

# Investigation of the impact of atmospheric pollution on air quality and ecosystems

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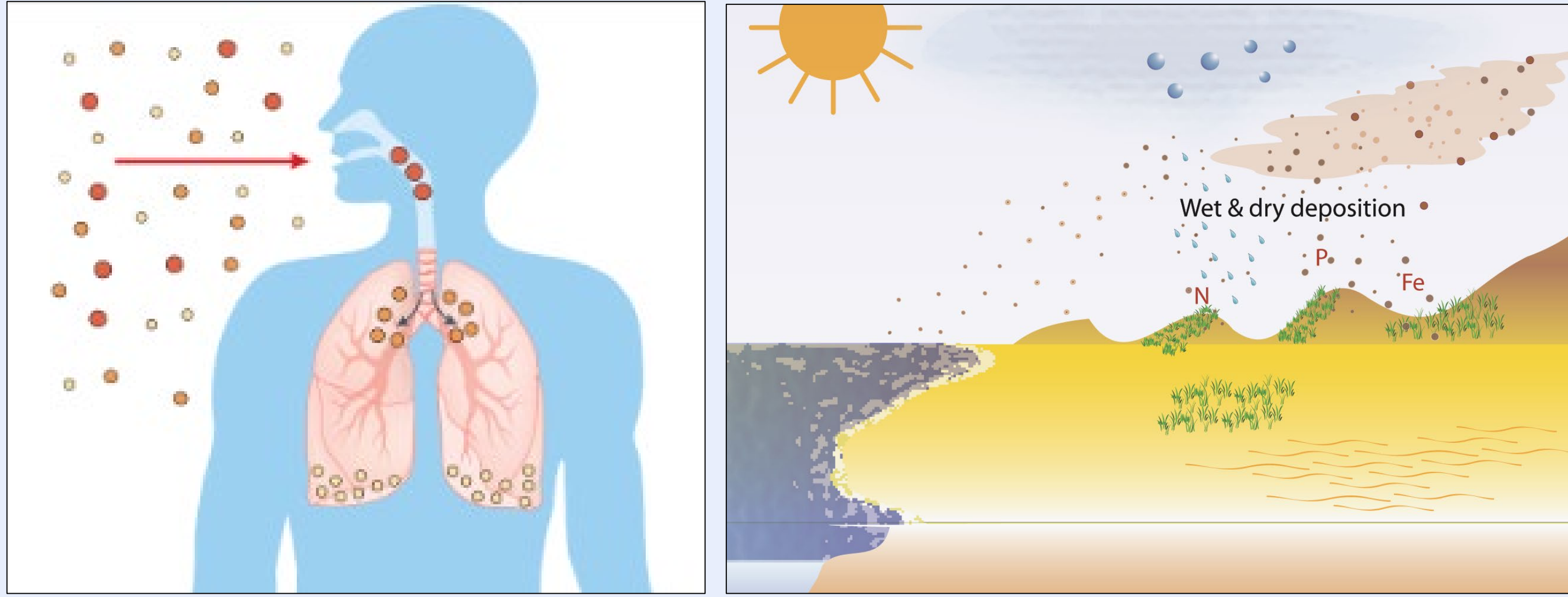
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## Motivation

