



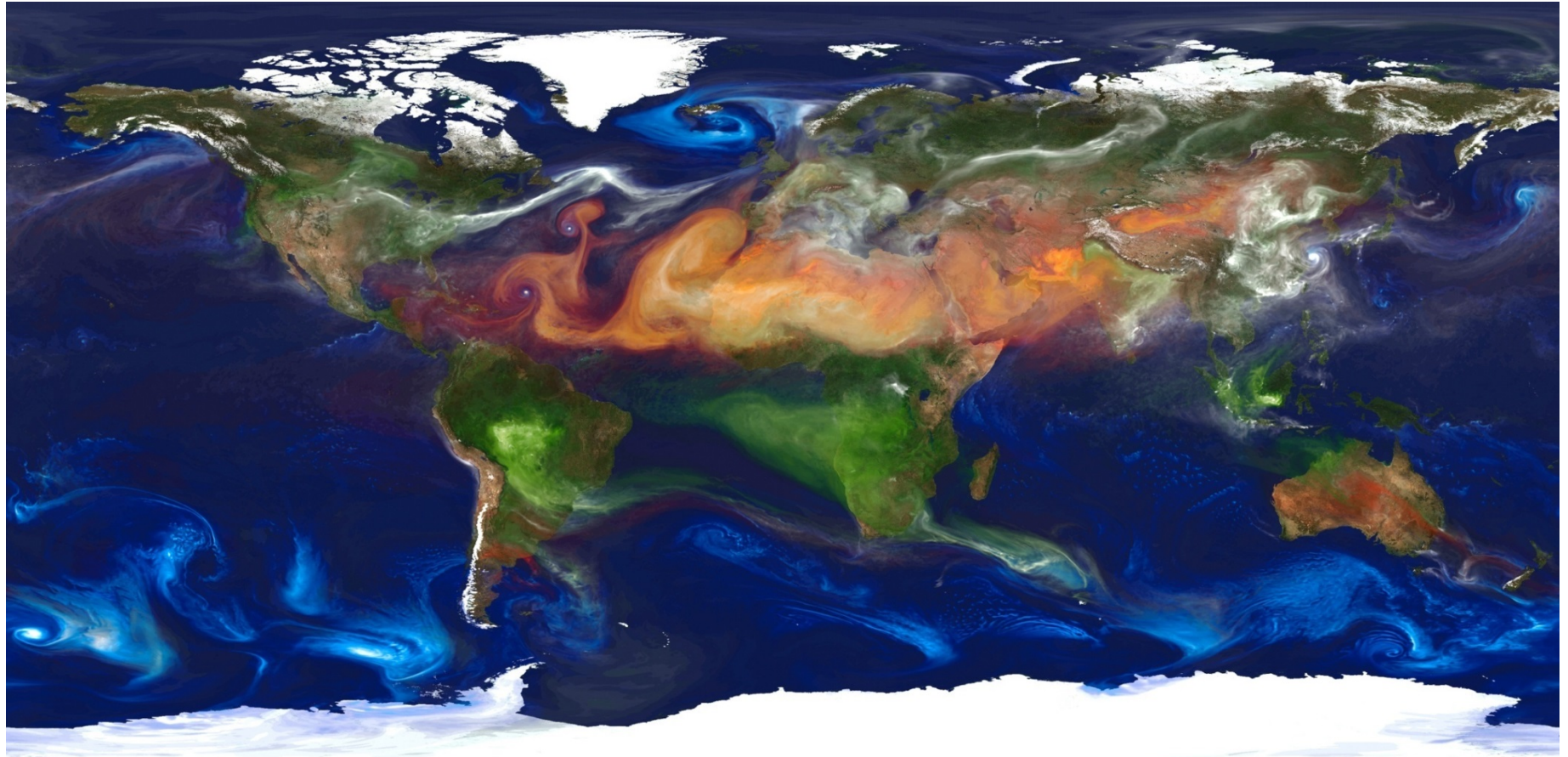
Methodology for detection of African dust events over Spain and estimation of desert dust load

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Emission and transport of African dust

Global emissions of dust from desert areas account for 1.5 Gt/year
0.84 Gt/year is emitted from North Africa (Ginoux *et al.* 2012)



