

## Identifying coupling Modes of Particulate Matter and Meteorological Fields through Singular Vector Decomposition

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- I Introduction
- **II** Motivation & Objectives
- **III Method**
- **IV Results**
- **V** Concluding Remarks



- $\rightarrow$  Radiation Budget
- $\rightarrow$  Atmospheric Dynamics
- → Human Health

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### What is known so far:

- → Dust is transported westwards → driven by meteorological patterns – Presents seasonal variation
- Detailed identification of African dust sources
   Subtropical Eastern North Atlantic Region
- Atmospheric scenarios favouring African air-mass intrusions
  Mediterranean Including Iberian Peninsula (IP)





Identifying the weather patterns responsible for dust transport for the Iberian Peninsula (IP) not depending on an event base method







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73.6 % of total variability



#### 11.7 % of total variability



7.1 % of total variability



3.2 % of total variability





**ID WR responsible for the intrusion of dust** 

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## <u>SW – Weather Regime</u>

#### 12/20



## NAO – Weather Regime

#### 13/20



#### <u>WW – Weather Regime</u>

14/20



## <u>N – Weather Regime</u>

15/20



# SVD method

→ 1<sup>st</sup> coupling mode (73.6 %) shows strong relation between South-west flow and dust transport;

Positive anomaly located over North Africa

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→  $2^{nd}$  coupling mode (11.7 %) shows dust transport inhibition due to North-west flow;

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Positive anomaly Westward displacement

→  $3^{rd}$  coupling mode (7.1 %) shows dust transport to Central Europe by South-west flow.



Positive anomaly Eastward displacement

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# Weather Regimes



- → 78 % of the Weather Regimes present dust transport for the IP;
- → 2 m Temperature shows evidence to be strongly linked to Dust lift;
- Persistent low pressure system over North Africa gives favourable conditions to dust lift
- Thermal Low over the IP favours Northward transport of Dust (NAO & WW);
- Low over North Africa + Cyclonic activity NW of Britain (WS).
   NE dust transport from the main Western dust transport belt

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# Weather Regimes



➔ More variability between Weather Regimes;

→ More intense Western flow → Less dust transport to the IP;
 – Only 50 % show dust transport to the IP – With less dust amounts

➔ Dust in the IP is associated to weak pressure gradients over the IP with a low pressure system located over Britain;

➔ Dust transport inhibition associated with a high density of cyclonic systems that produce strong winds.





➔ Analysis of other atmospheric variables;

Spatial clustering of dust concentrations
 – Finding regions with the same statistical behaviour







# Thank You



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