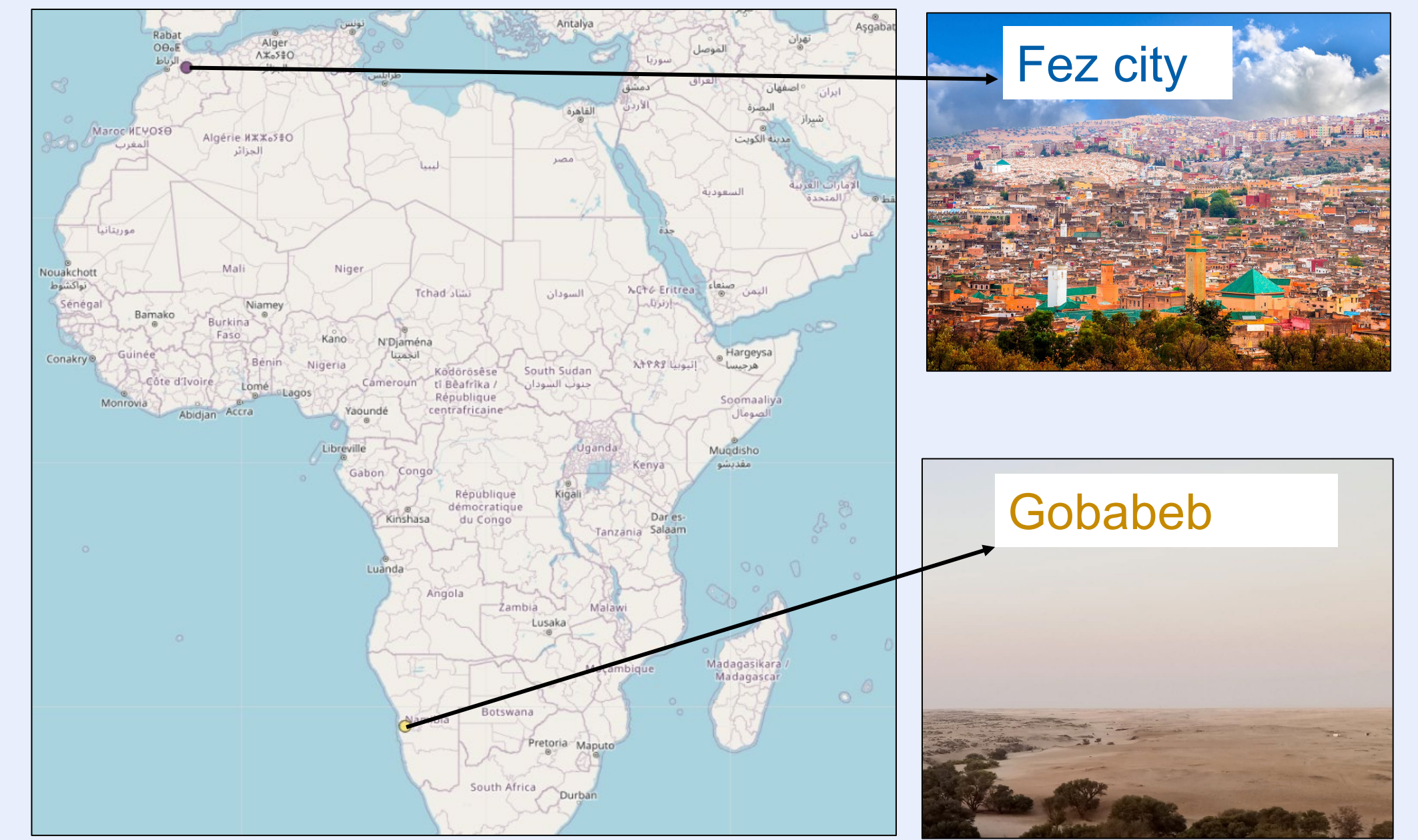


- Aerosol particles are of significant importance due to their impacts on climate, human health and ecosystems.
- Exposure to these particles via inhalation have been linked to human mortality.
- Nevertheless, aerosol particles can also deliver critical nutrients (N, P, Fe) to terrestrial and marine ecosystems.
- In Africa, studies focused on understanding such impacts are limited.

## Results

➤ Particulate matter (PM<sub>10</sub>) samples were collected at two distinct sites: an urban area (Fez City) and a desert site (Gobabeb).

