

Chemical composition of PM in a residential area of Beijing, China

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OBJECTIVES

Emission reduction measures were performed to improve air quality during the Olympic Summer Games in 2008: cut down mainly coarse particles.

Question: PM still a problem?

Objectives: Chemical composition of PM, characteristics of chemical elements, and special case studies during haze and dust events.

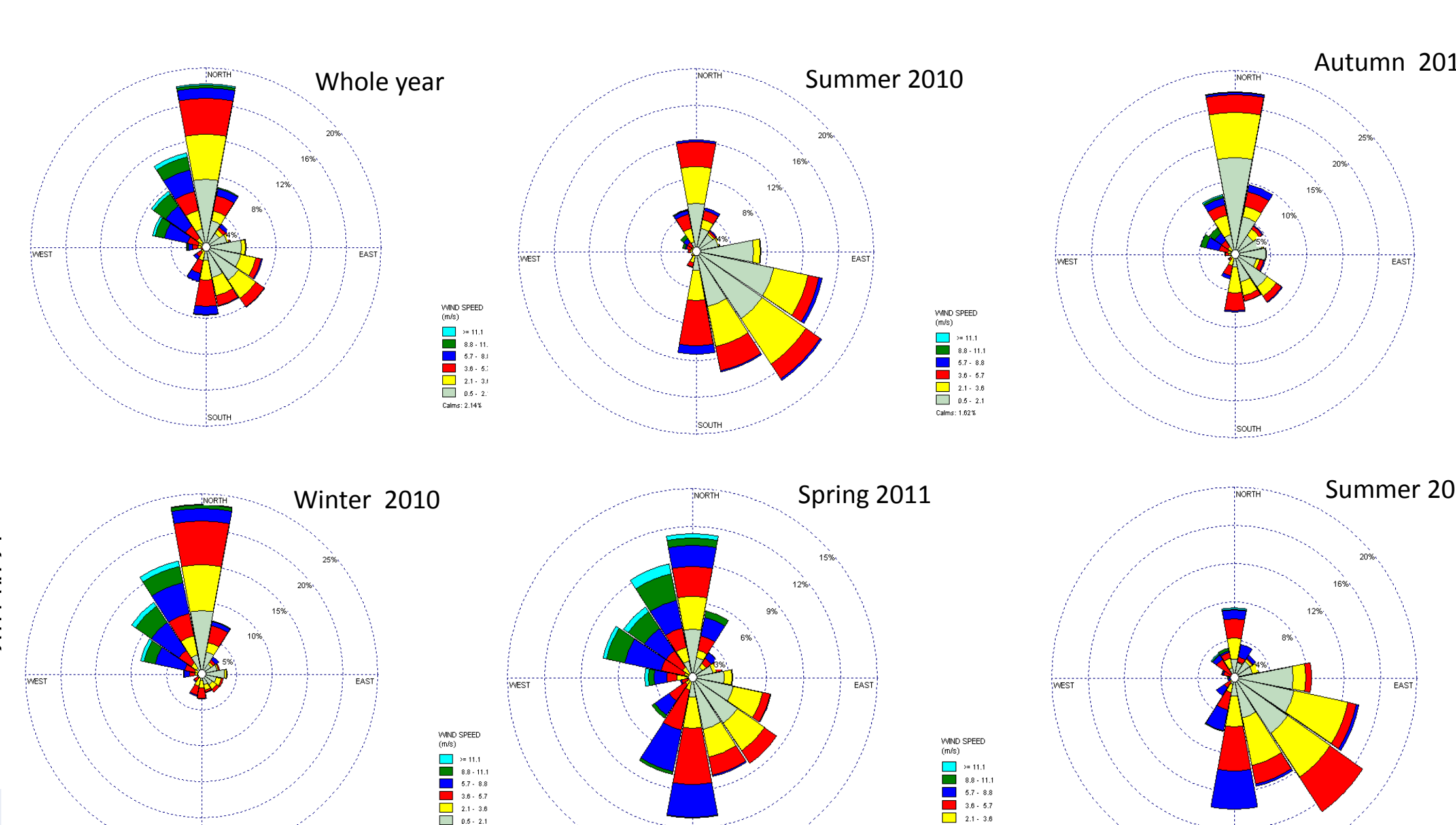
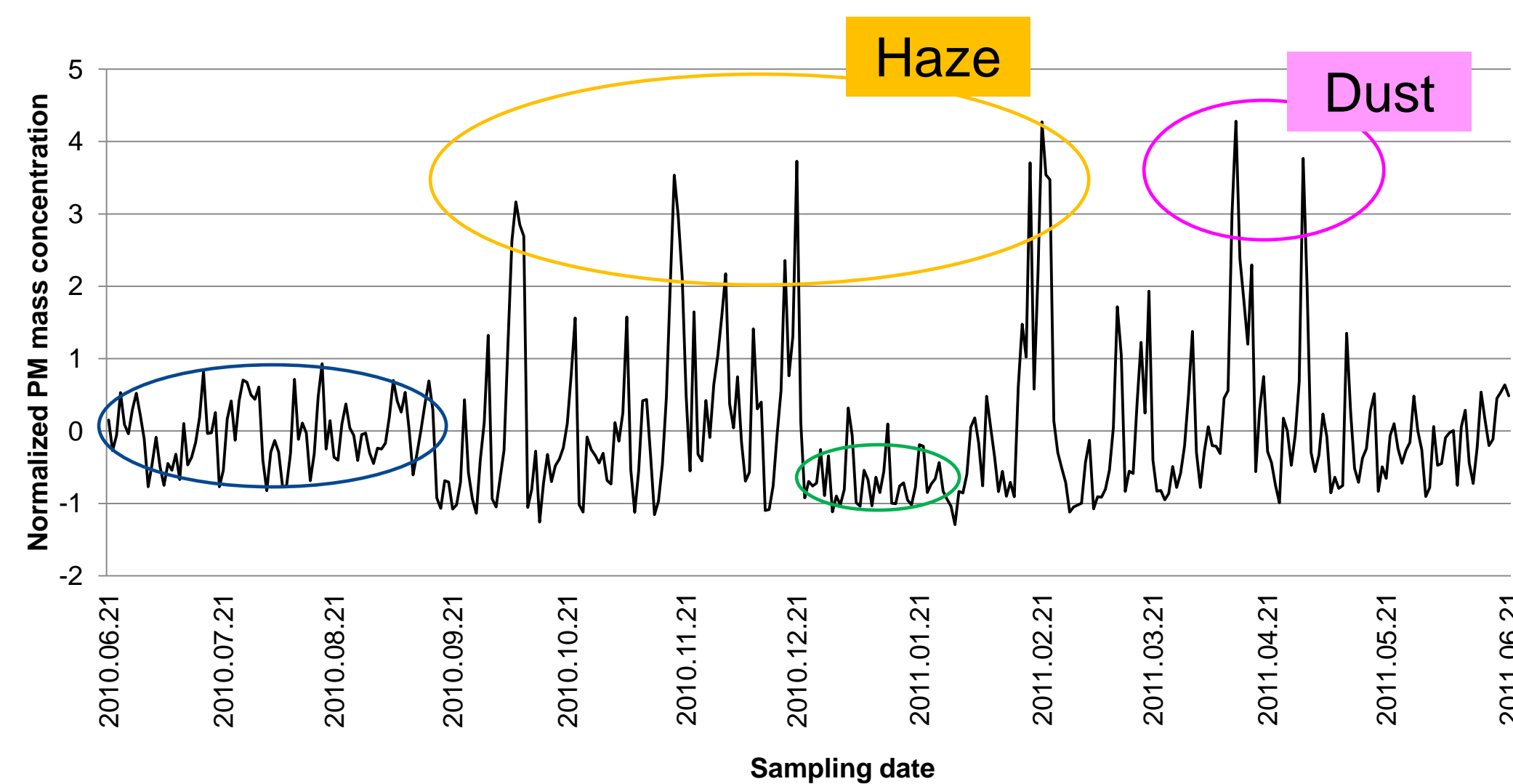
METHODOLOGY

