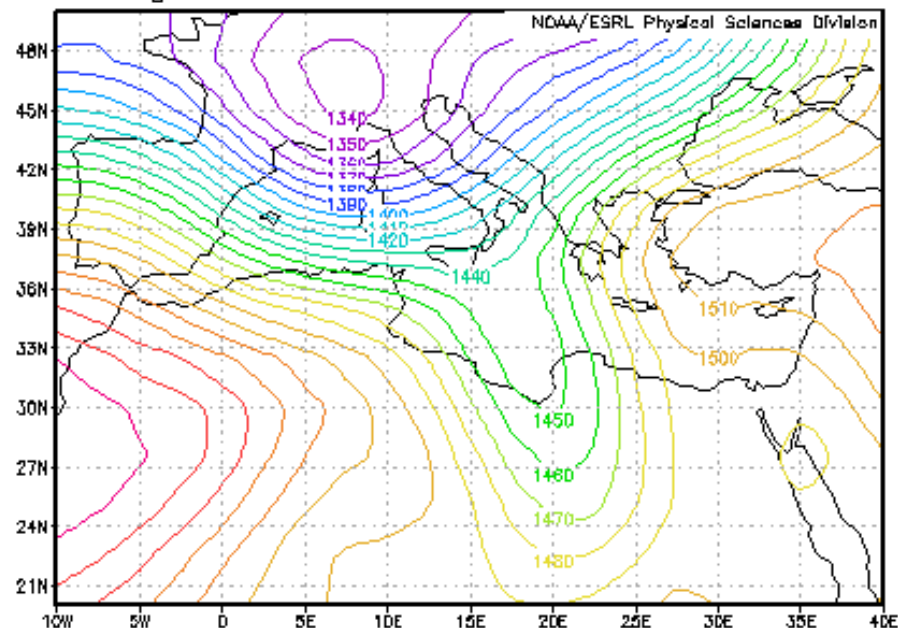


NOAA/ESRL Physical Sciences Division
NCEP Reanalysis Daily Averages Pressure Level GrADS image
MAX=140
MIN=1

lon: plotted from -10 to 40.0
lat: plotted from 20.00 to 50.00
lev: 850.00
t: Mar 30 2013

850 mb

Mean hgt m

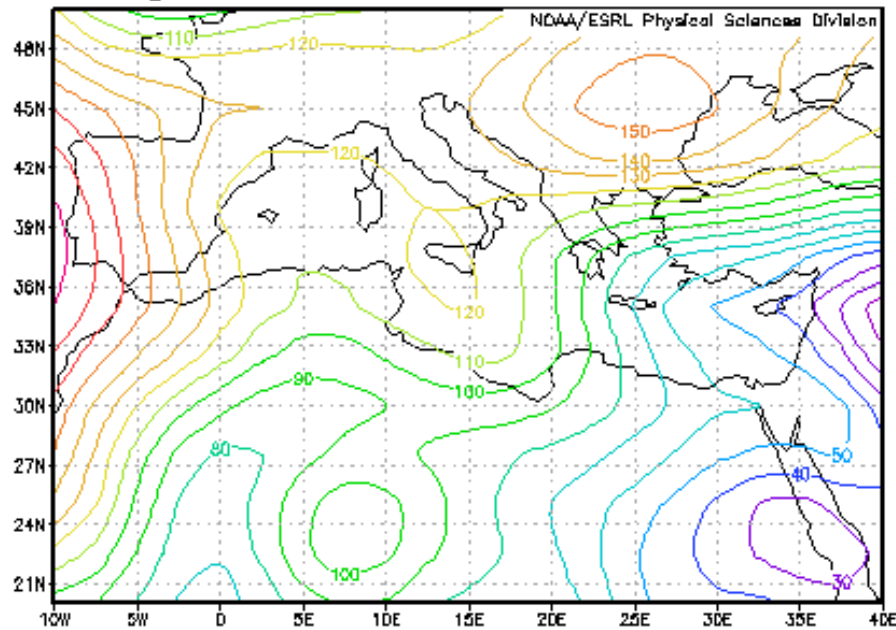


NOAA/ESRL Physical Sciences Division
NCEP Reanalysis Daily Averages Pressure Level GrADS image
MAX=1510
MIN=1337

lon: plotted from -10 to 40.0
lat: plotted from 20.00 to 50.00
lev: 1000.00
t: Jul 29 2005

1000 mb

Mean hgt m

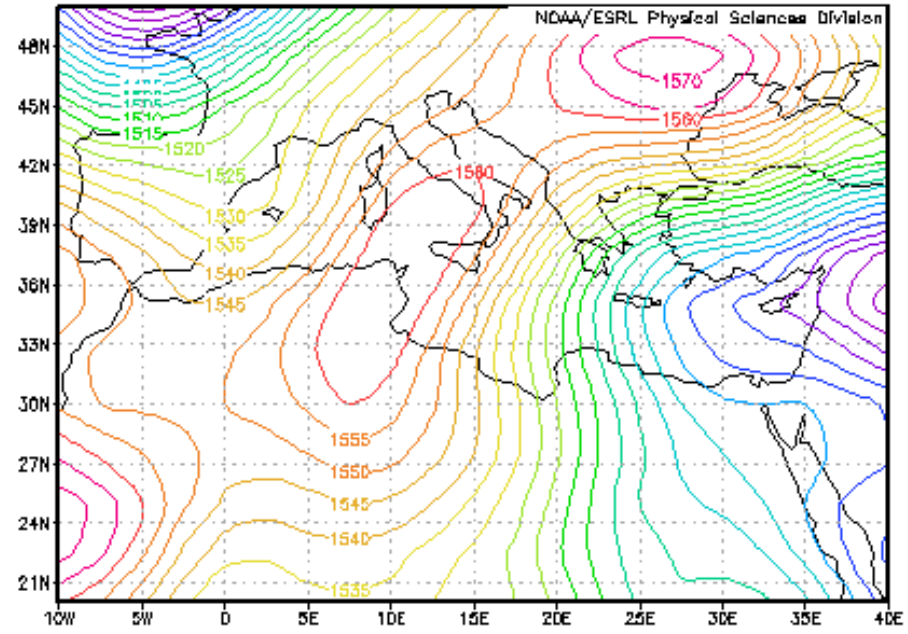


MAX=150
MIN=4
NCEP Reanalysis Daily Averages Pressure Level GrADS image

lon: plotted from -10 to 40.0
lat: plotted from 20.00 to 50.00
lev: 850.00
t: Jul 29 2005

850 mb

Mean hgt m



MAX=1580
MIN=1452
NCEP Reanalysis Daily Averages Pressure Level GrADS image



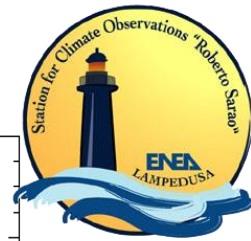
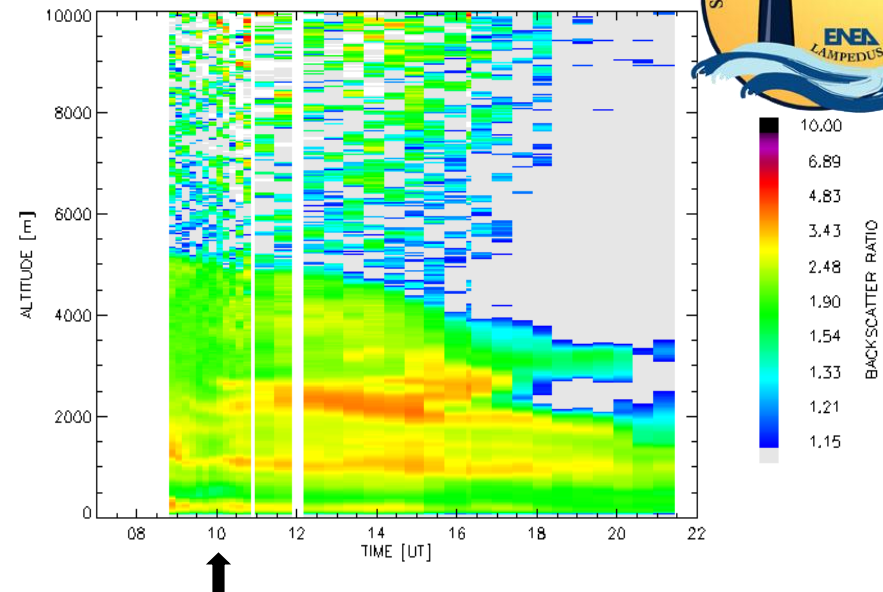
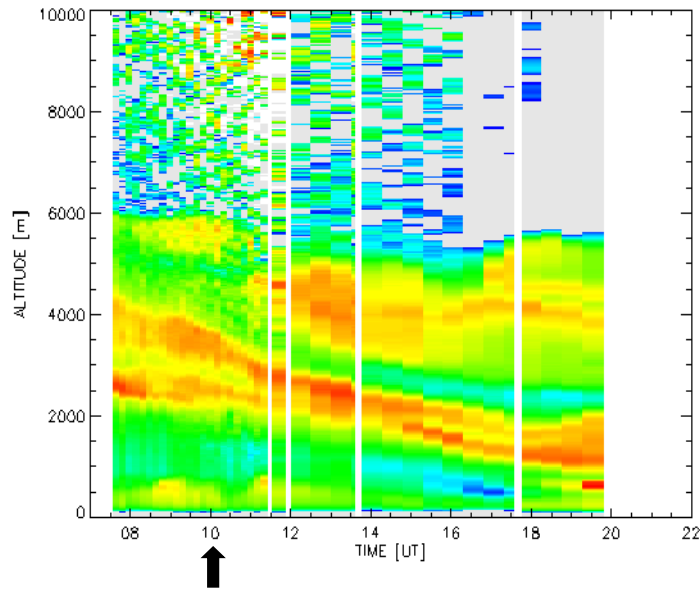
29 Luglio 2005
MODIS-Terra

Meloni et al., 2004

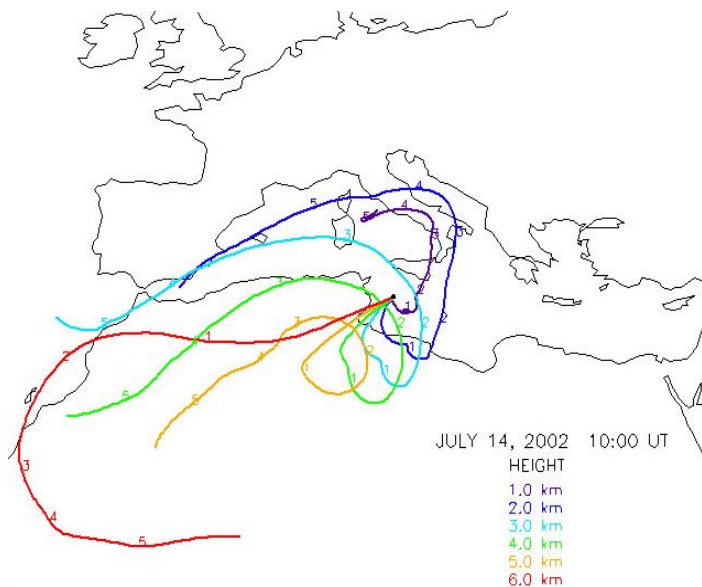
14 Luglio 2002

Lidar backscatter ratio

16 Luglio 2002



HYSPLIT transport and dispersion model, NOAA Air Resources Laboratory (ARL)