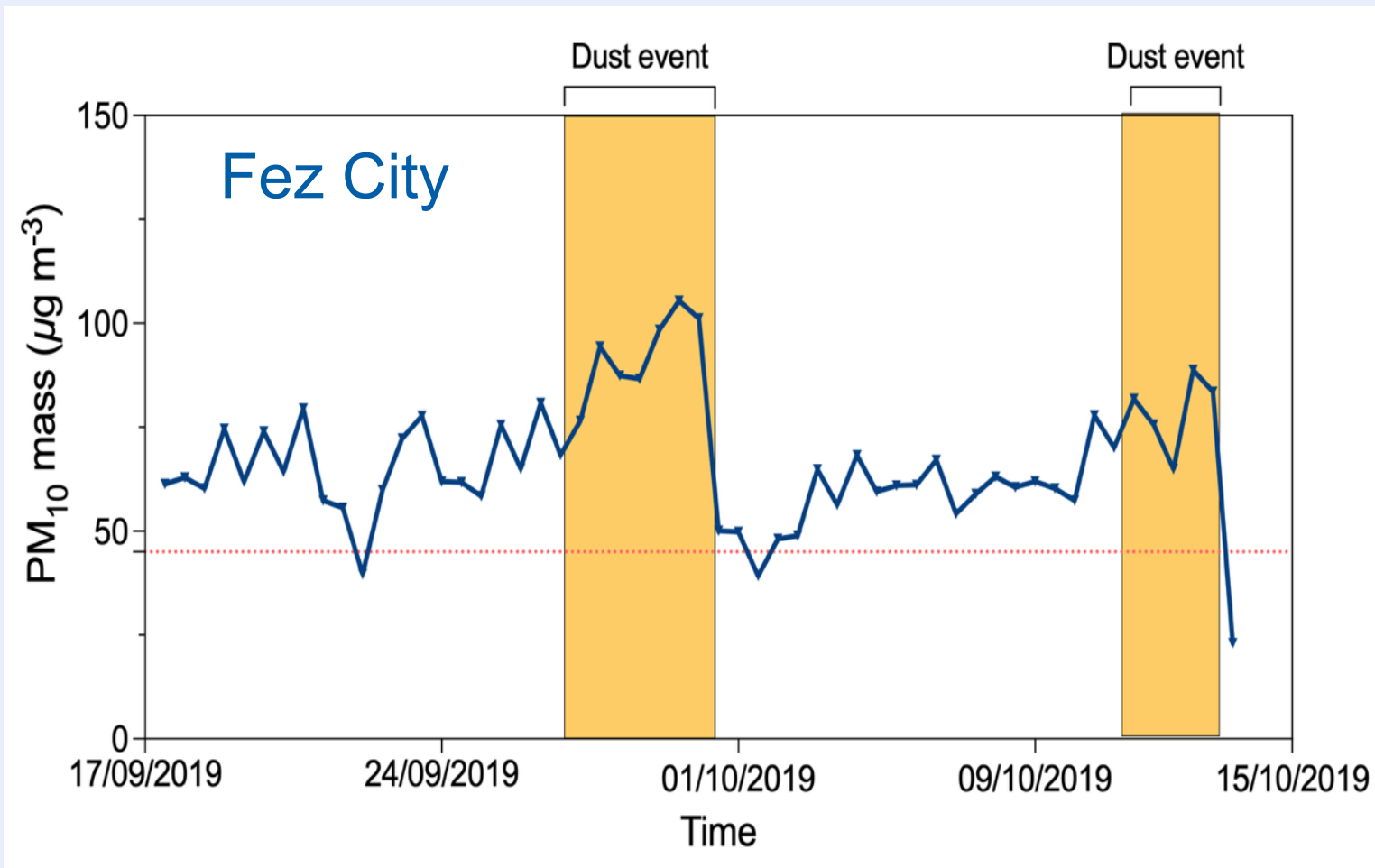
➤ Sampling was carried out using a high volume (HV) DIGITEL sampler with a PM<sub>10</sub> inlet from September to October 2019 and 2024 in Fez city and the Namib Desert, respectively.



