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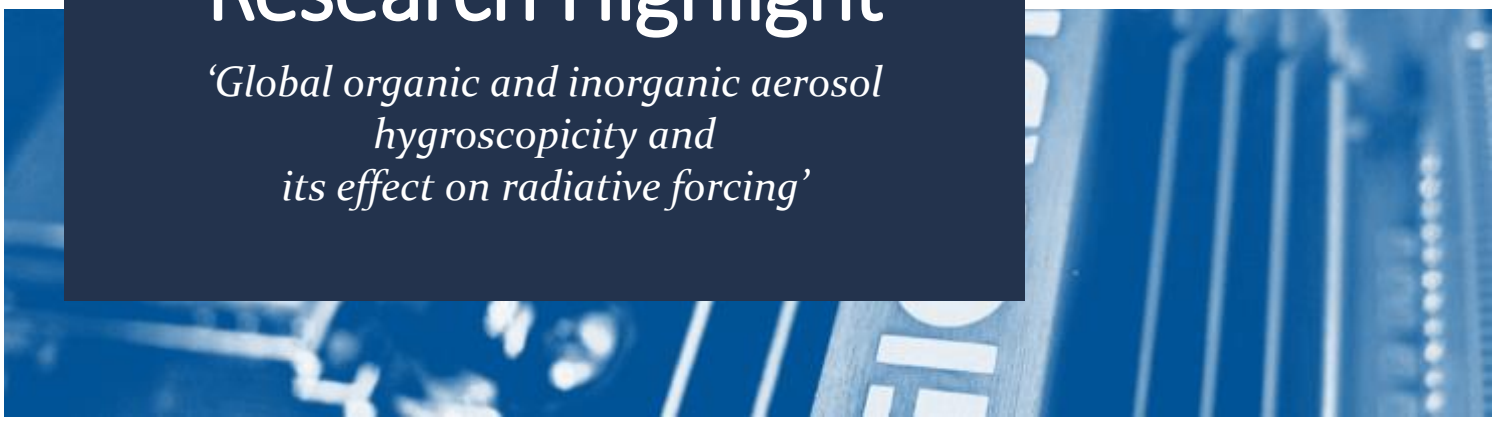
Research Highlight

'Global organic and inorganic aerosol hygroscopicity and its effect on radiative forcing'



Summary

The climate effects of atmospheric aerosol particles serving as cloud condensation nuclei (CCN) depend on chemical composition and hygroscopicity (i.e. the capacity of a particle to hold water), which are highly variable on spatial and temporal scales. The study, which has been recently published in the 'Nature Communications' journal, presents global CCN measurements, covering diverse environments from pristine to highly polluted conditions, showing that the effective aerosol hygroscopicity, κ, can be derived accurately from the fine aerosol mass fractions of organic particulate matter (ϵ_{org}) and inorganic ions (ϵ_{inorg}) through a linear combination. In spite of the chemical complexity of organic matter, its hygroscopicity is well captured and represented by a global average value of $\kappa_{org} = 0.12 \pm 0.02$ with $\kappa_{inorg} = 0.63 \pm 0.01$ as the corresponding value for inorganic ions.

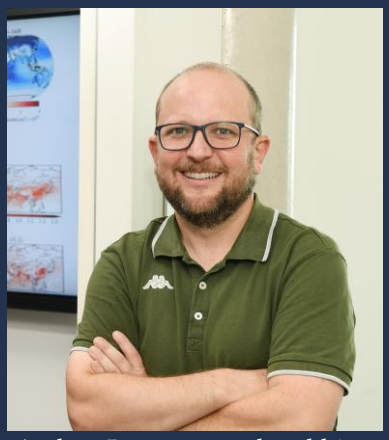
Impact

The study shows that hygroscopicity, averaged globally, is essentially determined by the share of organic and inorganic materials making up the aerosol.

The simple new formula to calculate the relationship between the chemical composition and the hygroscopicity of aerosol particles, proposed by this research has significant implications on climate forecasts as it can increase the reliability investigations and forecasts related to climate change.

By showing that the sensitivity of global climate forcing to changes in κ_{org} and κ_{inorg} is small, a critically important aspect of global climate modeling has been constrained.

Andrea Pozzer



Andrea Pozzer completed his BSc in Physics at the university of Padua (Italy) and Ph.D. at the University of Mainz, Germany, in collaboration with the Max Planck Institute for Chemistry (Mainz, Germany). After working as a postdoctoral researcher at the Cyprus Institute (Nicosia, Cyprus) and the International Center of Theoretical Physics (Trieste, Italy) he became research group leader at the Max Planck Institute for Chemistry and he is since 2022 adjunct

Reference

Pöhlker, M.L., Pöhlker, C., Quaas, J., Mülmenstädt, J., Pozzer, A., Andreae, M. O., Artaxo, P., Block, K., Coe, H., Ervens, B., Gallimore, P. J., Gaston, C. J., Gunthe, S. S., Henning, S., Herrmann, H., Krüger, O. O., McFiggans, G., Poulain, L., Raj, S. S., Reyes-Villegas E., Royer H.M., Walter D., Wang Y. & Pöschl, U. Global organic and inorganic aerosol hygroscopicity and its effect on radiative forcing. *Nat Commun* **14**, 6139 (2023). https://doi.org/10.1038/s41467-023-41695-8

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