AOD (500 nm)
= 0.227

14 Luglio

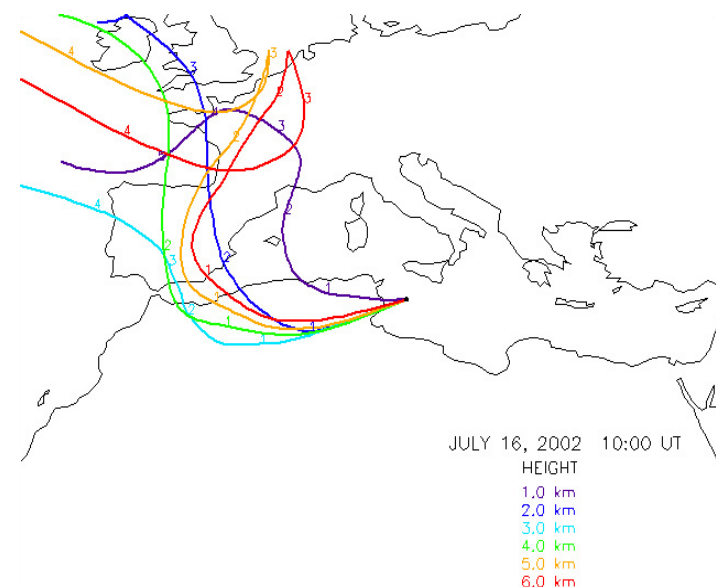
$\alpha = 0.080$

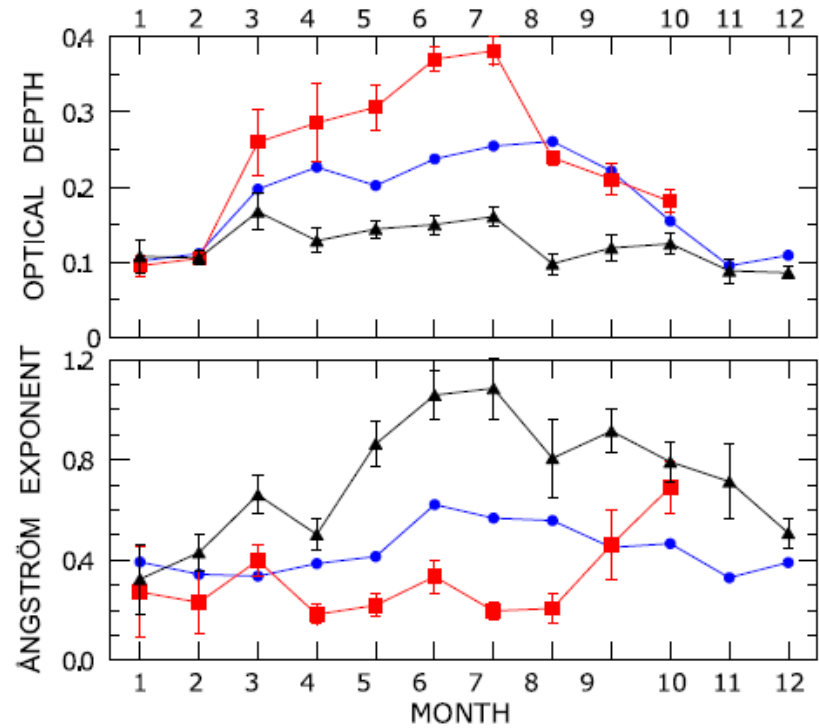
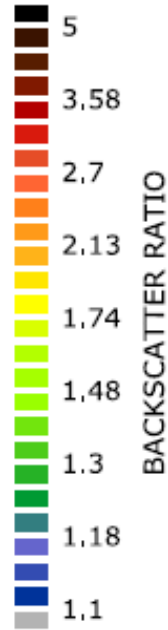
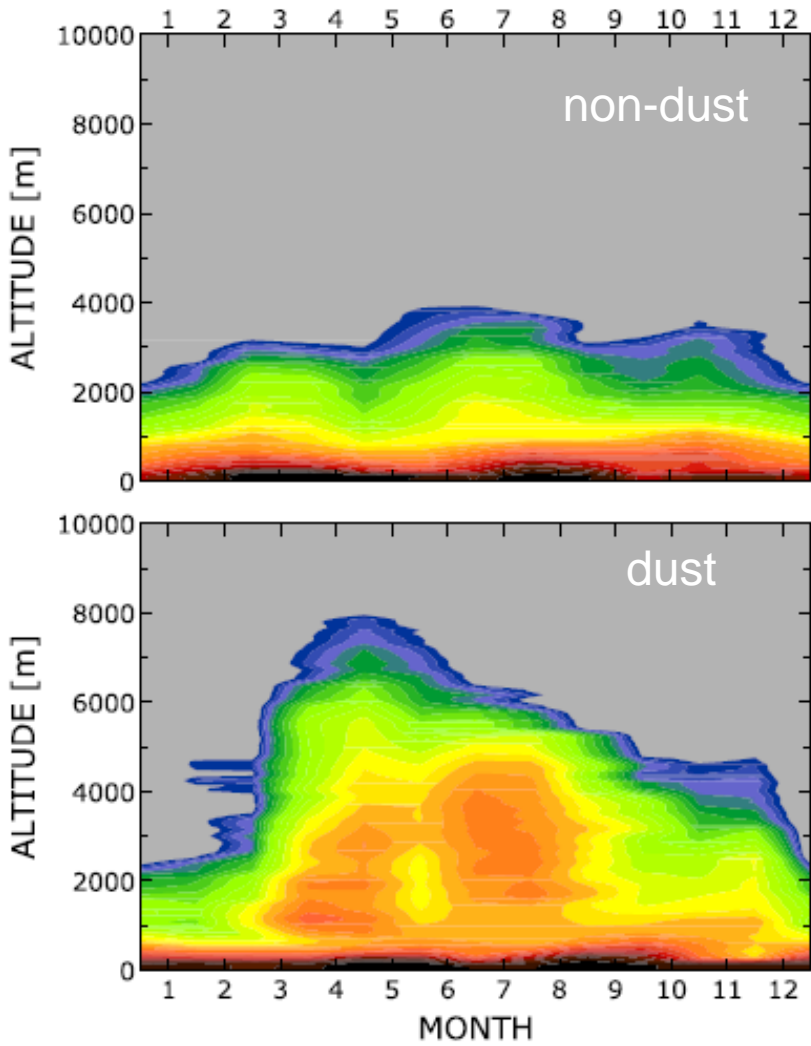
$\delta = 0.46-0.56$

16 Luglio

$\alpha = 0.70$

$\delta = 0.25-0.47$

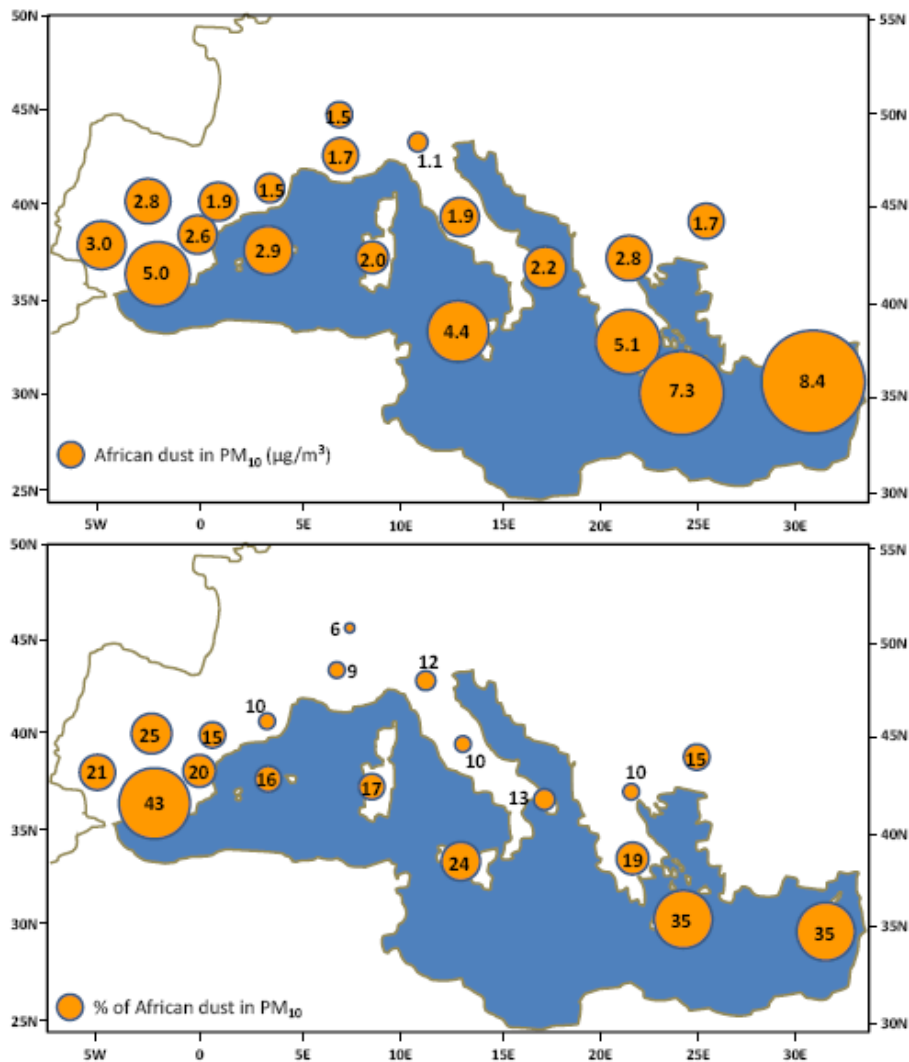




1999-2008

Di Iorio et al., 2009





Pey et al., 2013

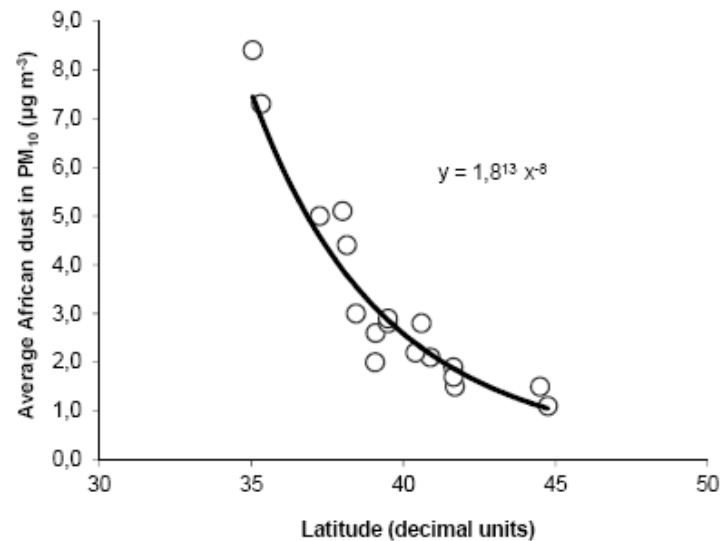
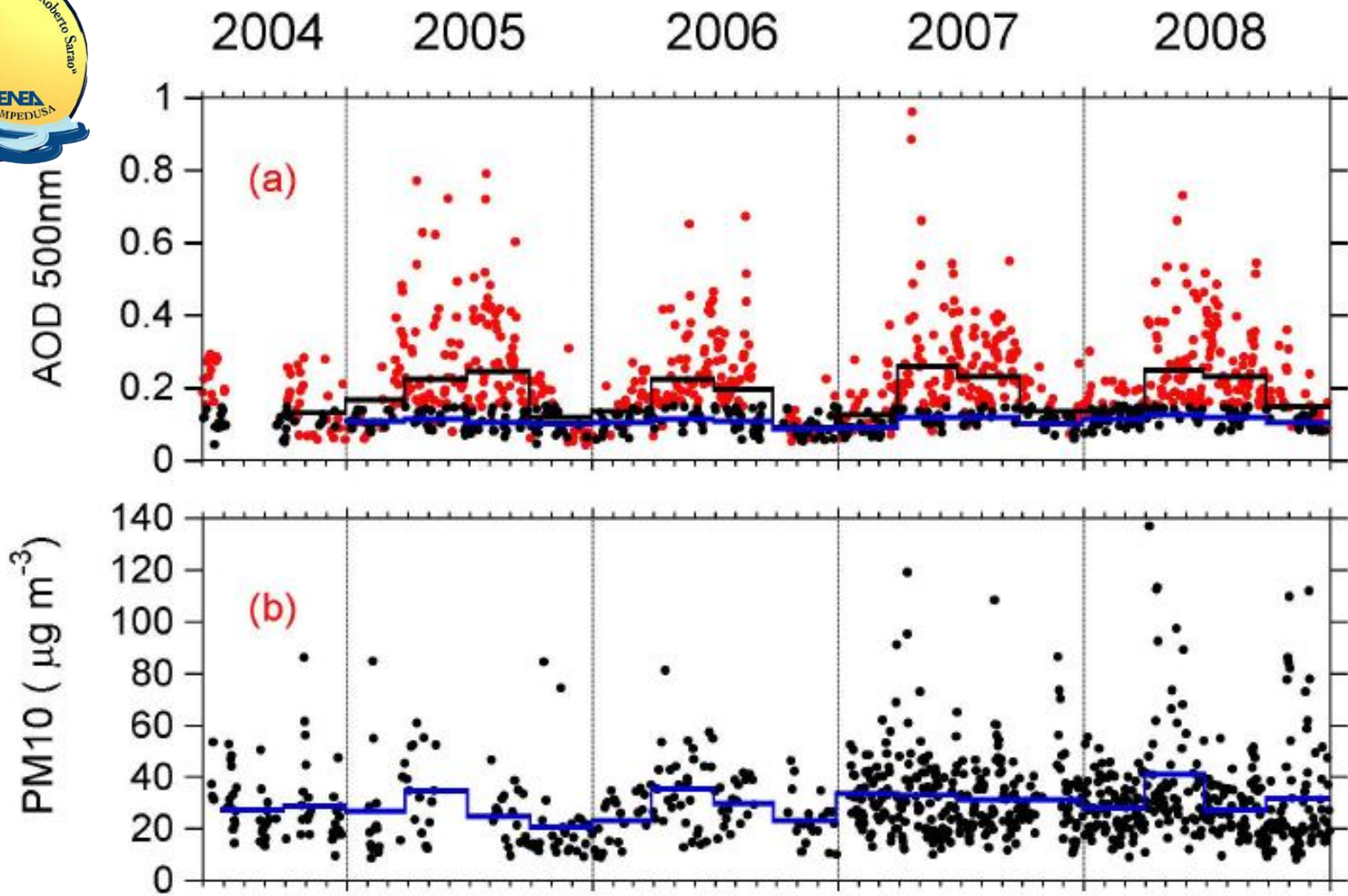
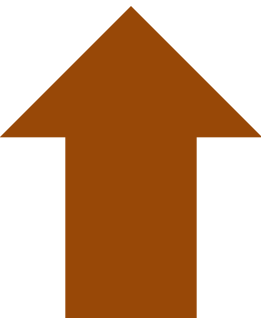
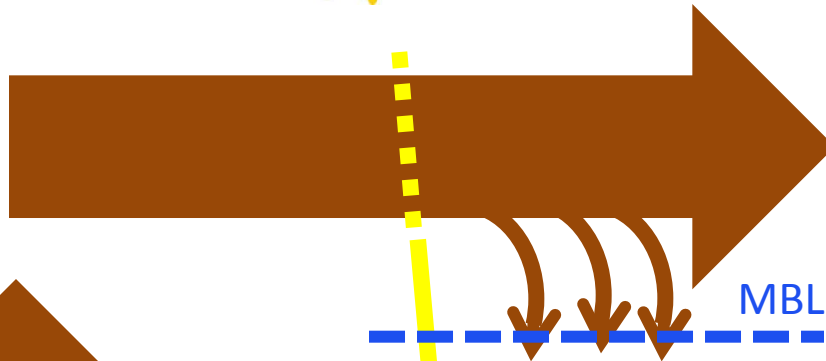


Fig. 5. (a) Top: mean African dust contributions to PM₁₀ (in µg m⁻³) across the Mediterranean (average values for the periods when data are available, in most cases from 2001–2010); **(b)** bottom: percentage of African dust over bulk PM₁₀ registered in the monitoring sites selected in this study (average values for the periods when data are available, in most cases from 2001–2010).