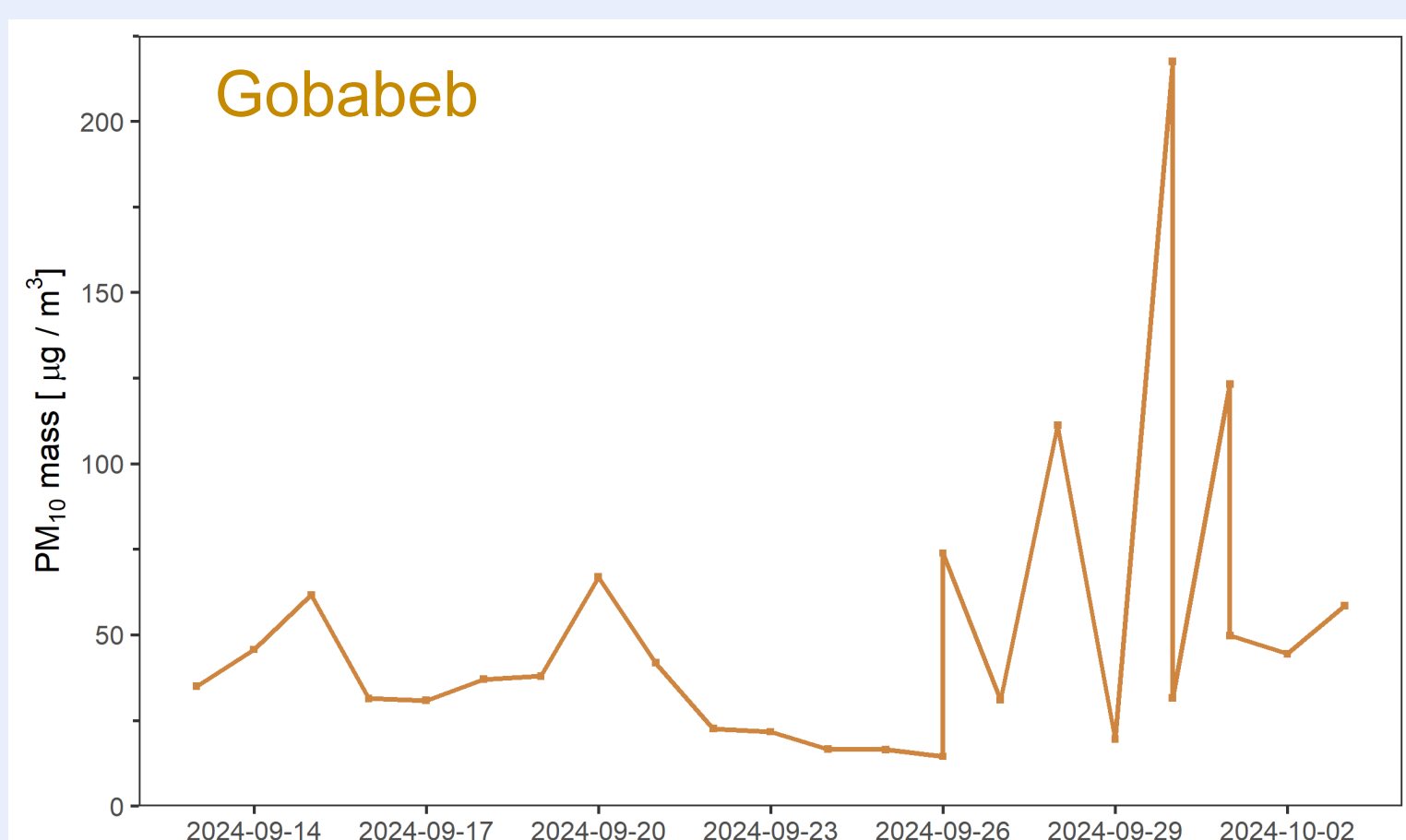
➤ Source apportionment and air mass back-trajectory analyses were used to estimate source contributions and potential source regions that contributed to the sampled particles.

