



Biomass Burning deteriorates air quality: a study case from Egypt

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Open burning of Solid (Agricultural, municipal, industrial and even medical) wastes, is an unpleasant behavior of many people worldwide



The salutation in Egypt is even worse, as farmers after collecting rice grains and storing rice straw, they burn the residual parts in the field to prepare the land for next crop rotation





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15 Sep (Morning)



15 Sep (Evening)



22 Sep (Morning)



22 Sep (Evening)



29 Sept (Morning)

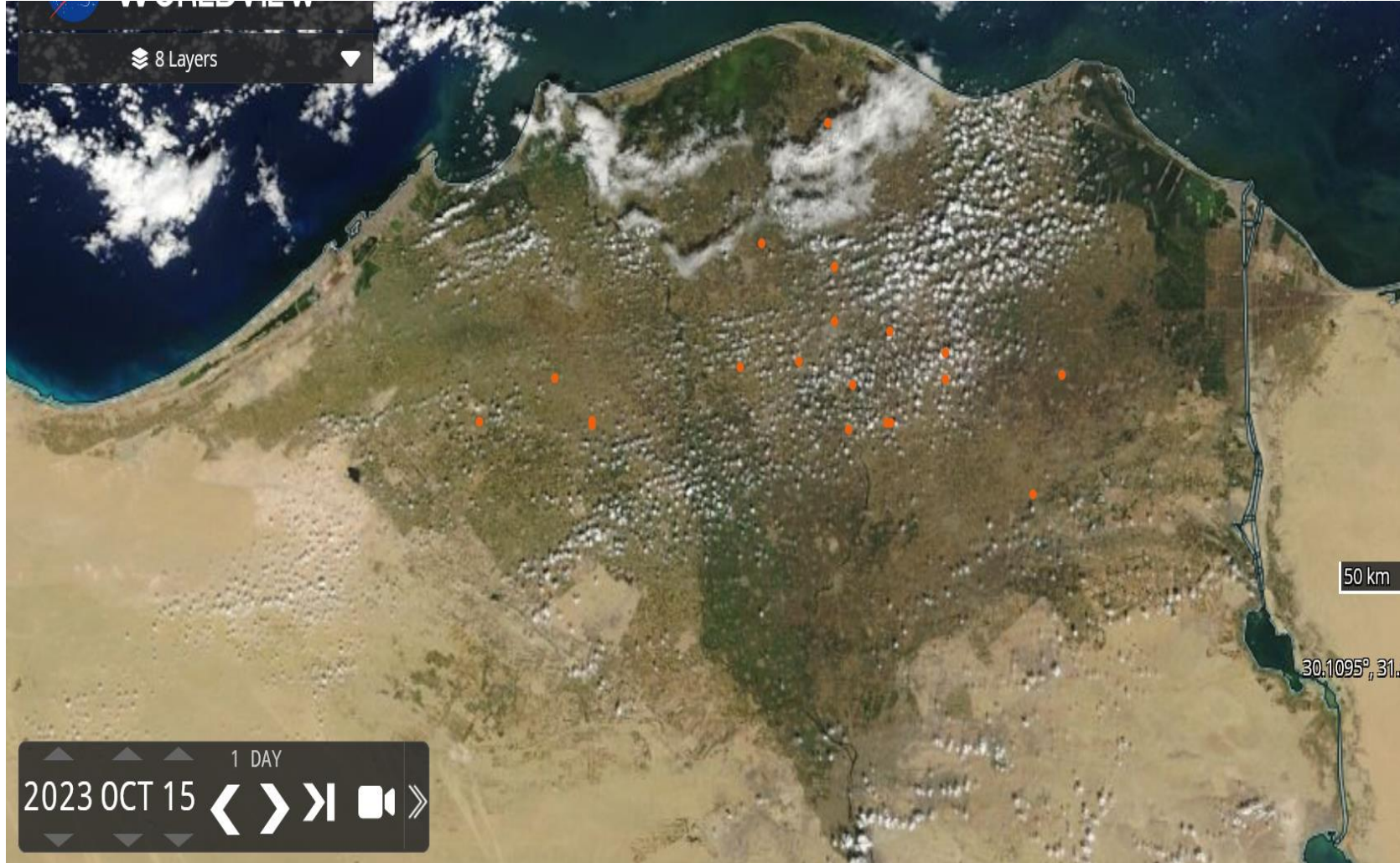


29 Sep (Evening)

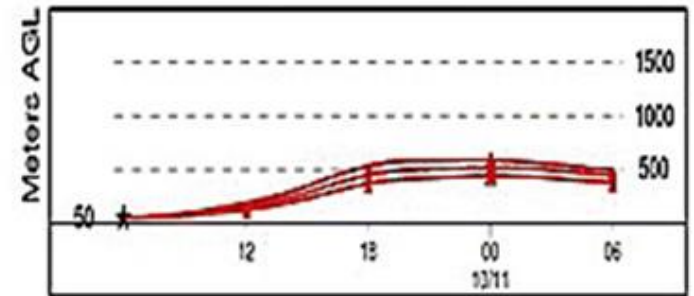
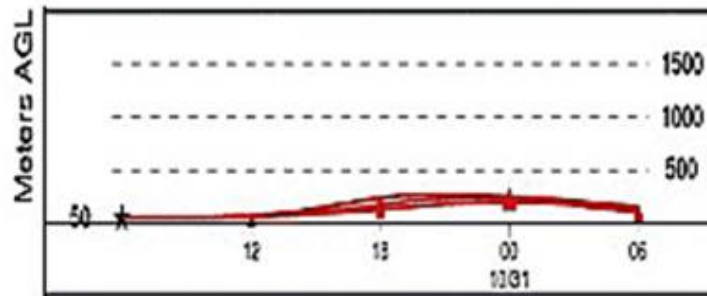
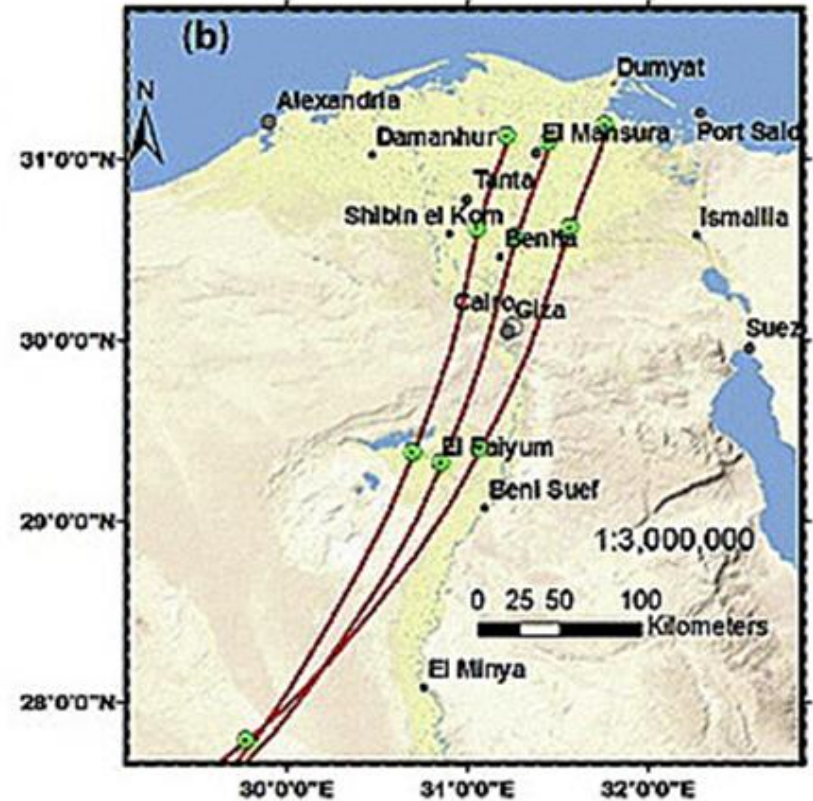
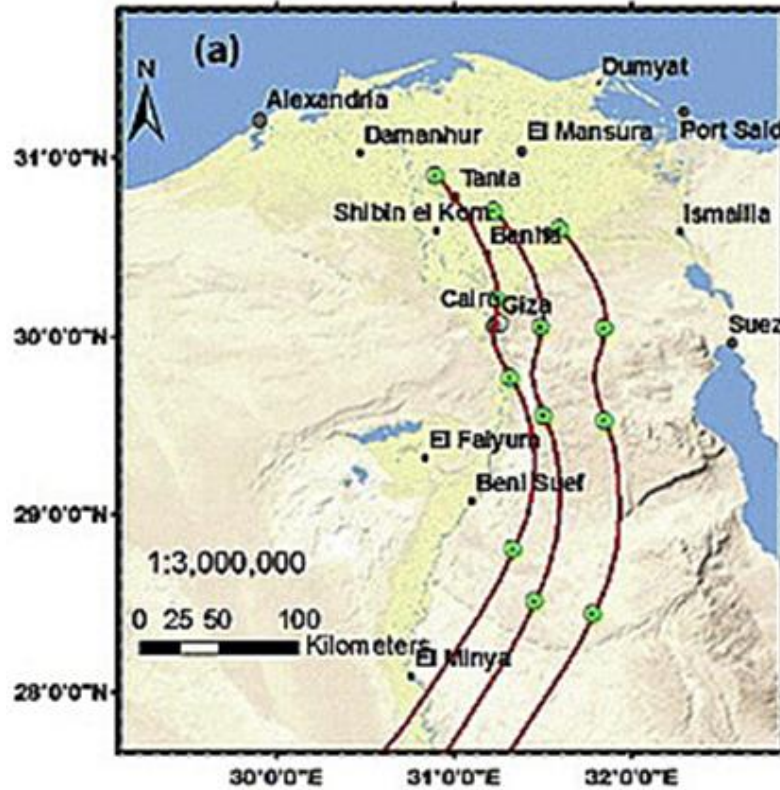