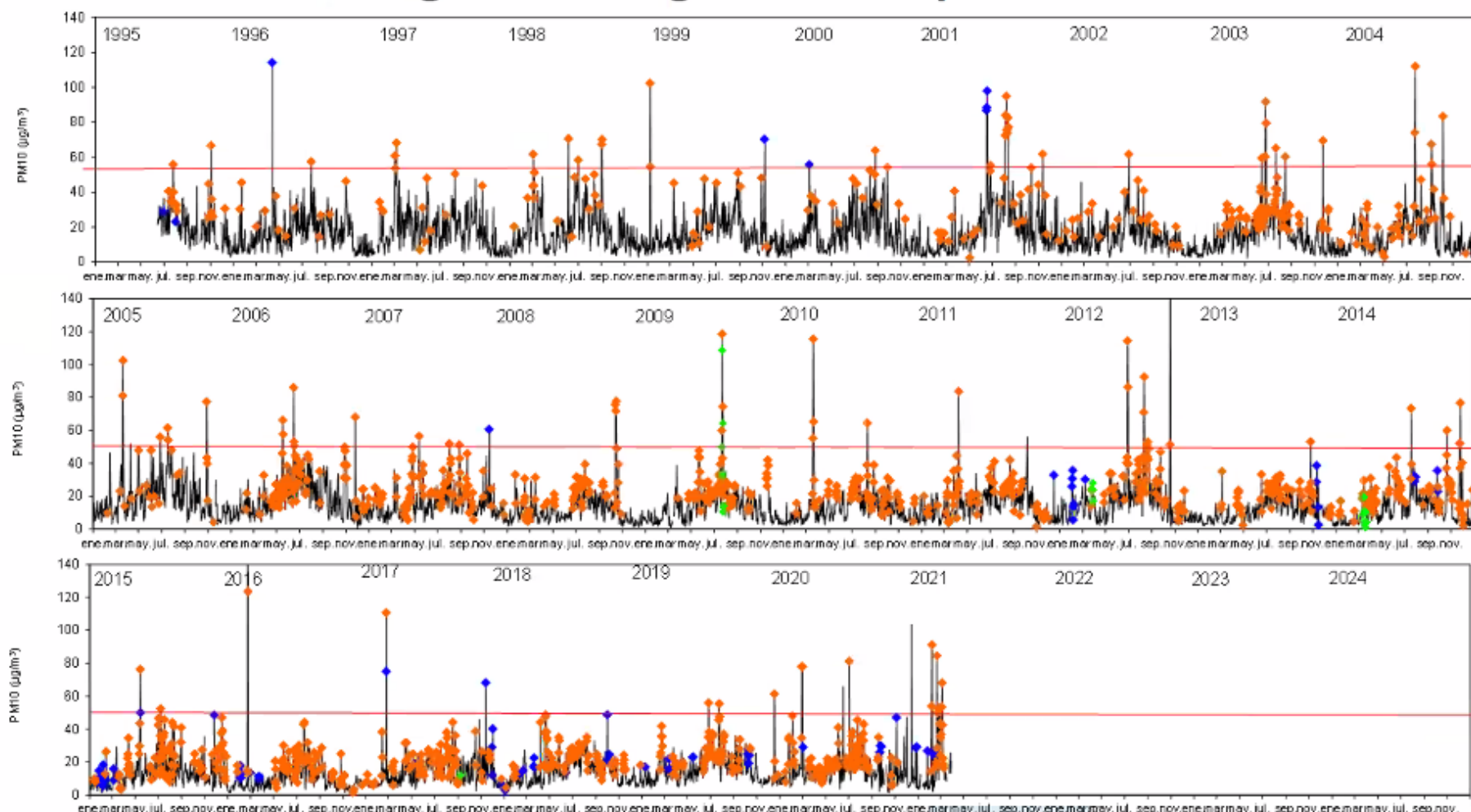
EXTINCTION OPTICAL THICKNESS OF AEROSOLS from the Goddard Earth Observing System Model, Version 5 (GEOS-5): system of models integrated using the Earth System Modeling Framework (ESMF) (2006 – 2007).