## Results

### Overview of PM<sub>10</sub> mass at the urban and desert site

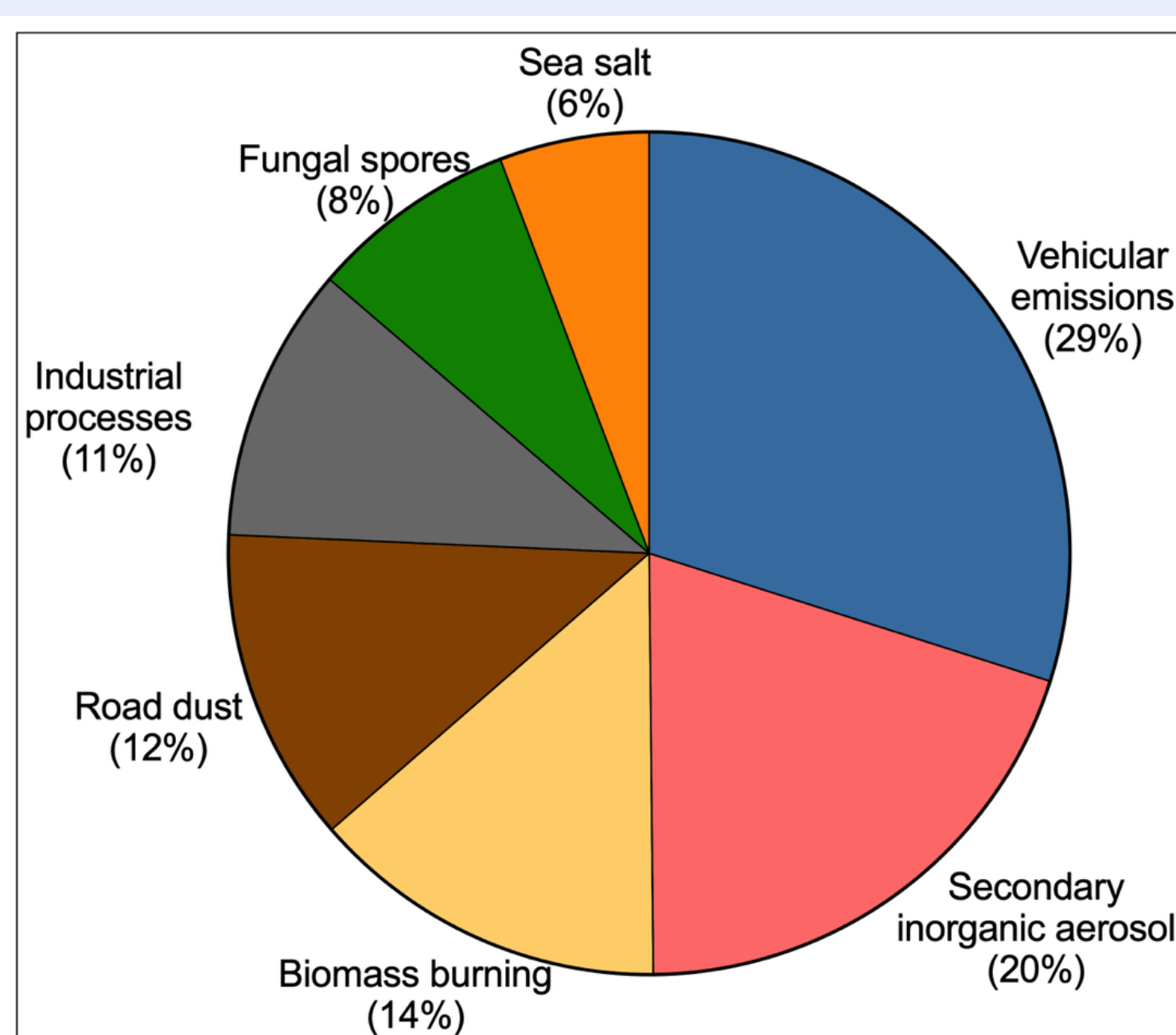


- The average PM<sub>10</sub> mass at Fez city was 68.8 µg.m<sup>-3</sup>
- Daily PM<sub>10</sub> mass at Fez city was consistently above air quality limit (45 µg.m<sup>-3</sup>) defined by the World Health Organization (WHO).
- Dust outbreaks elevated the PM<sub>10</sub> mass by 50%.