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Fires in the Delta and BB plume observed by MODIS (15 Oct. 2023)



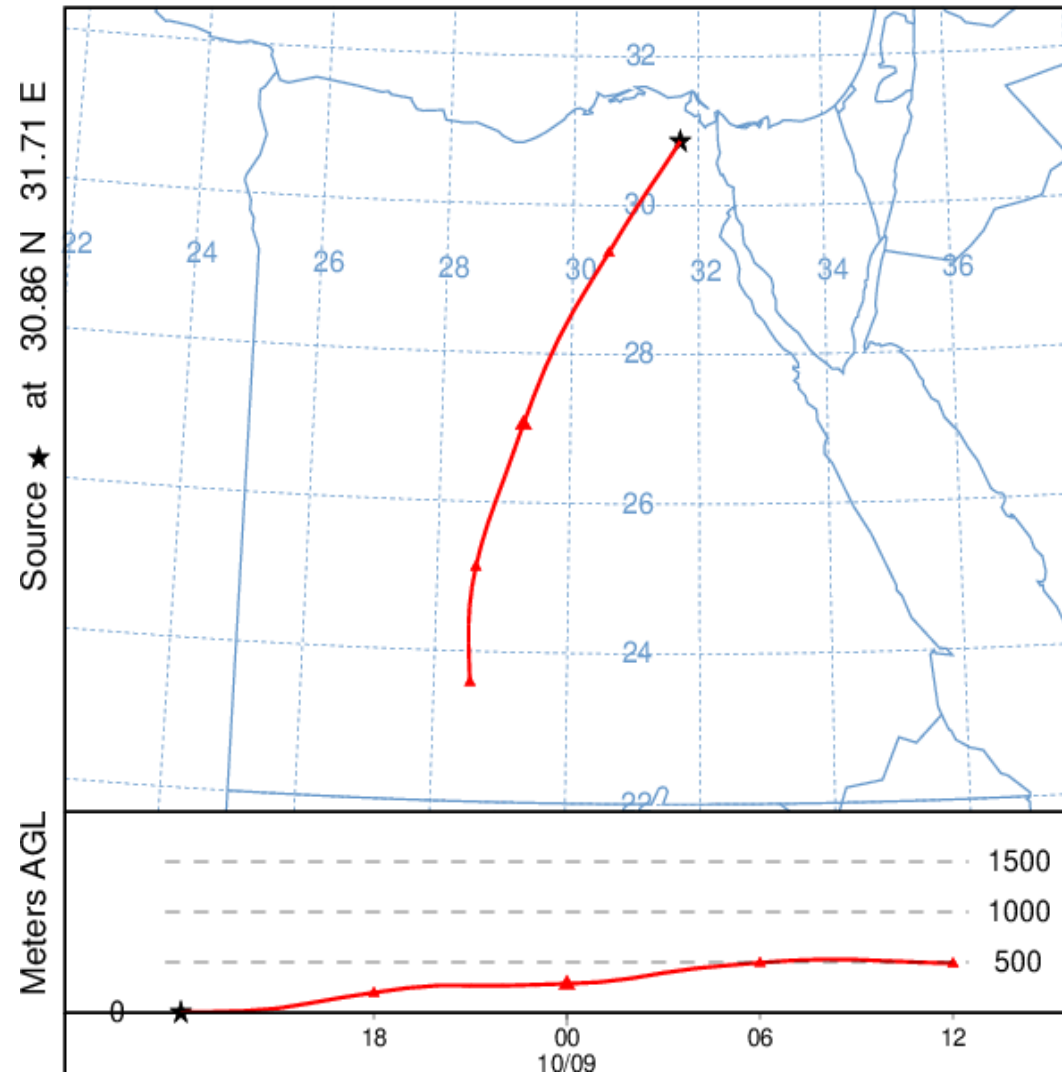