DUST (red)
SEA SALT (blue)
BC and OC (green)
SULPHATE (white)

Impact of dust outbreaks on air quality

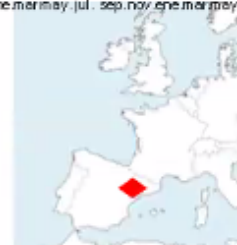
African dust, regional background NE Spain

Daily PM₁₀ ($\mu\text{g}/\text{m}^3$)



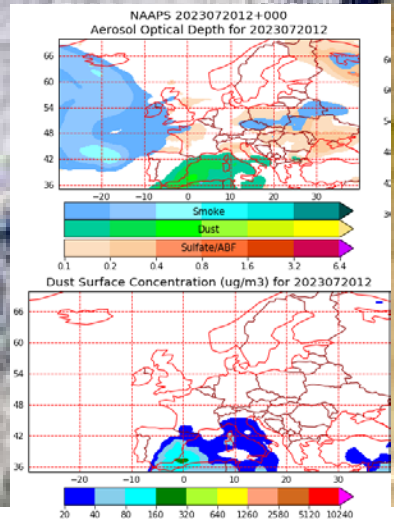
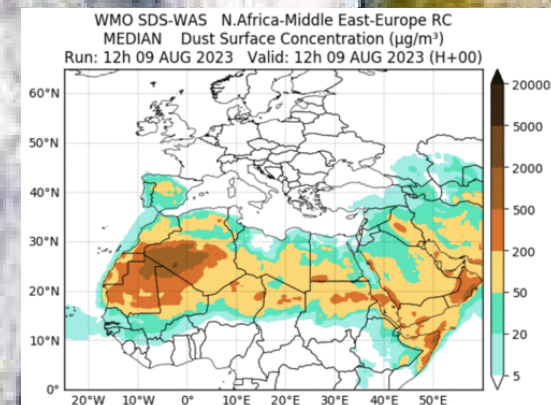
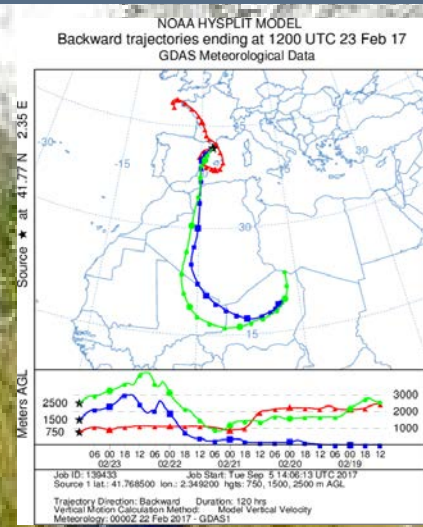
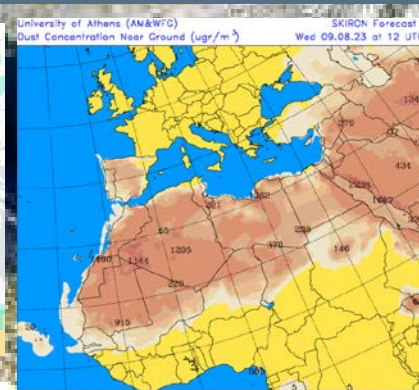
Daily limit value PM₁₀ 2008/50/CE ($50 \mu\text{g m}^{-3}$)

97 out of 110 exceedances registered in near 26 years are caused by African dust outbreaks



- ◆ African dust outbreaks
- ◆ Local dust from Monegros
- ◆ Forest fires

Methodology: detection of African dust events



Detection tools

- Dust models (MONARCH, SDS-WAS, SKIRON, NAAPs-NRL)
- Air mass back-trajectories (HYSPLIT)
- NASA satellite imagery



Methodology: report on dust episodes, forecasting and warning



MINISTERIO DE AGRICULTURA, ALIMENTACIÓN Y MEDIO AMBIENTE



MINISTERIO DE ECONOMÍA Y COMPETITIVIDAD

Predicción de intrusión de masas de aire africano sobre España para los días 25 y 26 de abril de 2015

Para el próximo día 25 de abril, los modelos prevén la continuación del episodio de intrusión de masas de aire africano que ha afectado a zonas del este peninsular y las islas Baleares esta semana. Estiman concentraciones de polvo a nivel de superficie en los rangos 10-40 $\mu\text{g}/\text{m}^3$ para el sureste y este peninsular y las islas Baleares, y de 10-20 $\mu\text{g}/\text{m}^3$ para el noreste peninsular. Los modelos prevén que a lo largo del día 25 las masas de aire se vayan desplazando hacia el este, y para el día 26 no coinciden, aunque podría quedar algo de polvo sobre el noreste peninsular y las islas Baleares. Los modelos prevén que el día 27 de abril haya finalizado el episodio de intrusión. Adicionalmente se podría producir episodios de deposición seca de polvo en el noroeste.