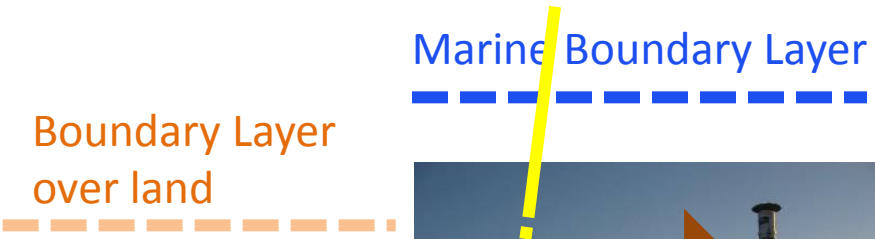


Becagli et al., 2012

Estate



Inverno

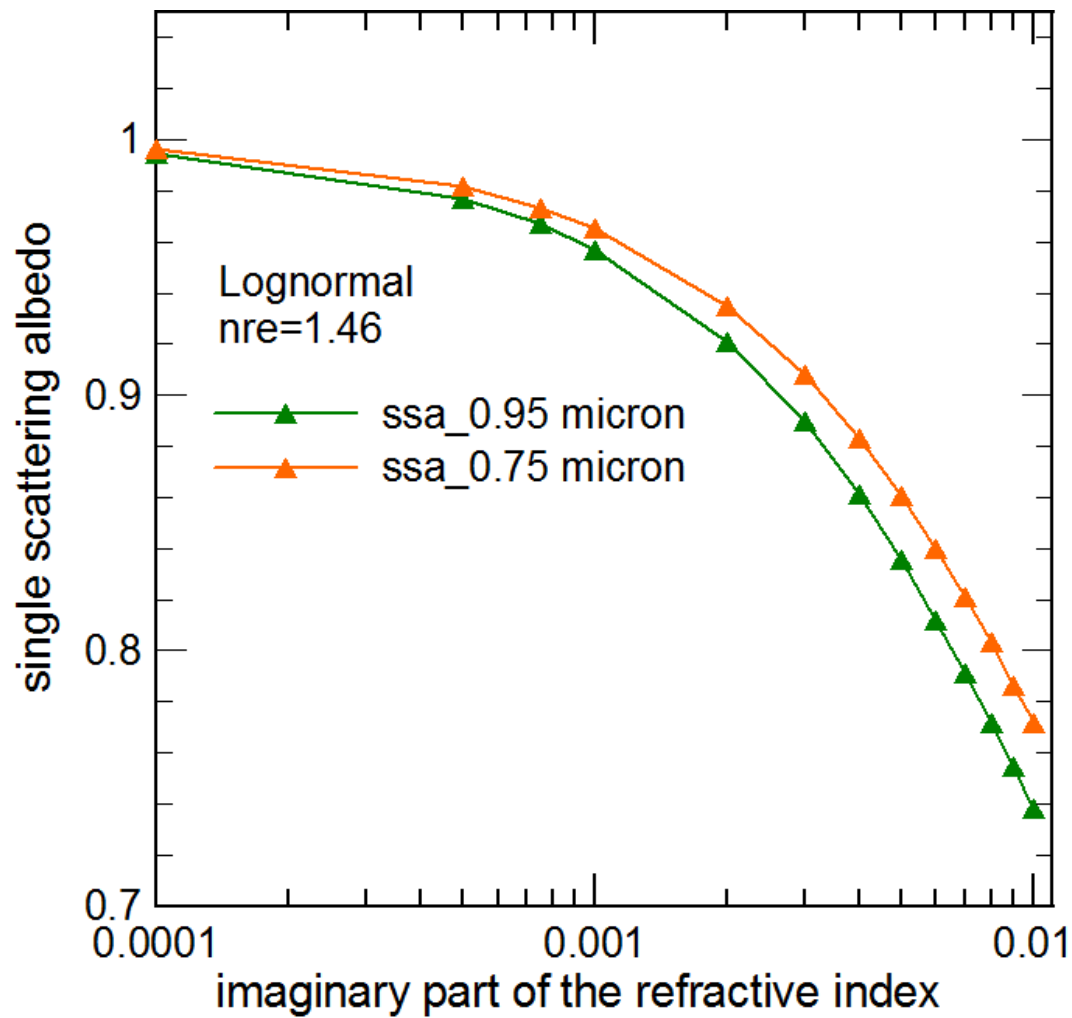


Forcing radiativo

$$\Delta F = F^{n,s} - F^n$$

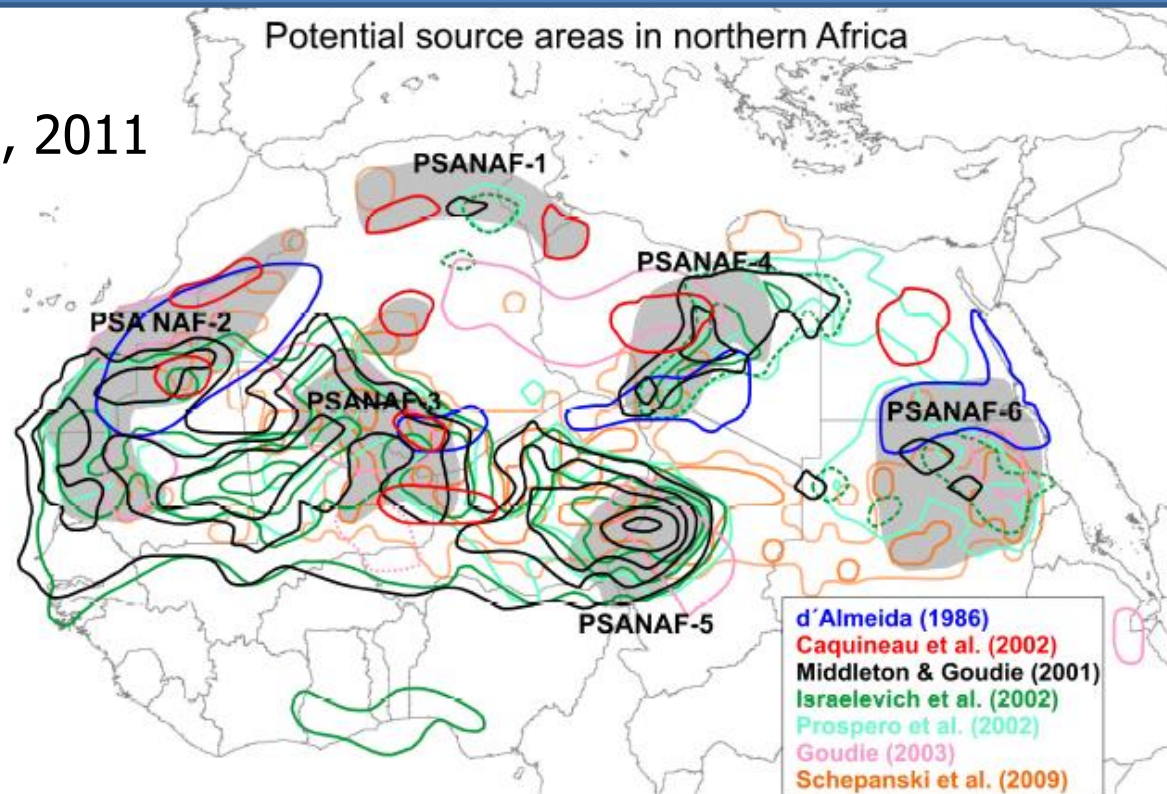
$$\frac{dL_\lambda}{\beta_\lambda ds} = \frac{dL_\lambda(\tau_s, \theta, \varphi)}{d\tau_s(\theta, \varphi)} = -L_\lambda(\tau_s, \theta, \varphi) + \bar{\omega}_0(\tau_s) \tilde{J}_{\lambda,sc}(\tau_s, \theta, \varphi) + [1 - \bar{\omega}_0(\tau_s)] L_\lambda^*(\tau_s)$$

$$\tilde{J}_{\lambda,sc}(\tau_s, \theta, \varphi) = \frac{1}{4\pi} \int_0^{2\pi} d\varphi' \int_0^\pi d\theta' \sin \theta' p_\lambda(\theta', \varphi'; \theta, \varphi) L_\lambda(\tau_s, \theta', \varphi')$$



Indice di rifrazione
Dimensione
Forma

Formenti et al., 2011

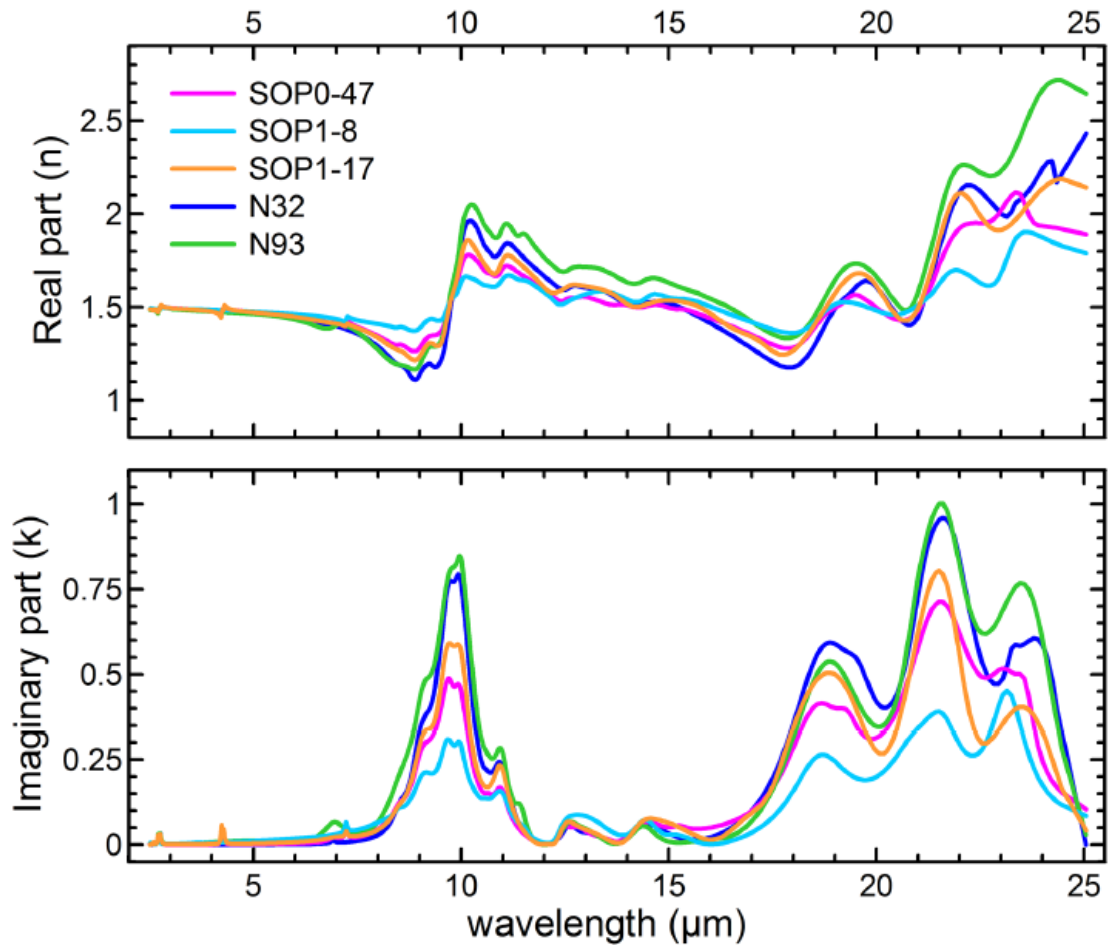
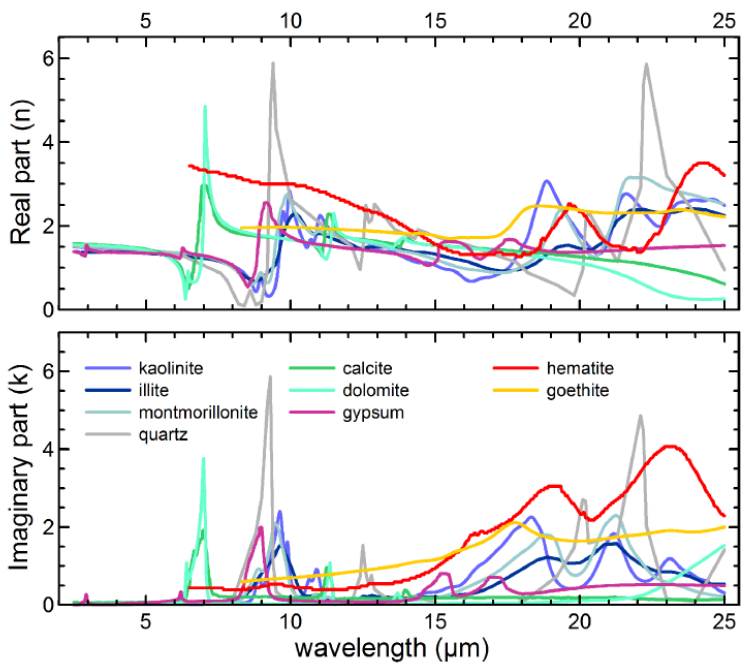


Scheuvens et al., 2013

Potential source areas in northern Africa and their bulk compositional fingerprints (see also Formenti et al., 2011); carbonate and palygorskite contents: abundant: > 30 wt.%, intermediate: 5–30 wt.%, low: 1–5 wt.%, very low: trace amounts.