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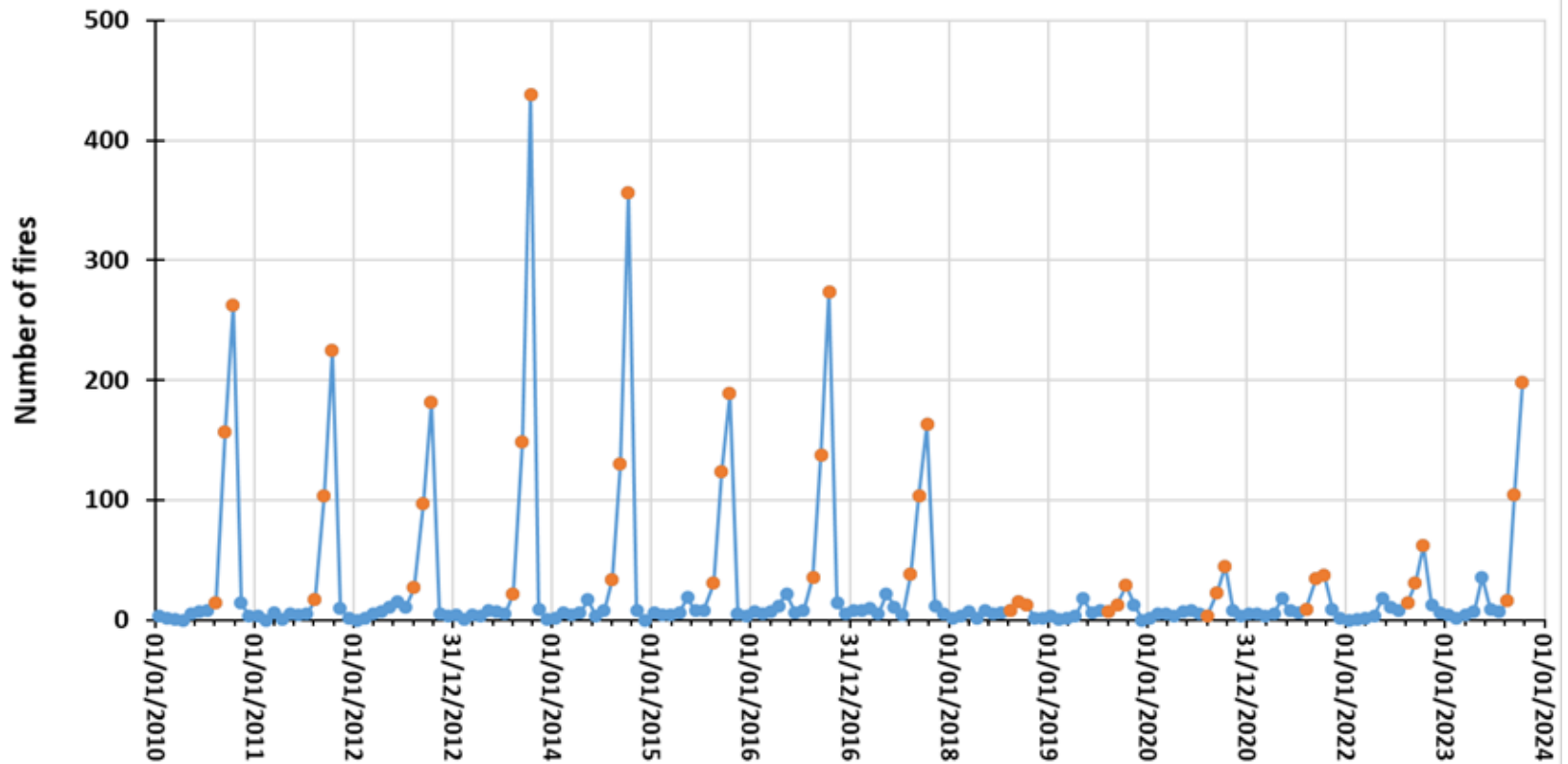
HYPSPPLIT (Forward Trajectory)