MAYO 2017									
	CANARIAS	SUROESTE	SURESTE	LEVANTE	CENTRO	NOROESTE	NORTE	NORESTE	BALEARES
COMBUSTIÓN BIOMASA		2 18 21	2 7 19 21	2 4 7 20	2 7 9 25	4 25	4 25		21
EUROPEO SULFATOS									
AFRICANOS	14 17-20	3-4 8 16-17 21-28	3-5 8 15-18 21-31	4-5 8 22-31	4-5 8 21-28	4 22-28	5 22-28	5 22 24-27	4-5 31

Impact on surface PM concentrations

Validation with PM10 data from background sites:

- EMEP network
- Regional air quality networks

(data availability most sites from 2001, Canary Islands from 2006)

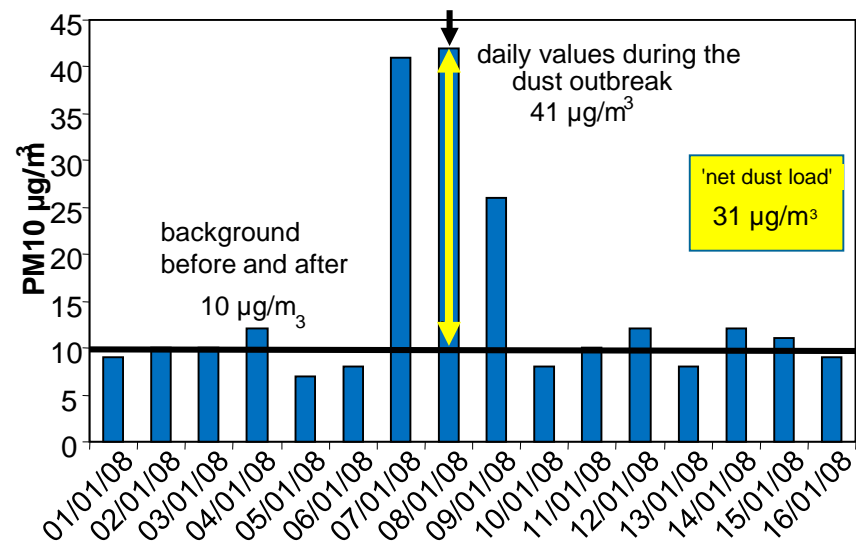


- Other than EMEP
- EMEP stations with real time measurements
- EMEP station with gravimetric measurements

Methodology: quantification of African dust contribution to PM

Calculation of daily dust contributions:

- Identifying the occurrence of African dust episodes
 - PM10 daily data from a regional monitoring site
- ↓
- Extraction of days with African dust influence from the dataset
 - Apply a moving 40th percentile to dataset (to estimate the background PM)
 - PM levels – background PM = African dust load**



Escudero et al., Atmospheric Environment (2007)

A	B	C	D	E	F	G	H	I	J
	Viznar PM10	Alcornocales PM10		Viznar PERC40	Alcornocales PERC40		Viznar Descuento	Alcornocales Descuento	
09/07/2014	20	20		14	19				
10/07/2014	21	19		14	19				
11/07/2014	19	27		14	19				
12/07/2014	19	26		14	20				
13/07/2014	19	31		14	20				
14/07/2014	32	32		14	20				
15/07/2014	39	31		14	20		25	11	
16/07/2014	50	23		16	22		34	1	
17/07/2014	56	24		17	22		39	2	
18/07/2014	40	33		17	22		23	11	
19/07/2014	14	13		17	20		0	0	
20/07/2014	8	18		17	20				
21/07/2014	14	20		18	20				
22/07/2014	16	25		19	20				
23/07/2014	20	26		19	20				
24/07/2014	26	36		19	22		7	14	
25/07/2014	21	31		19	23		2	8	
26/07/2014	30	31		19	22		11	9	
27/07/2014	27	37		19	21		8	16	
28/07/2014	29	26		20	20		9	6	
29/07/2014	32	26		19	20		13	6	
30/07/2014	28			20	20				
31/07/2014	28	26		18	21				
01/08/2014	22	20		19	22				