Particulate sampling: Daily PM filter sampling on quartz fibre filters with 2 High-Volume Samplers DHA80 (Digital) by KIT/IMK-IFU from 2010.06.21 on for one year with CUMTB at the entrance of CUGB in 20 m distance (Low-Volume Sampler (weekly PM_{2.5} samples) of KIT/IMG).

Meteorological data: ZBAA (<http://weather.uwyo.edu/upperair/sounding.html>) and IAP

Particle composition: Main and trace elements analysed by PEDXRF (Polarized energy dispersive X-ray fluorescence) from KIT/IMG.

Z-transformation: Concentration data normalized according to equation $Conc_{z-trans} = (Conc_{value} - Conc_{avg}) / Stdev$



Wind and mixing-layer height (MLH) influence on PM mass concentration:

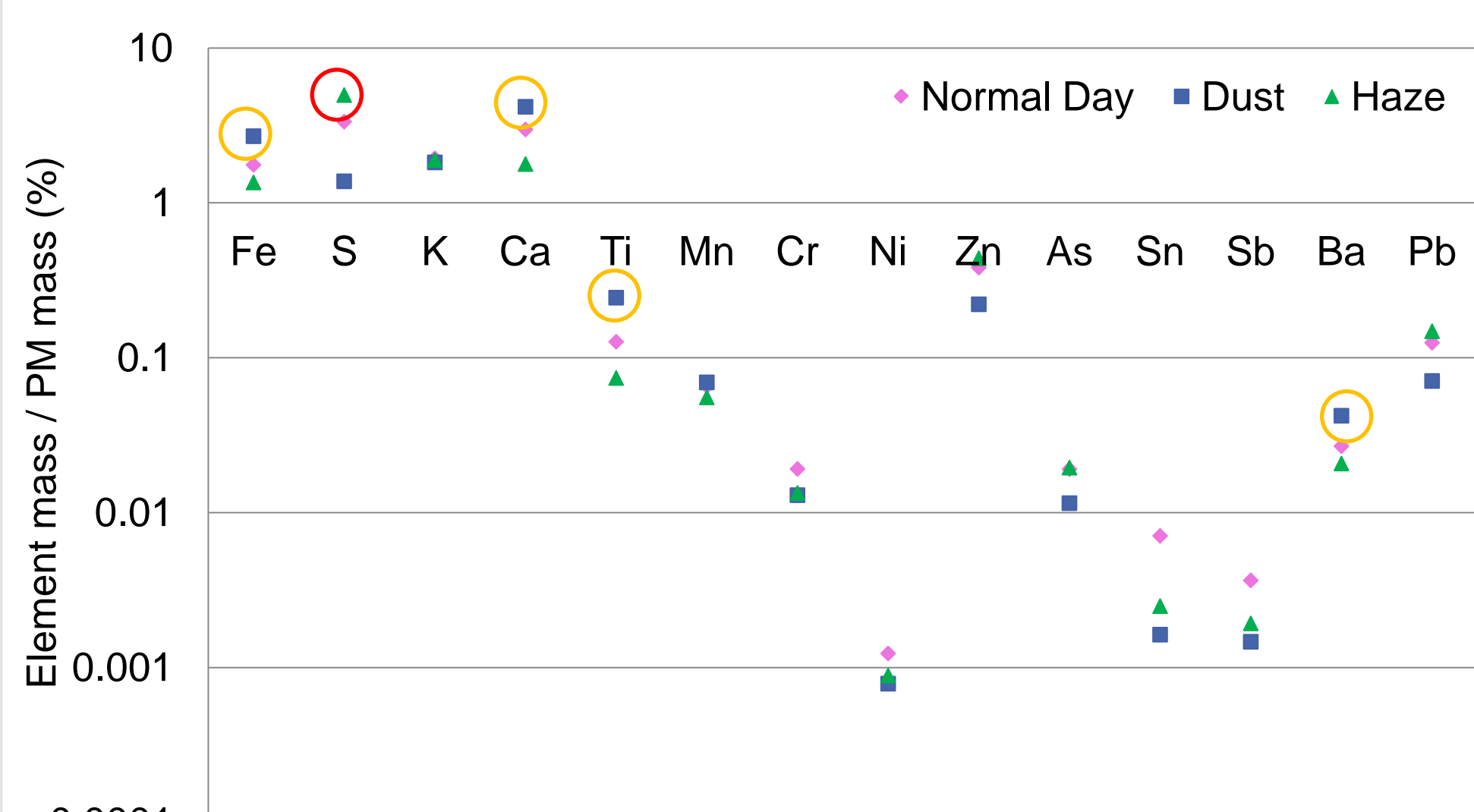
Spring – pollutant transport from South East where are industrial areas