- The BB plume travels very close to the ground (atmospheric stability)
- 'Fumigation' of the GC area



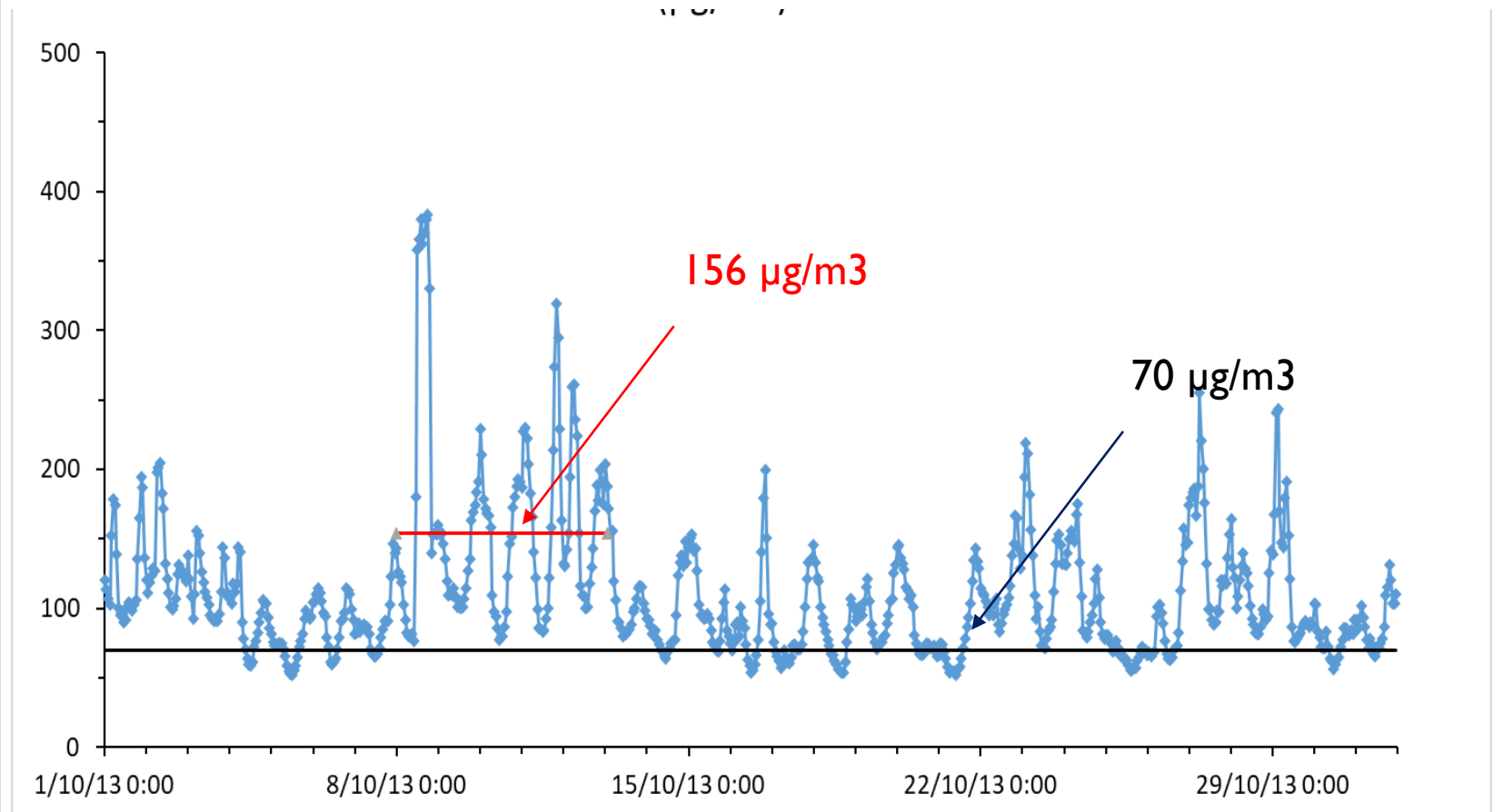


Fires in the Nile Delta detected each month by MODIS (Terra and Aqua)





Conclusion: dramatic enhancement of the PM_{10} concentrations, but relatively short-lived





Results of the calculations made with AirQ+, of the WHO

PM10 ($\mu\text{g}/\text{m}^3$)	70	156
PM2.5 ($\mu\text{g}/\text{m}^3$)	35	78
Non accidental mortality (> 30y; all causes)	3.0%	8.0%
Hospital admissions		
Respiratory diseases	4.6%	12.0%
Cardio-Vascular Diseases (including strokes)	2.2%	6.0%

Because of their enrichment in VOC, BB particles might be more toxic than urban aerosols.

In this case, the WHO results might underestimate the real health impact of the Black Cloud.