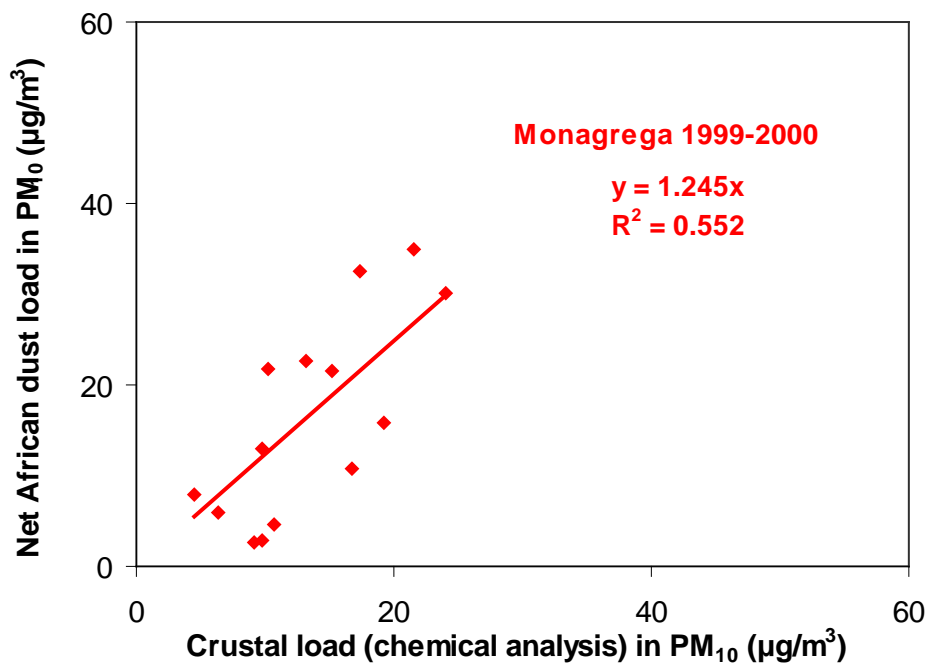
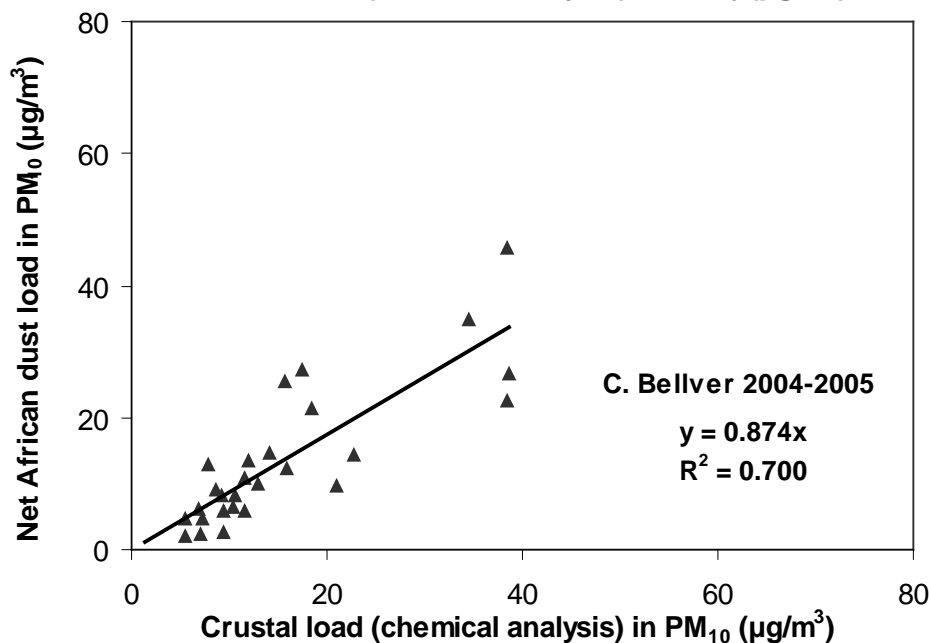
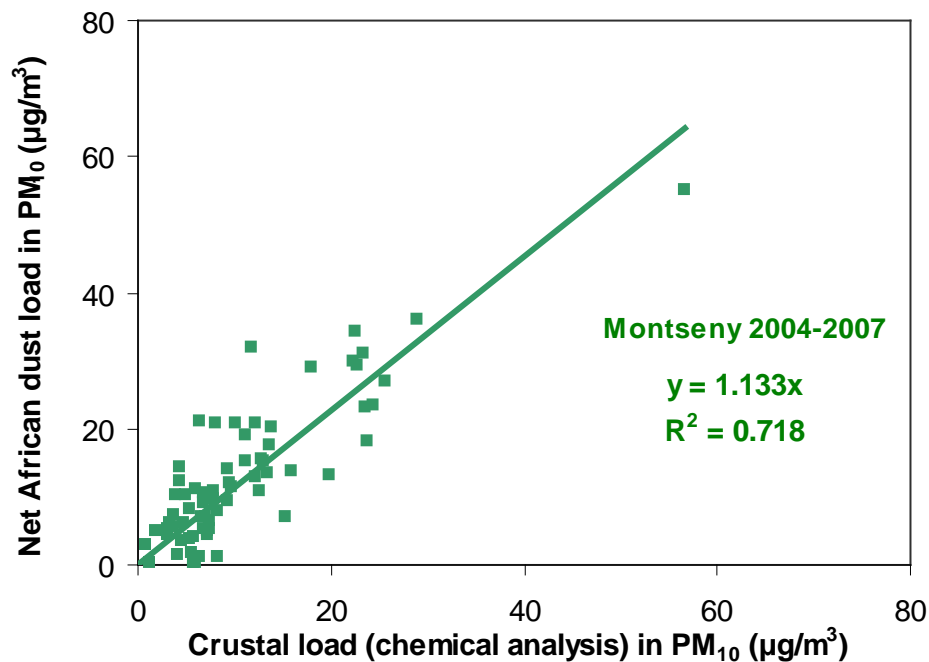
EUROPEAN COMMISSION