Potential source area	Illite/kaolinite ratio	Chlorite/kaolinite ratio	Carbonate content [wt.%]	Palygorskite content [wt.%]	(Ca + Mg)/Fe [wt.%]/[wt.%]	⁸⁷ Sr/ ⁸⁶ Sr	ε _{Nd} (0)
PSA 1	1.0–2.0	1.5	Intermediate to abundant	Low to intermediate	No data	0.714–0.717	–13.5 to –9.5
PSA 2	> 1.6	0.0–1.0	Intermediate to abundant	Low to intermediate	0.6–12.6	0.720–0.738	–17.9 to –13.5
PSA 3	0.3–1.3	0.2–0.9	Variable	Low	0.6–1.2	(0.721–0.726)	–12.4 to –12.1
PSA 4	0.2–1.9	0.0–2.6	Low to intermediate	Not detected	No data	0.715	–15.4 to –10.7
PSA 5	0.0–0.5	Chlorite not detected	Very low	Not detected	0.4–0.7	No data	–12.7
PSA 6	0.7	No data	No data (low?)	Not detected	0.9–2.1	0.706–0.718	–11.0 to –3.9

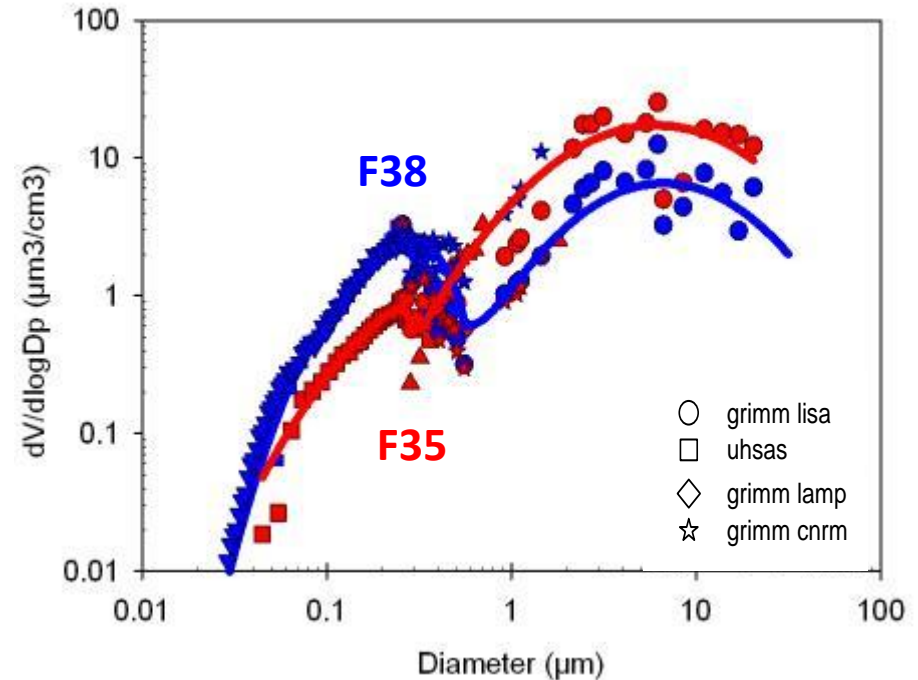
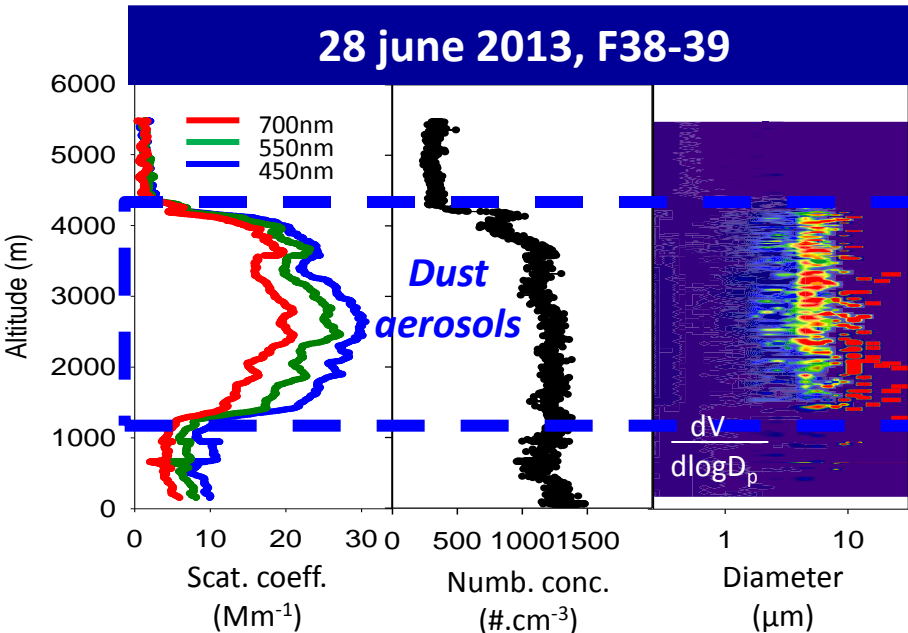
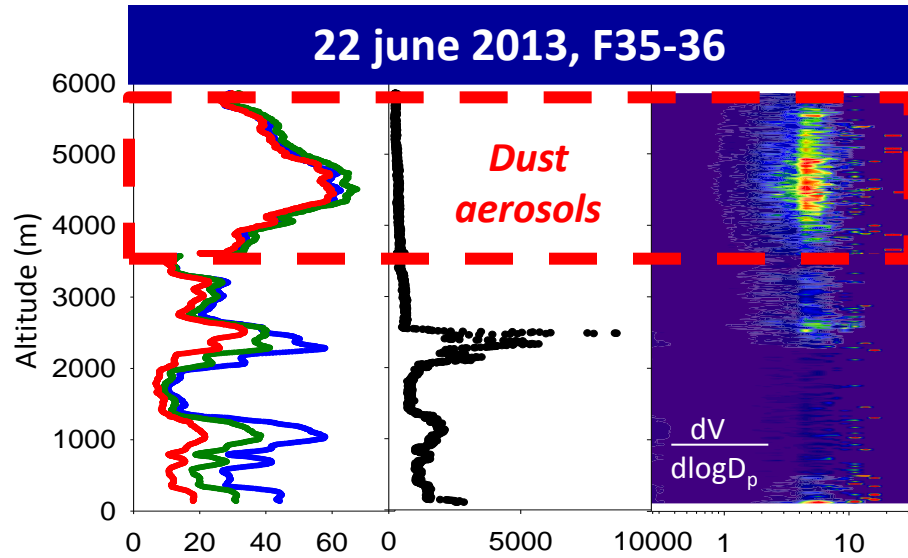
INDICE DI RIFRAZIONE



Di Biagio et al., 2014

Denjean et al., 2015

22 e 28 Giugno 2013: Trasporto dalla Tunisia a Lampedusa



→ Sorgenti vicine,
meccanismi di trasporto simili,
differenti condizioni di
mescolamento con altri tipi di
aerosol

Zhao et al., 2013

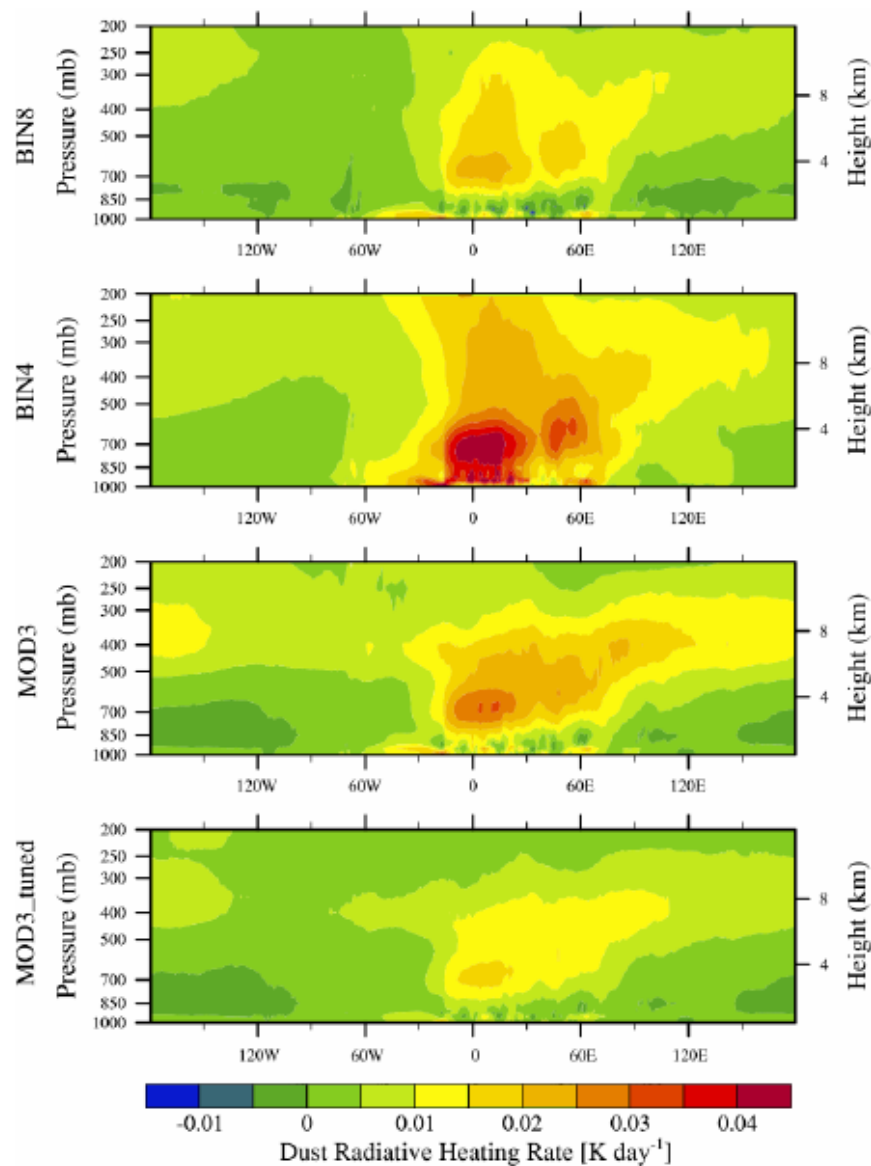
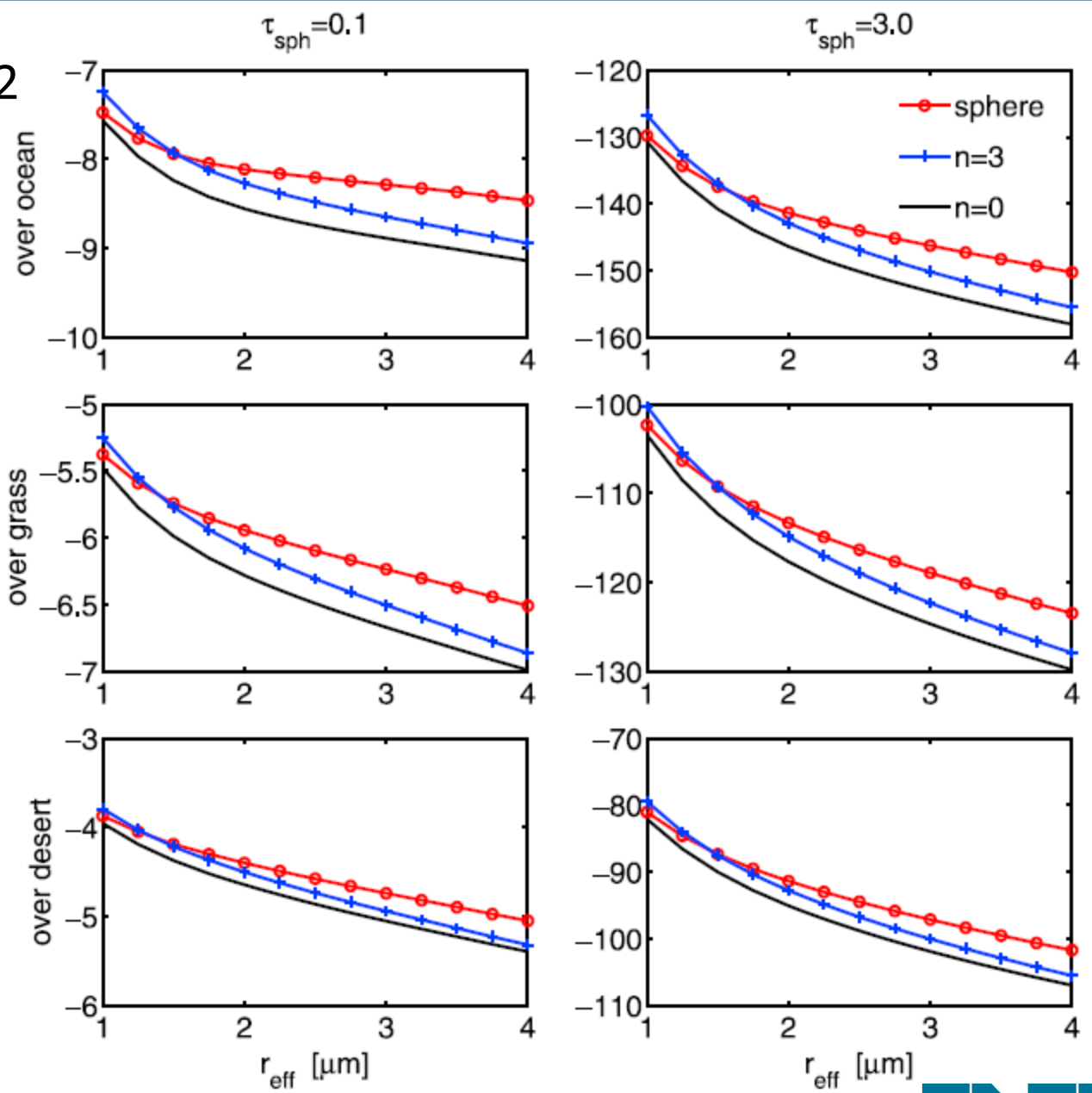
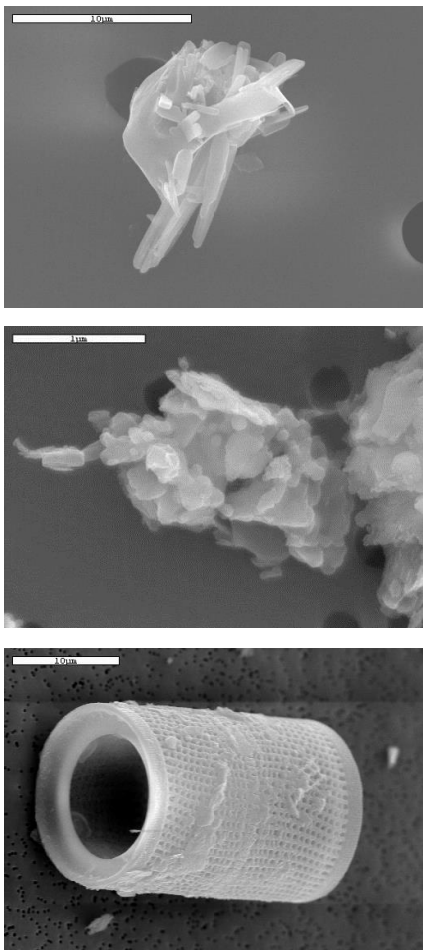