Summer – similar, combined with precipitation and large MLH

Autumn – prevailing wind direction North and low wind speeds

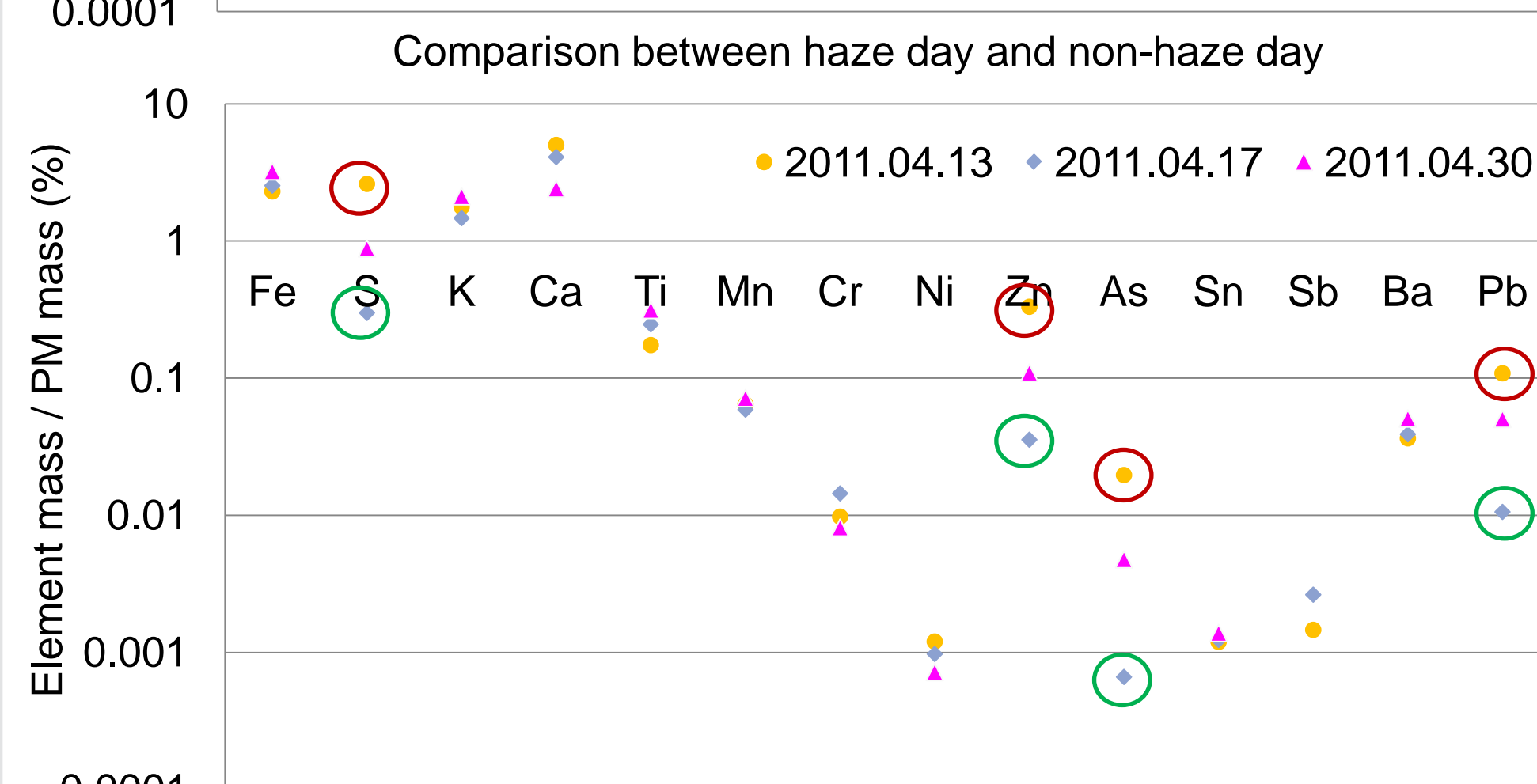
Winter - fresh air from North West with higher wind speeds reducing pollutant concentration caused by residential heating

Peaks of PM mass concentration caused by haze and dust.