Brussels, 15.02.2011
SEC(2011) 208 final

COMMISSION STAFF WORKING PAPER

establishing guidelines for demonstration and subtraction of exceedances attributable to natural sources under the Directive 2008/50/EC on ambient air quality and cleaner air for Europe

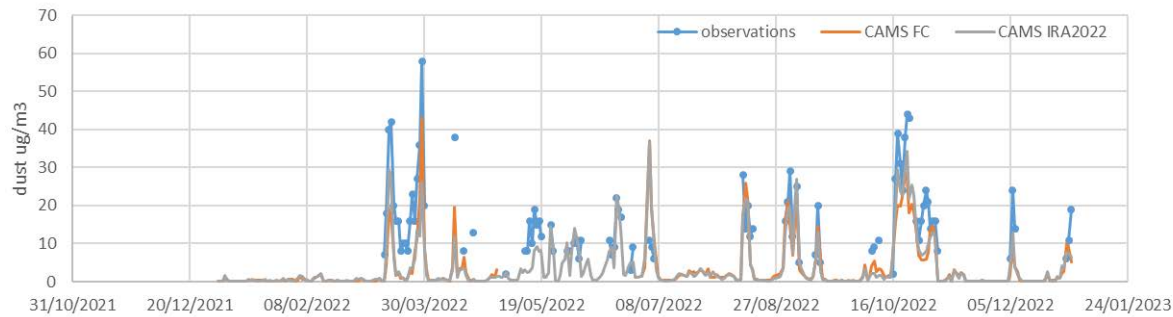
Methodology: verification of the method with chemical analyses



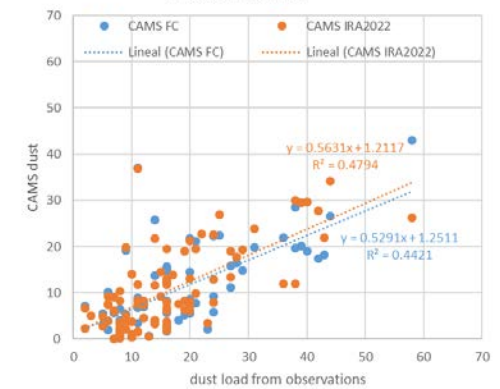
Escudero et al., 2007 (Atmospheric Environment)