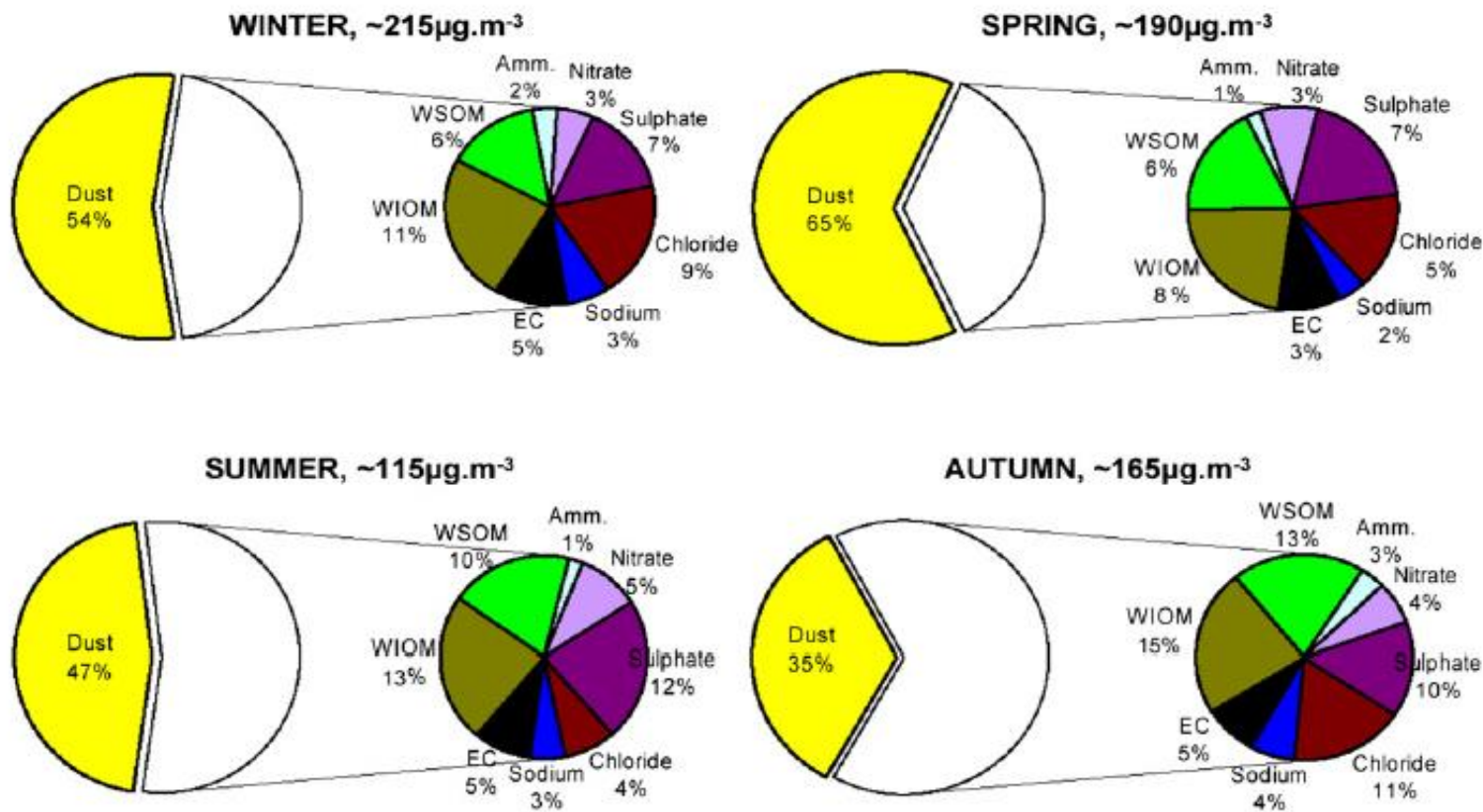