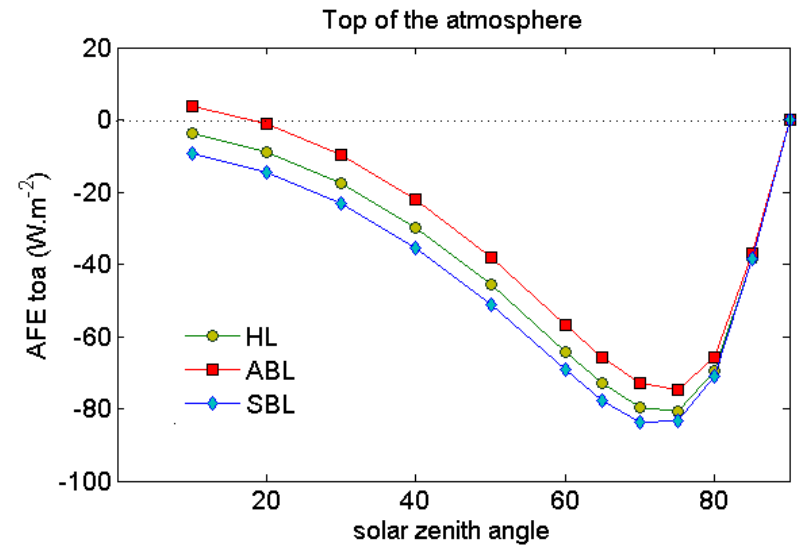
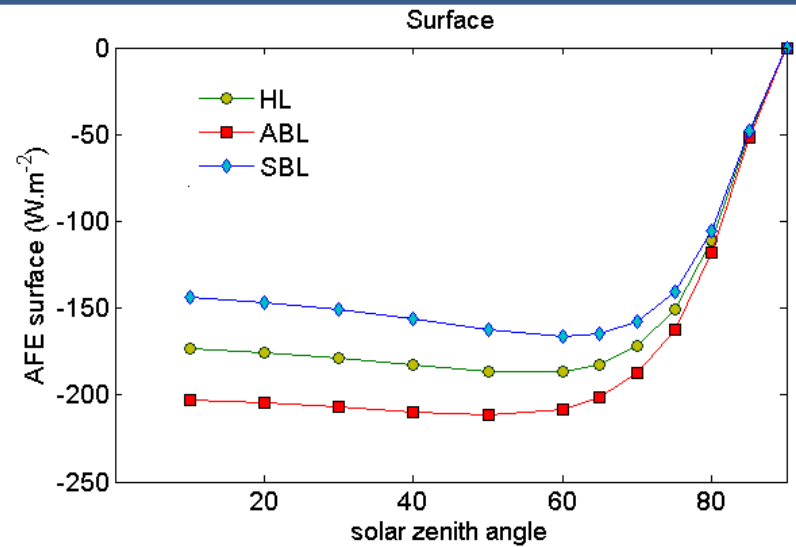
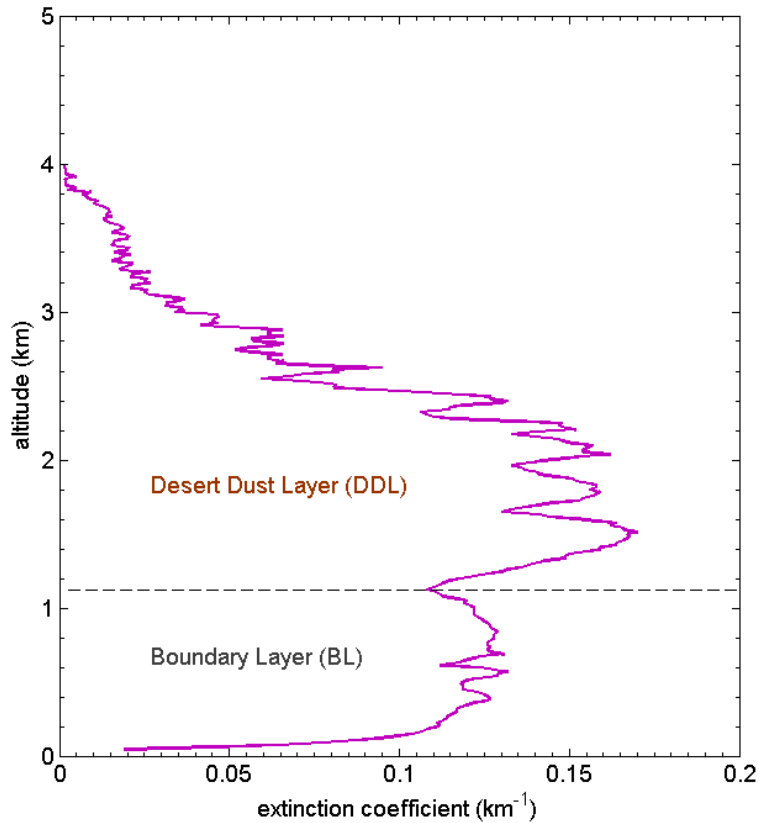
Fig. 12. Cross section of dust-induced radiative heating rate in 2011 from the WRF-Chem simulations in the cases of BIN8, BIN4, MOD3, and MOD3_tuned.

Haanpanala et al., 2012



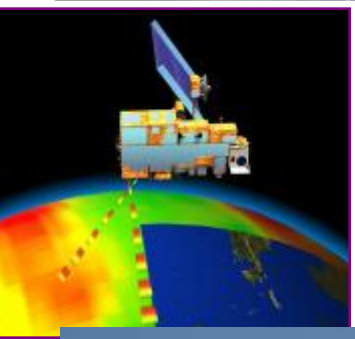
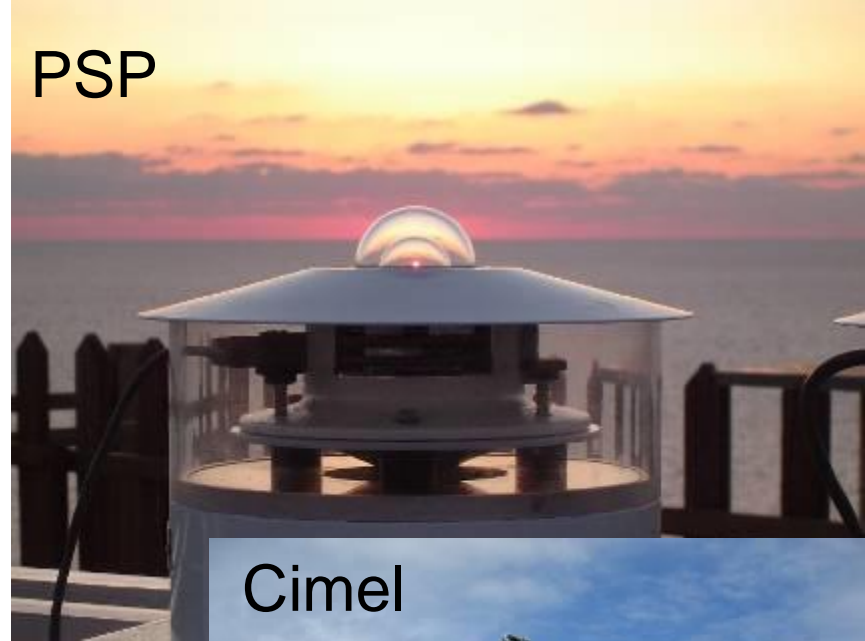
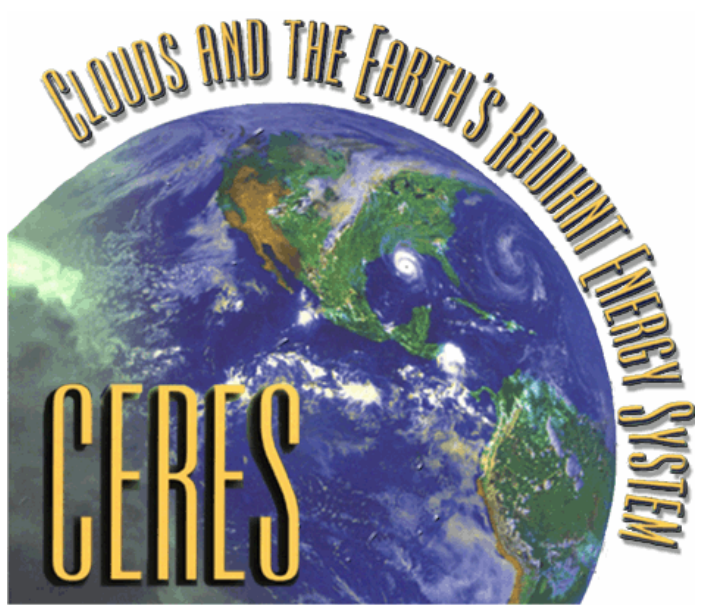
Forcing radiativo diretto alla superficie

