Summer variability of Saharan dust transport events in mountain areas: North and South of Po basin

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Outline



Materials and Methods

- Tools to identify desert dust particulate matter
- Region of interest
- 2 Results
 - In situ dataset
 - Synoptic dataset

3 Conclusions

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Tools to identify desert dust particulate matter Region of interest

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As reported in EEA Technical report No 10/2012

- Interpretation of particulate matter data series (i.e. PM, aerosols size distribution) together with meteorological information (i.e. wind, temperature, relative humidity)
- Remote-sensed data from/at ground-based (i.e. sun-photometers) and satellite (i.e. MODIS, CALIPSO)
- Numerical modeling : regional air quality models (i.e. CHIMERE)

Tools to identify desert dust particulate matter Region of interest

North and South of PO basin: Two high mountain sampling sites



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In situ dataset Synoptic dataset

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In situ dataset Synoptic dataset

Summer field campaign at Stelvio National Park (SNP)



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In situ dataset Synoptic dataset

Basic statistic for the summer field campaign of 2012: DUST and NODUST conditions





DUST outbreak - anticyclonic circulation (8 events / 71 days)



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AOD from space: NO DUST and DUST scenarios

DUST outbreak - cyclonic circulation (2 events / 71 days)



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In situ dataset Synoptic dataset

Modeling of meteorological and aerosols parameters

Typical dust event - anticyclonic circulation Run of 24h : WRF (Shamarock et al., 2008) / CHIMERE (Bessagnet et al., 2008) / AODEM (Landi T. C. 2013) July 28th, 2012

Tony Christian Landi, 2013. AODEM: A post-processing tool for aerosol optical properties calculation in the Chemical Transport Models. Book published by LAP - Lambert Academic Publishing ISBN: 978-3-659-31802-3.

In situ dataset Synoptic dataset

Investigating the vertical structure of dust load: obs and model

Measurements from space - CALIPSO



Investigating the vertical structure of dust load: obs and model

Run of 144h: WRF (Shamarock et al., 2008) / CHIMERE (Bessagnet et al., 2008)

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Ground based observations and predictions CMN: Cimone SNP : Stelvio



Investigating the vertical structure of dust load: obs and model

Run of 144h: WRF (Shamarock et al., 2008) / CHIMERE (Bessagnet et al., 2008)

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Ground based observations and predictions CMN: Cimone SNP : Stelvio



Conclusions

- Despite during summer conditions Mt. Cimone (2165 m asl) is strongly influenced by PBL dynamic of Po basin, we confirm that it is an atmospheric *sentinel* observatory for mineral dust that generally moves from northern Africa towards northern Italy. During dust outbreaks PM10 concentrations increase about 70% in respect to no dust conditions (15.2 -> 25.6 μ g/m³).
- Three field campaigns successfully performed within SHARE Stelvio project - founded by FLA* - at Guasti hut (Stelvio National Park 3285 m asl) permitted to establish that SNP is a suitable sampling site to investigate the **free troposphere conditions** even in summer.
- To achieve the directive EU/2008/50, i.e. quantification of the natural and anthropogenic contributions to the PM concentrations, high altitude observatories play a crucial role in the investigation of the vertical structure of aerosol particles load in a quantitative manner.

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Urbanized areas in Northern Italy (according to Corine 1990)



Nocturnal illumination in Northern Italy (satellite view)

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