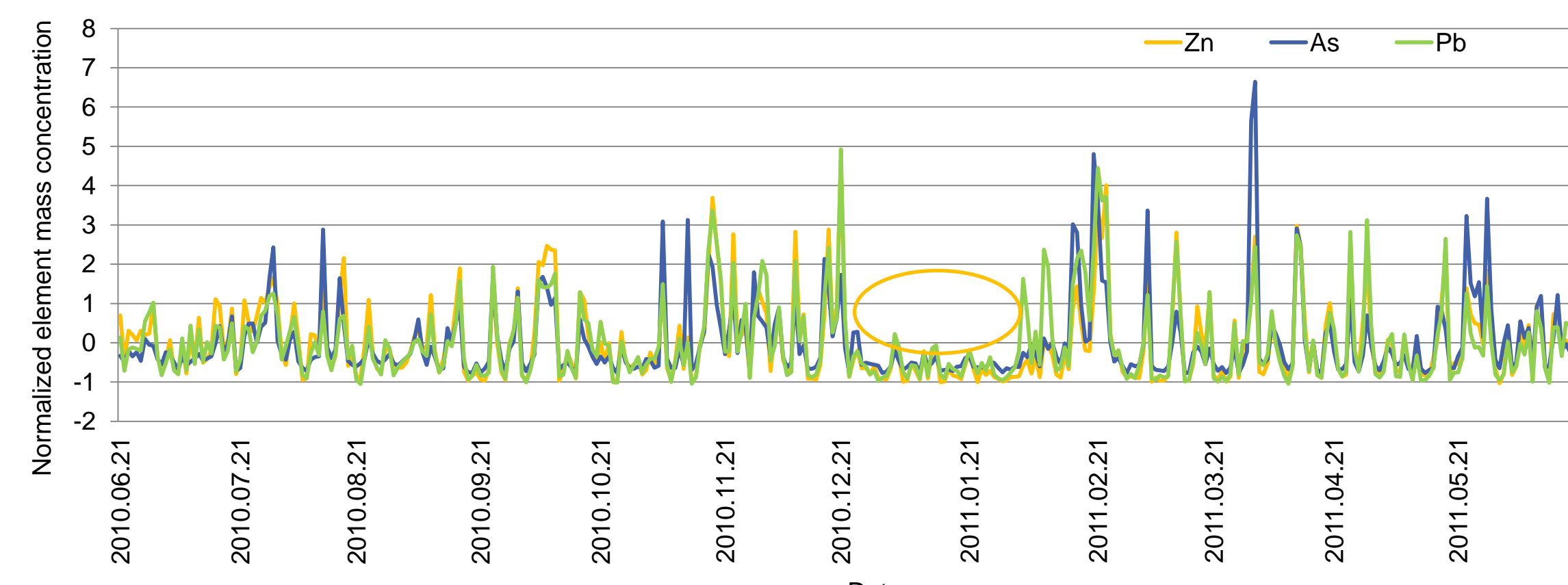


Sulfur, Zinc and Lead which refer to anthropogenic influences - highest amount during haze days.

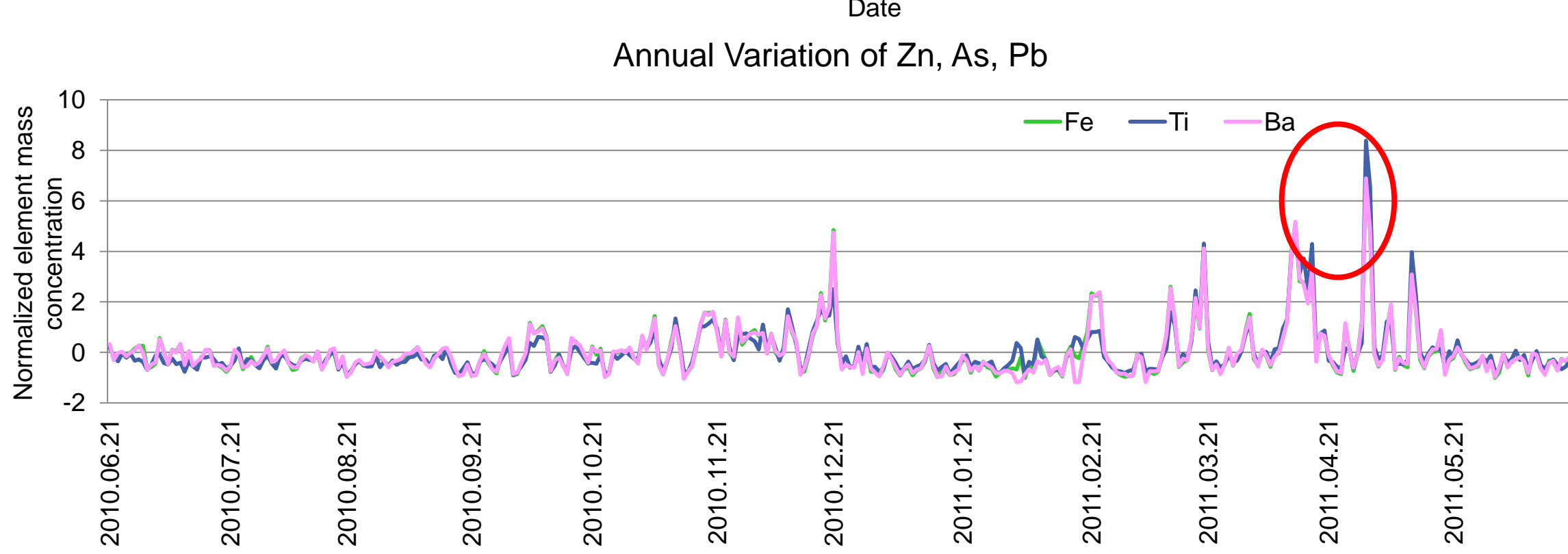
Fe, Ti, Ca, Mn, Ba which refer to geogenic sources - highest amount during dust days.