Gomez Amo et al., 2010

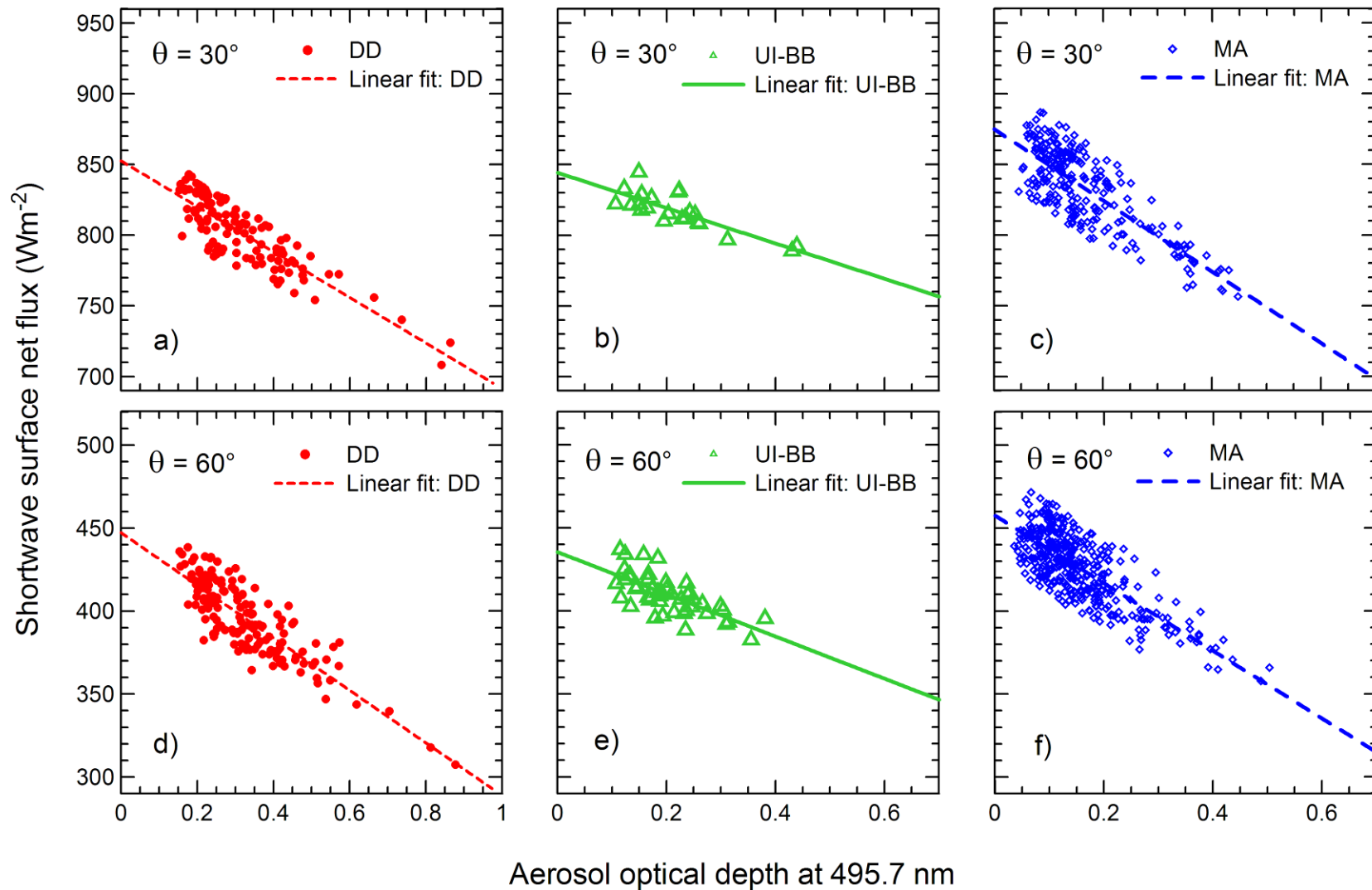


(HL-ABL)/HL (%)			(HL-SBL)/HL (%)		
surface	toa	atm	surface	toa	atm
-13	16	-22	11	-13	17

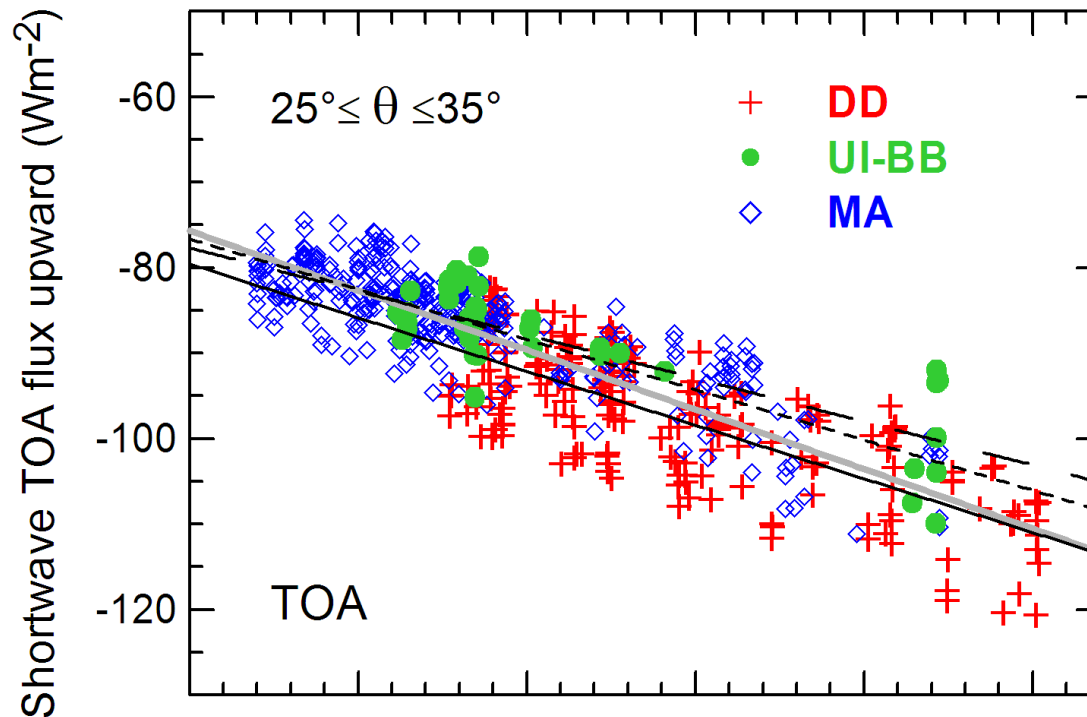
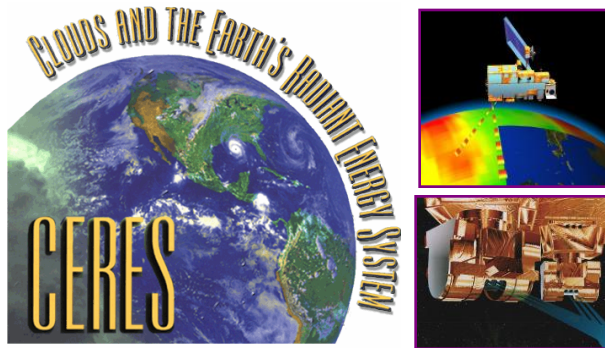
In che modo possiamo ottenere una stima corretta del *forcing* radiativo?



Efficienza di forcing alla superficie per diversi tipi di aerosol

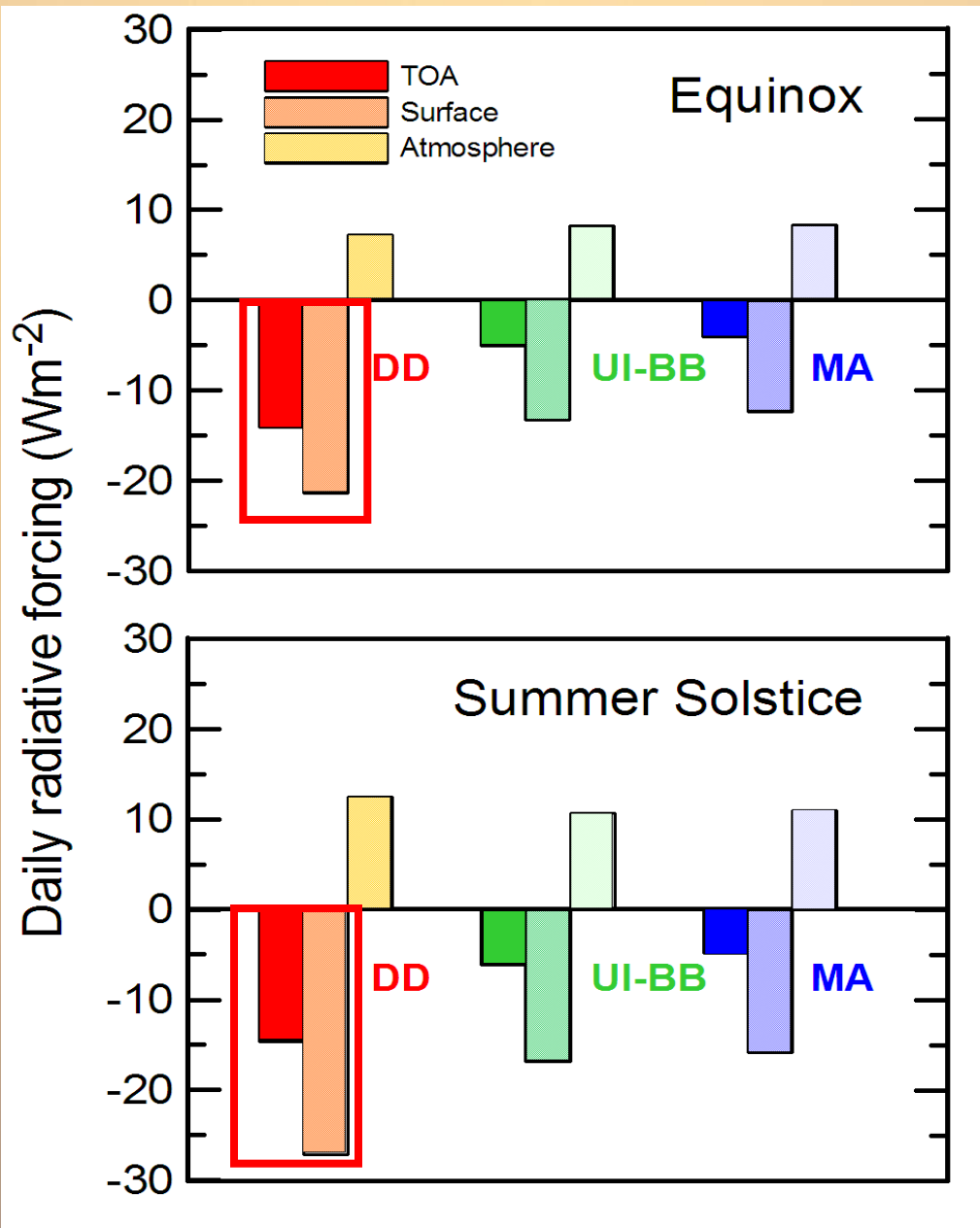


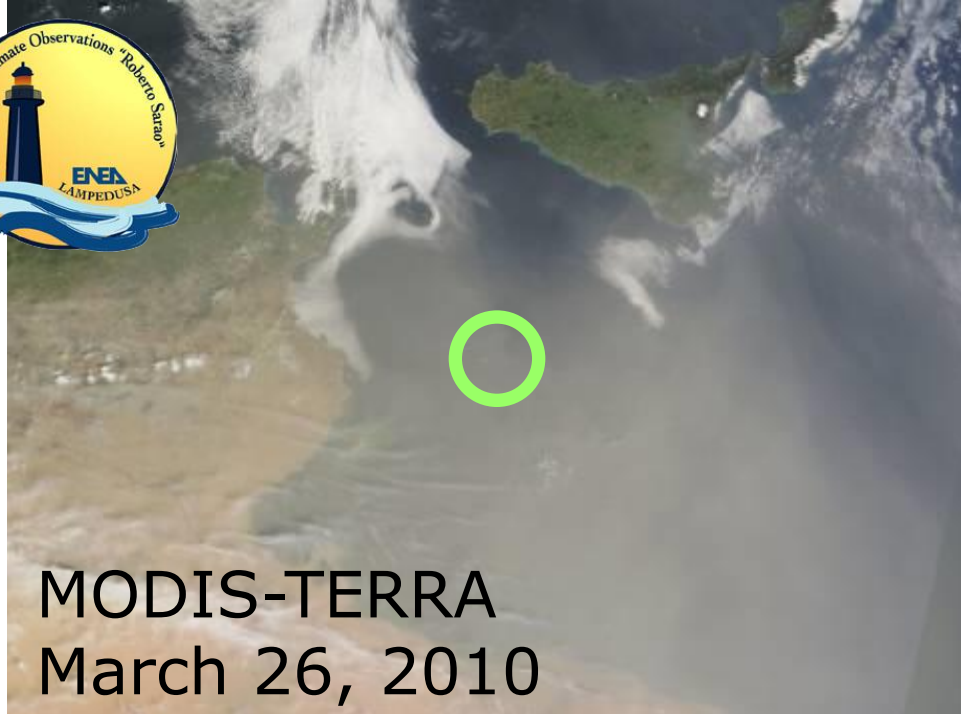
Efficienza di *forcing* alla sommità dell'atmosfera