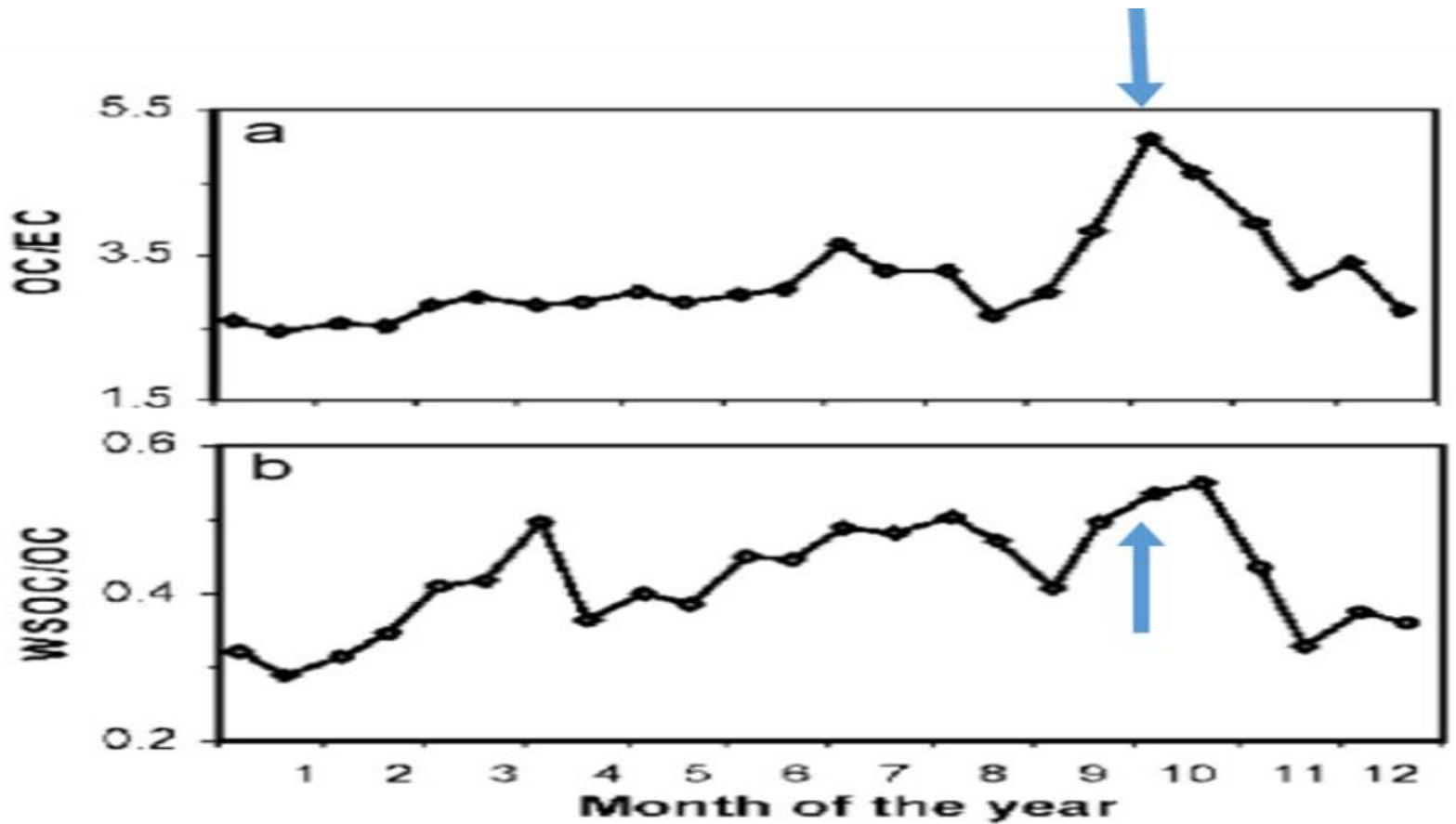