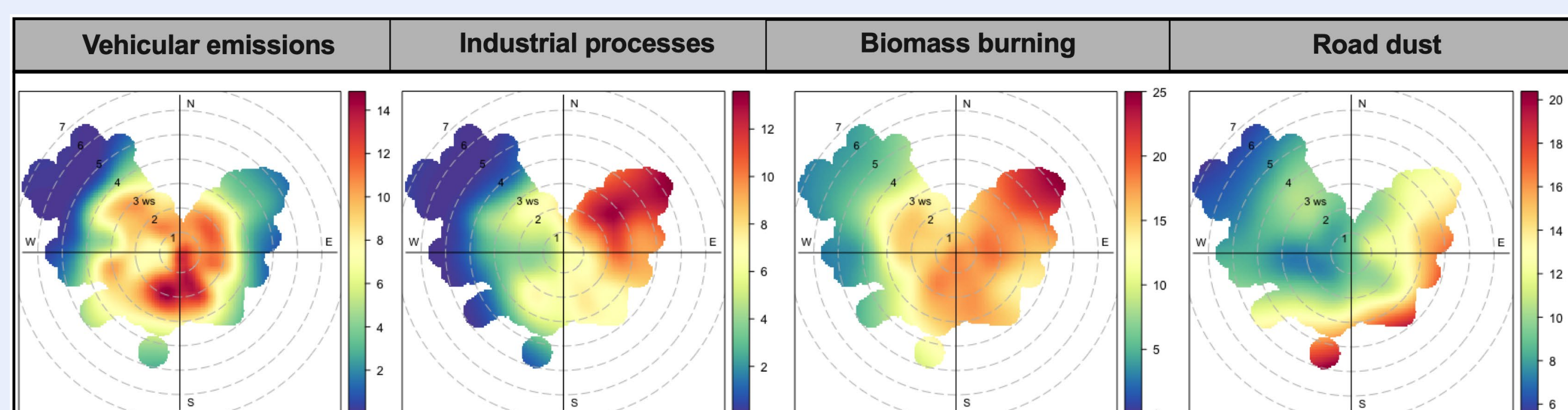


- Mean PM<sub>10</sub> mass at Gobabeb (51.7 µg.m<sup>-3</sup>) was mostly above background conditions (16.5 µg.m<sup>-3</sup>).
- PM<sub>10</sub> mass increased up to 217 µg.m<sup>-3</sup> during dust events

### Source identification and contribution to PM<sub>10</sub> at Fez city

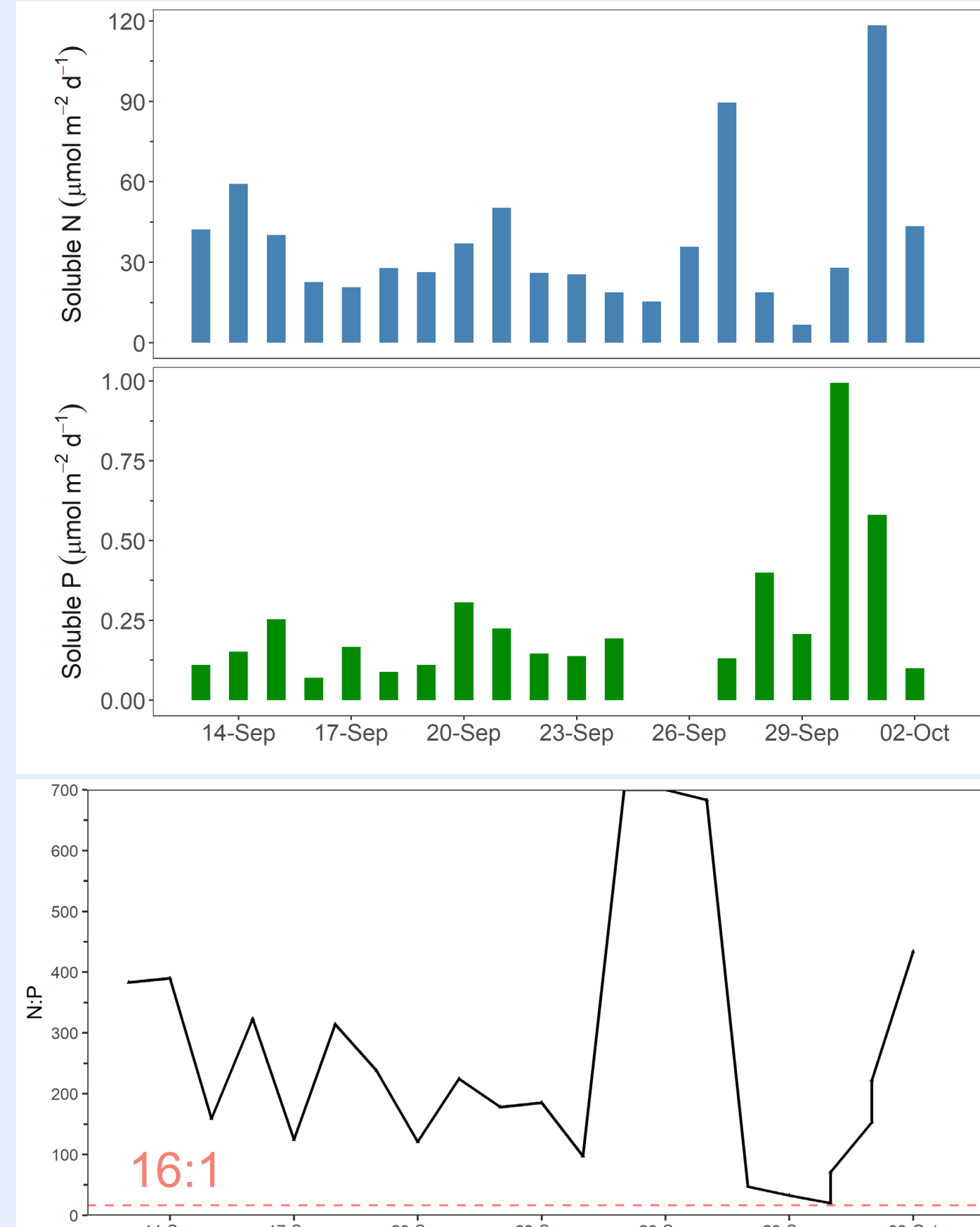


- Varied sources (7) identified to contribute to PM<sub>10</sub> at Fez
- Total contribution dominated by anthropogenic sources
- Emissions from vehicles were the most important