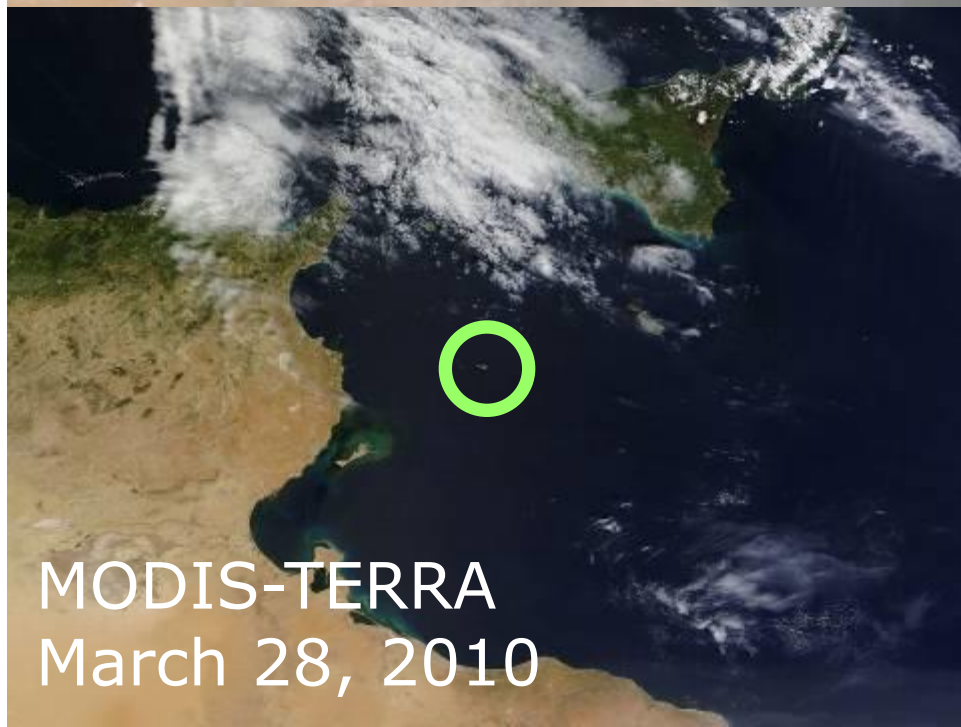
Media giornaliera del forcing radiativo degli aerosol

Di Biagio et al., 2010





MODIS-TERRA
March 26, 2010



MODIS-TERRA
March 28, 2010

March 26, 11:50 UT

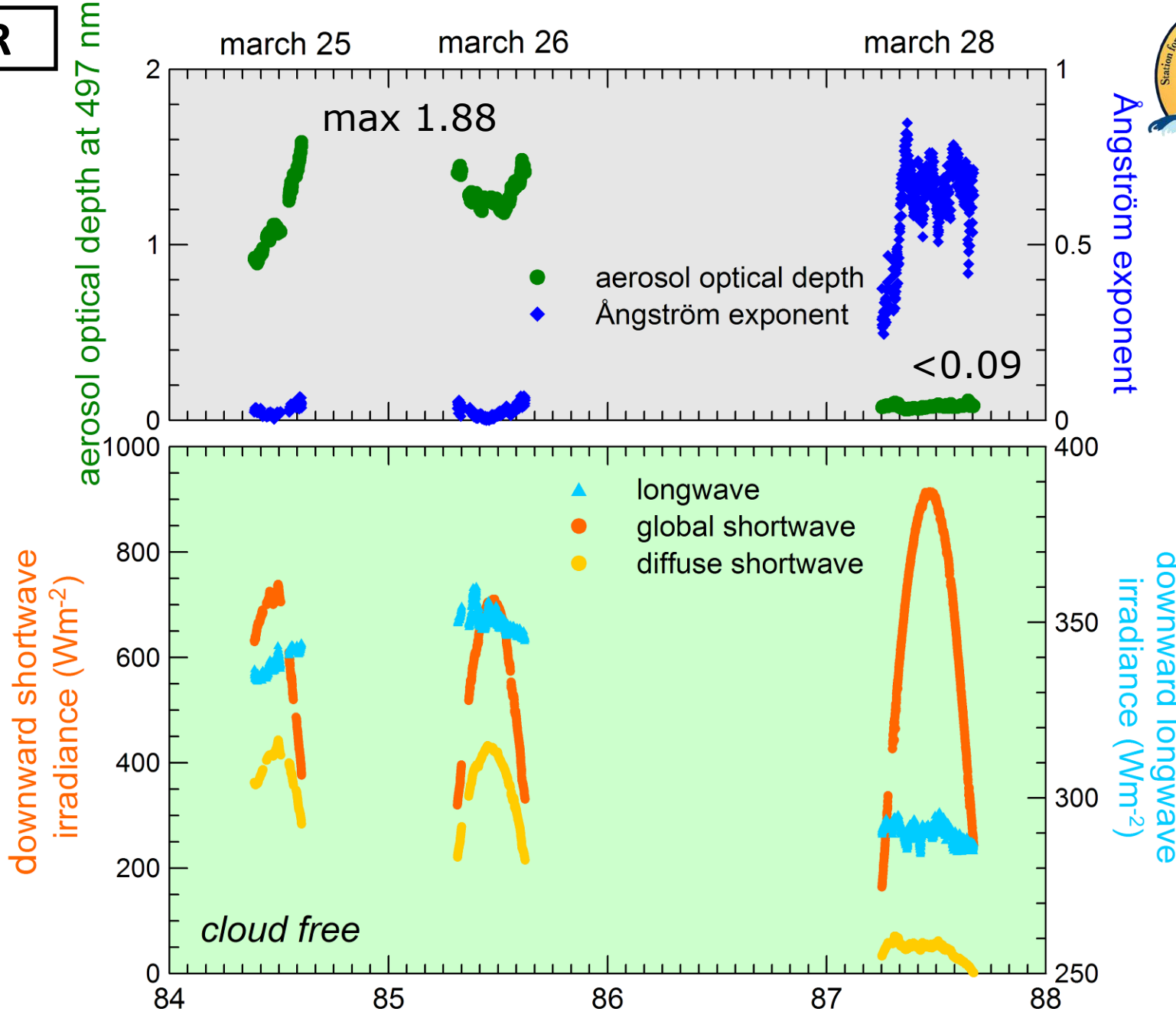


March 28, 11:50 UT



di Sarra et al., 2011

MFRSR



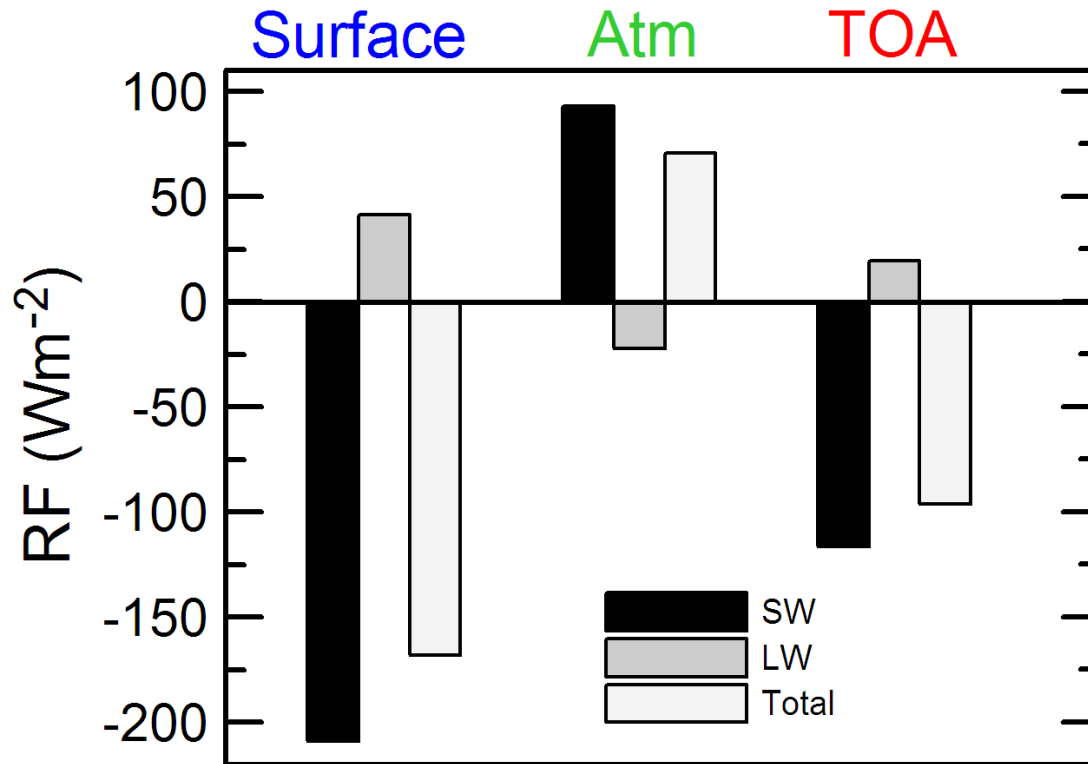
Radiometri PSP e PIR

di Sarra et al., 2011

Forcing istantaneo ad un angolo zenitale solare di 35° per il 26 Marzo 2010.

SW: misure alla superficie + CERES

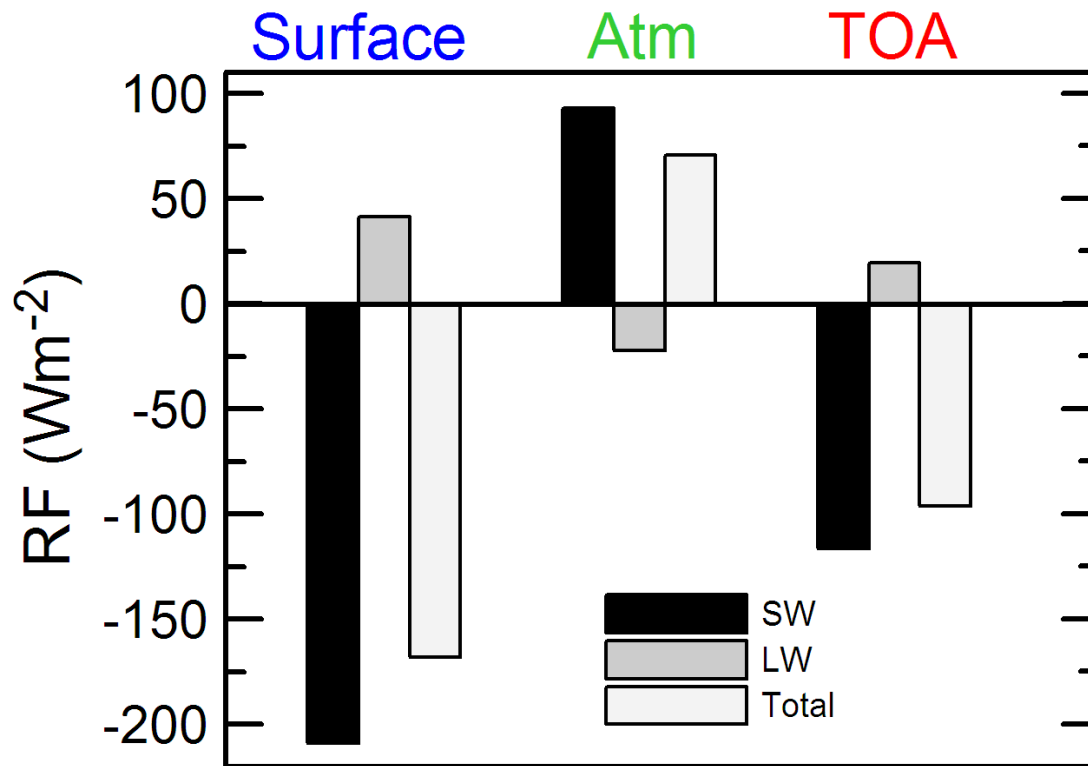
LW: modello radiativo + misure alla superficie + CERES



Forcing istantaneo ad un angolo zenitale solare di 35° per il 26 Marzo 2010.