Sulfur and Zinc highest amount during dust event on 2011.04.13 - influenced by re-suspended dust.



See also poster on "Source apportionment studies on particulate matter in Beijing/China"



Concentrations of Fe, Ti and Ba (natural sources) and Zn, As and Pb (anthropogenic sources) in PM: dust storm on 2011.04.30 highest Fe, Ti and Ba concentrations.

RESULTS

PM mass concentration:

Highest in April - dust storm, re-suspended road dust. Lowest in January - low emissions during Spring Festival holiday, influenced by wind direction, speed.

Wind:

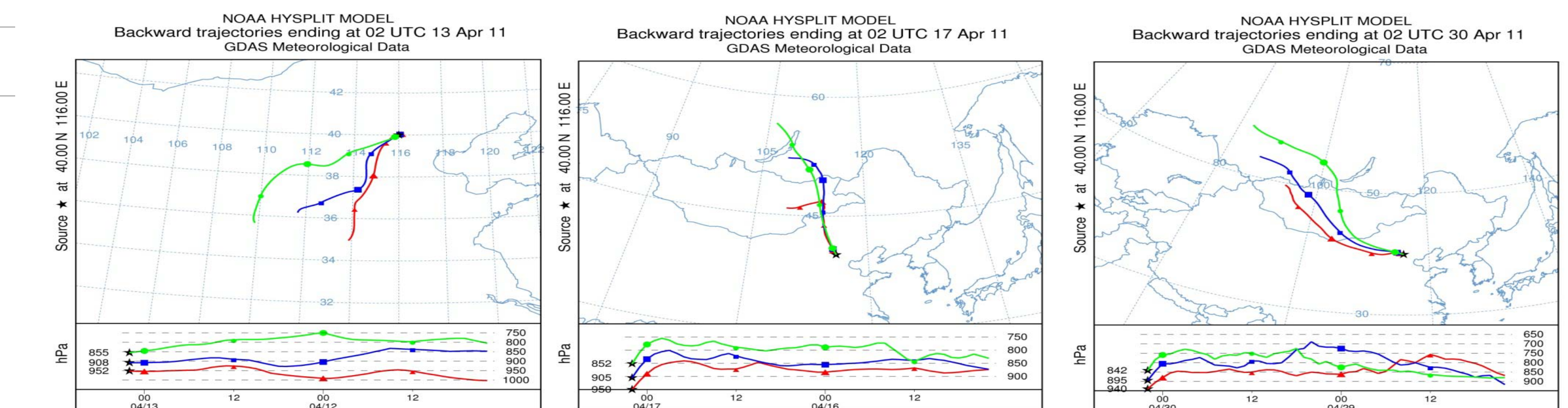
Wind plays a key role for influences on PM mass concentration.

Haze:

S, Zn and Pb - anthropogenic influences - highest contribution to PM and highest mass concentration: relative humidity and wind speed favor formation of secondary aerosols and aggravate pollution level.

Dust:

High PM mass concentration by re-suspended road dust, Mongolian desert and Gobi desert respectively.



CONCLUSIONS

Meteorological parameters: PM mass concentrations influenced by wind direction, surrounding emissions contribute to air quality.

Haze days: highest PM mass concentration from anthropogenic activities, highest sulfur amount, air pollution event during all seasons.

Dust events: sources different (re-suspended dust, dust storm), mainly desert dust, highest Fe, Ti, Ca, Mn, Ba amount, contribution to anthropogenic air pollution.

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