Fig. 9. Seasonal relative contribution of each major aerosol species for the year 2005.

- Mineral dust is a major component all year round, but particularly in spring (Khamsein)
- In Autumn (October, Black Cloud), enrichment of the aerosol in organic matter (OM), and particularly in the water soluble one (WSOM)



The question of how to tackle the Black Cloud problem must be considered not only at the very short-term (crisis management, when Black Cloud occurs or is about to) but also over the long term.



This analysis provides the first time quantified evidence that biomass burning (BB) does have an impact on PM_{10} concentration in GC.



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This study identifies the best ways and avenues to tackle to problem of black cloud and its negative impacts on ecosystems.

it is very important that the government manages to persuade the farmers not to return to the burning practices



The black cloud in GC is not only due to biomass burning (BB) in the Delta. It is due to a combination of factors (meteorological, emissions by different sectors such as municipal, industrial activities) and dangerous PM_{10} levels can occur even without massive biomass burning. Assuming 'business as usual' emissions in the Delta and GCA, air-quality models could be used to predict these strong pollution events. If such models do not exist in Egypt, they must be implemented and validated.



CONCLUSIONS



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This needs coordination at least between the air-quality (Air quality index: AQI) issued regularly as a forecast for the next hours or days. In case of exceedance of values considered as 'normal', the population could be warned through public (TV, Radio) or individual (telephones) channels. Different ministries (Environment, Local Development, Health, Interior, Education, and Higher Education, as well as EMA) will be involved in the diffusion of these alerts.



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In case of air-quality is expected to be dangerous, there are a series of quick measures to be taken at governmental level (closure of some industries in Northern Cairo, reduction of traffic, banning of waste burning in GC and Delta, ask the population to stay at home). All these measures will be more easily accepted by the population if efficient awareness campaigns have been made before. In these campaigns, the Ministries of Health, Media, Education and Environment have a prominent role to play.

Over the long-term, green technologies in all sectors (Agriculture, industries, waste management, and transportation) must be encouraged, including financially if necessary.

Research (by private and public sectors) is important to develop to propose original and novel ideas



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RECOMMENDATIONS for Rice straw

1. Using Rice straw as a fodder, wind breaks, ceiling for houses, staple yards and fuel for cooking in rural villages and peasant farms.
2. Enhancing the solid waste management. In China, they bury rice straw under the top soil of yellow sands in deserts (10 – 20 cm in depth) and irrigate these lands with treated waste water, the yellow sand changes into black sand "Fertile" within three years and they use it for afforestation.
3. Encouraging college of agriculture to modify machinery of harvesting and suggest innovative ways of utilizing straw.



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Thanks