Results: comparison of observations with CAMS natural dust products

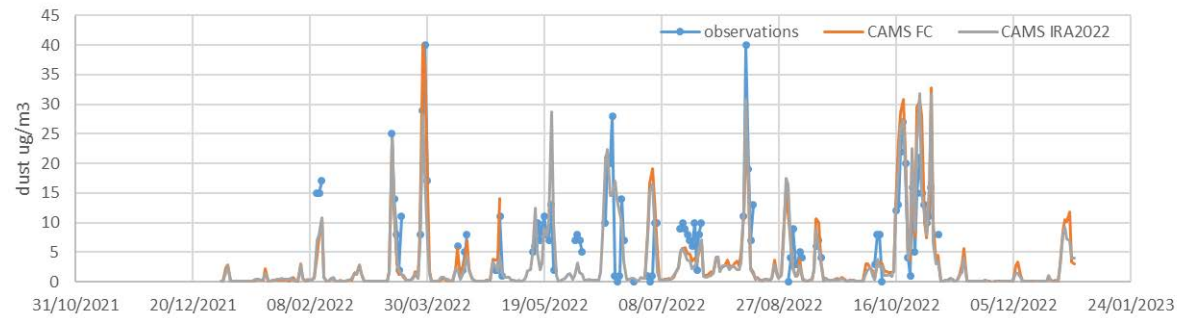
ES1604A Bellver



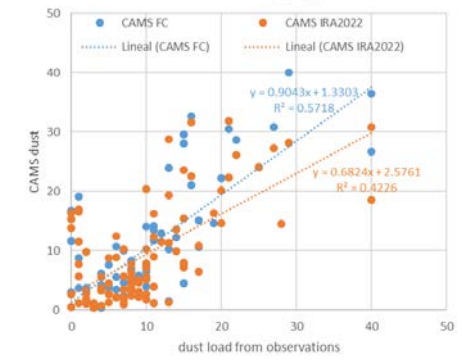
ES1604A Bellver



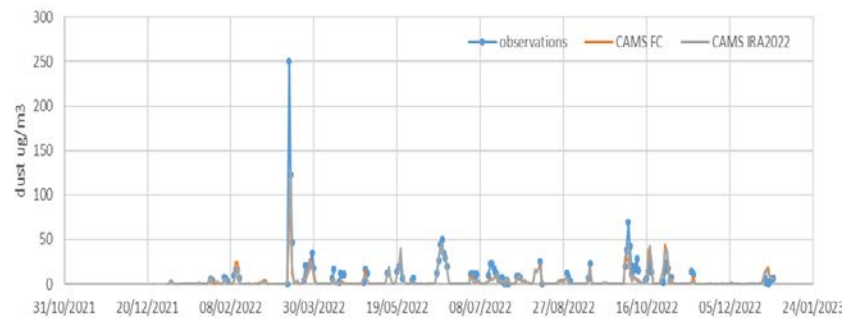
ES2070A Monagrega



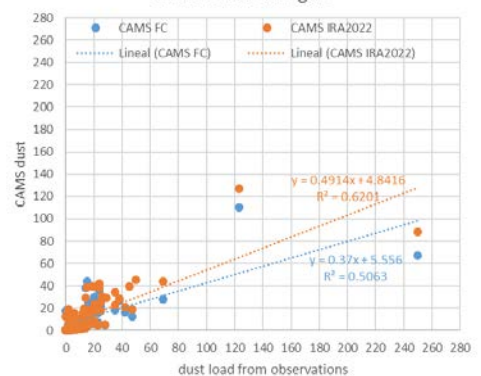
ES2070A Monagrega



ES1616A Monfragüe

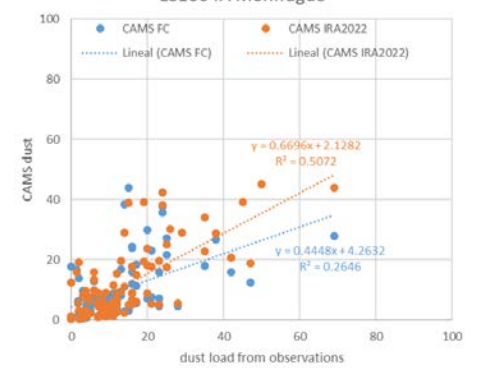


ES1616A Monfragüe



Removing the two highest points

ES1604A Monfragüe



Thanks for your attention !



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