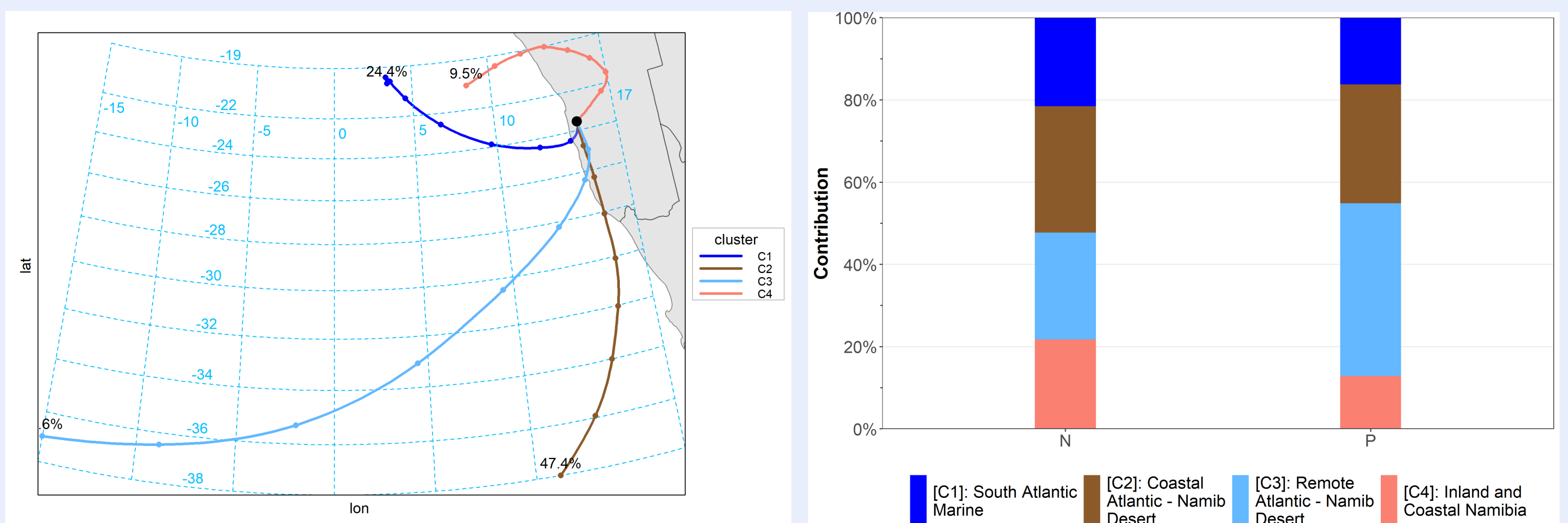
- Local and distant traffic sources identified to contribute to air pollution in Fez
- Biomass burning tracers were attributable mainly to unregulated waste burning.

### Deposition fluxes of bioavailable N and P at the desert site



- Strong variation in fluxes of major nutrients (N and P) to desert ecosystems.
- Proportion of soluble N in deposited aerosols much higher than that of P
- Peak in soluble P fluxes linked to dust events
- Estimated ratios of N to P far exceed the optimum of 16:1 (~ 220)

### Air mass origin and relative contribution to deposited nutrients



- Four distinct air mass clusters identified; a mix of marine and continental regions
- Air masses spending considerable time over the Namib Desert (C2 and C3) supply most of the bioavailable P .

## Conclusion

- Human activities are the primary driver of pollution in Fez city.
- Aerosols deposited to terrestrial ecosystems in the Namib Desert are P limited
- Dust emission is an important source of bioavailable P

## References

- Deabji et al., Environ. Sci. Pollut. Res., 2024
- Fomba et al., ACS Earth Space Chem. **Under Review**, 2025