SW: misure alla superficie + CERES

LW: modello radiativo + misure alla superficie + CERES

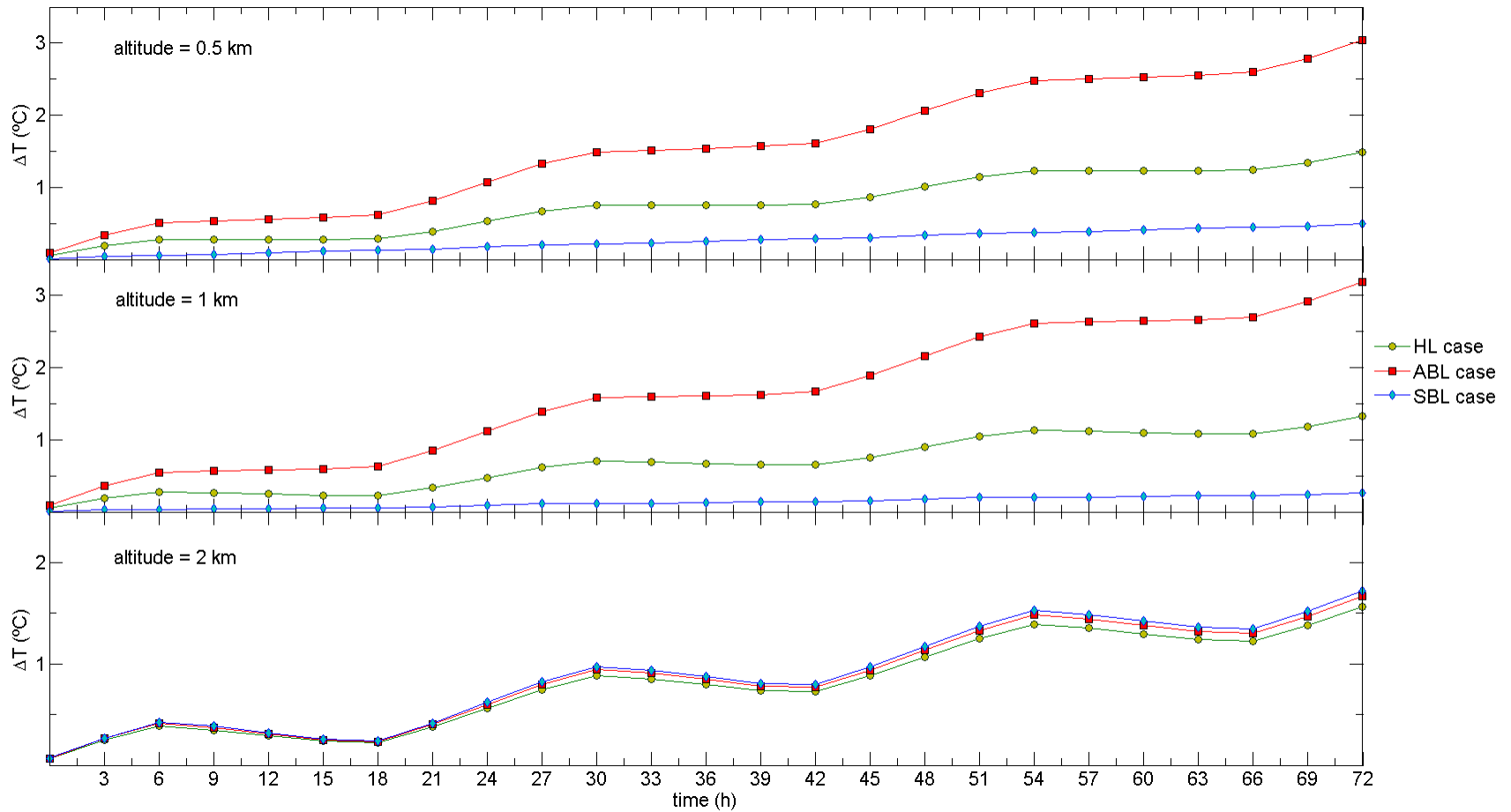


Sulla media **giornaliera**: il RF LW alla superficie è circa il 50% dello SW

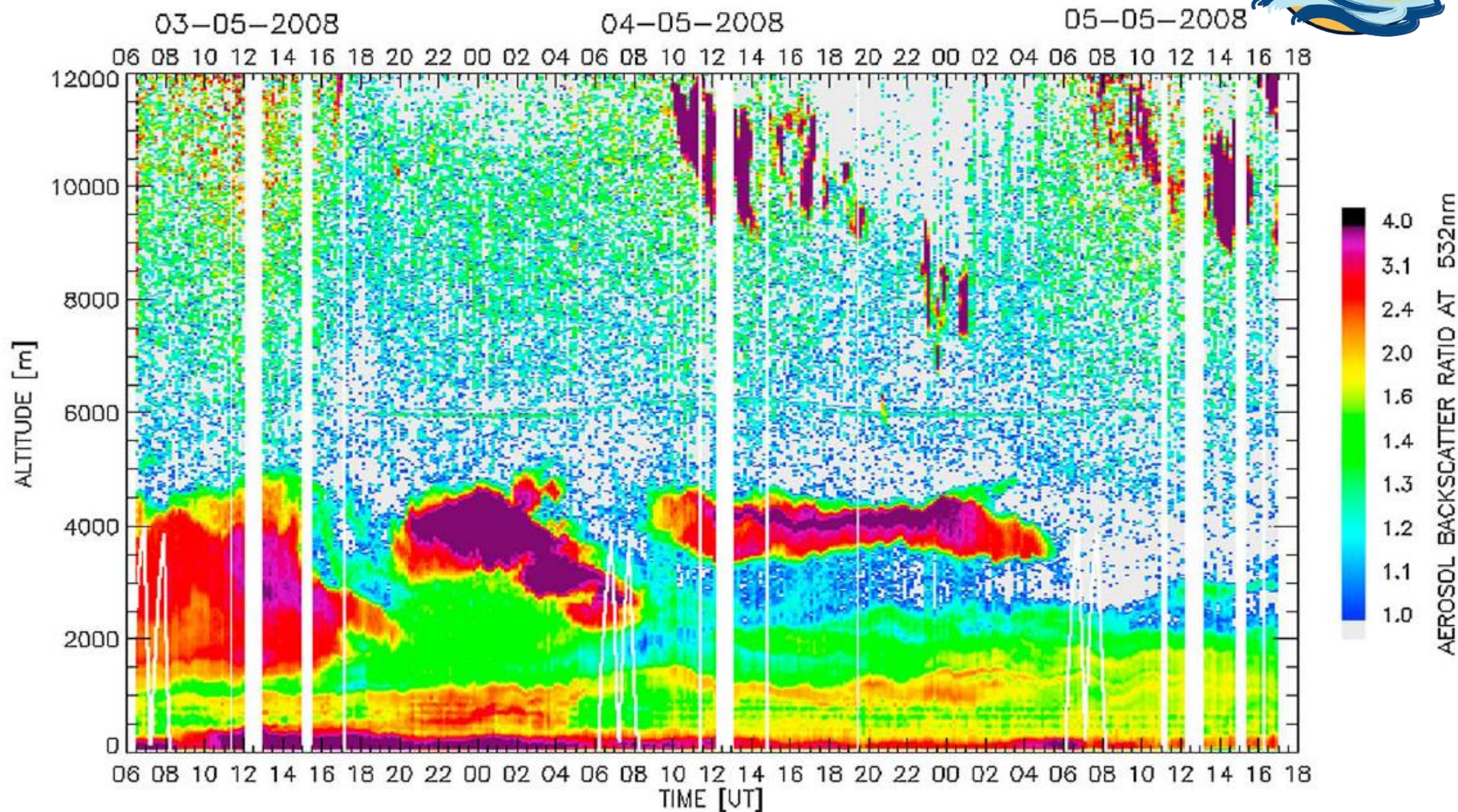
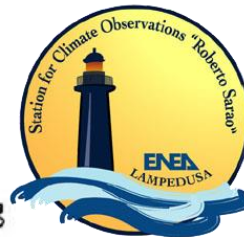
Il RF LW al TOA è circa il 40% dello SW

circa il 75% del RF atmosferico SW è compensato dal LW

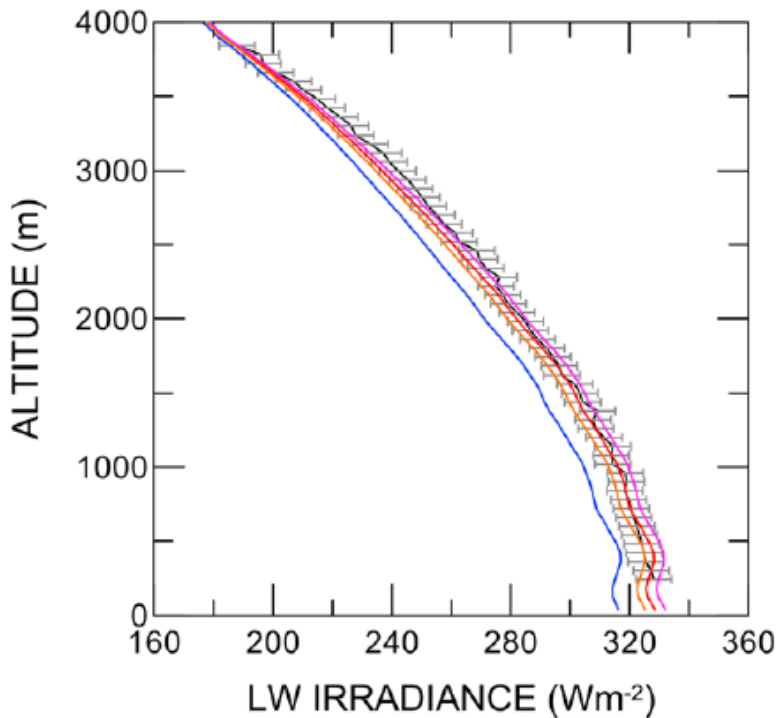
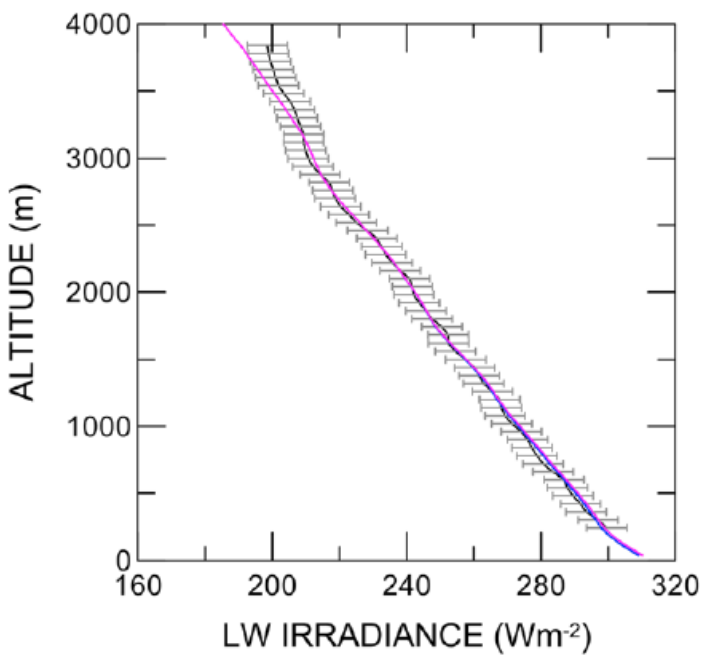
Gomez Amo et al., 2014

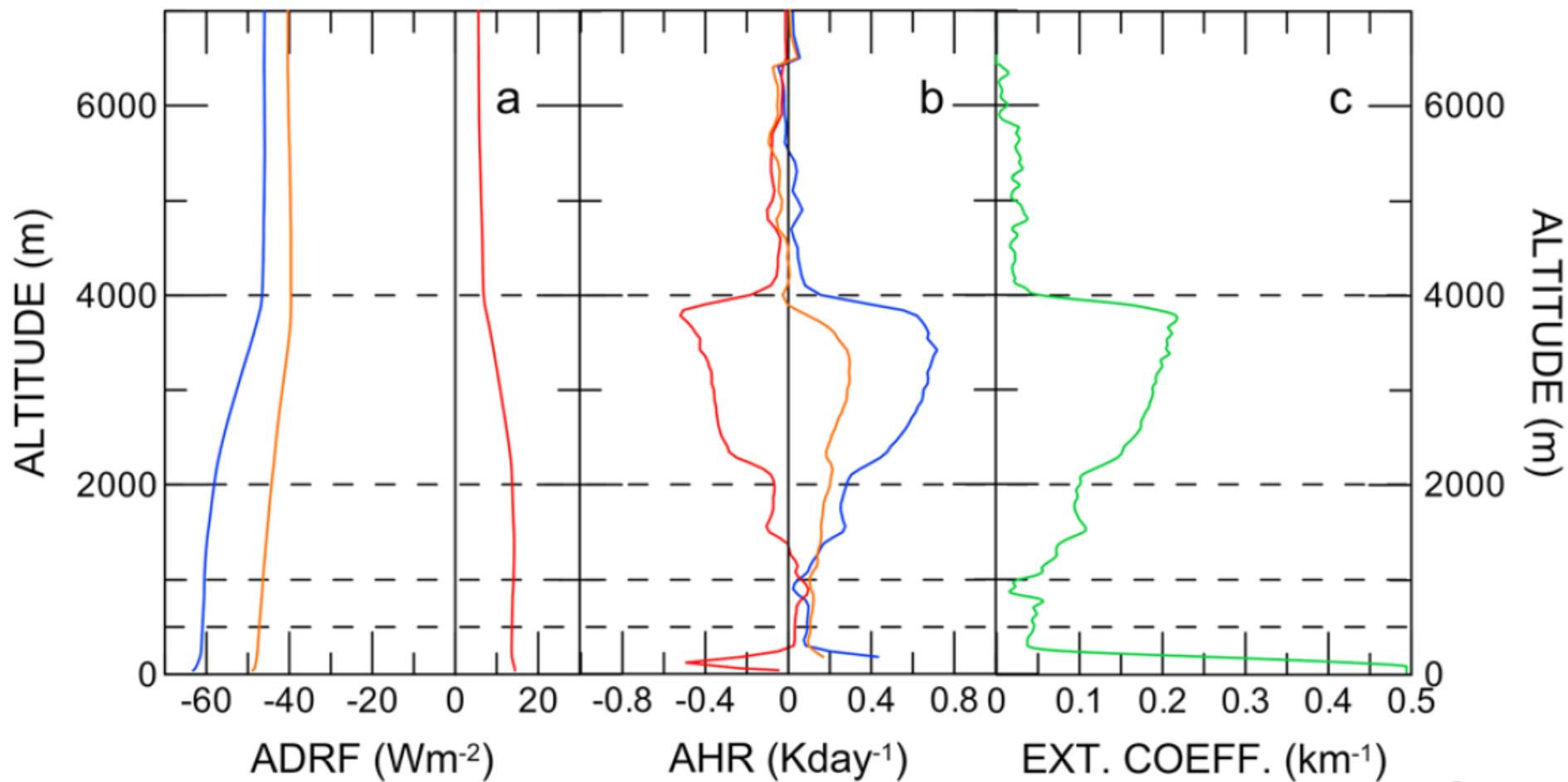


Meloni et al., 2015



Ground-based and Airborne Measurements of the Aerosol Radiative Forcing (GAMARF) 2008





- Distribuzione verticale
- Proprietà ottiche
- Effetti nell'IR

Raccomandazione:

Chiusura rispetto a misure di radiazione di qualità

Grazie