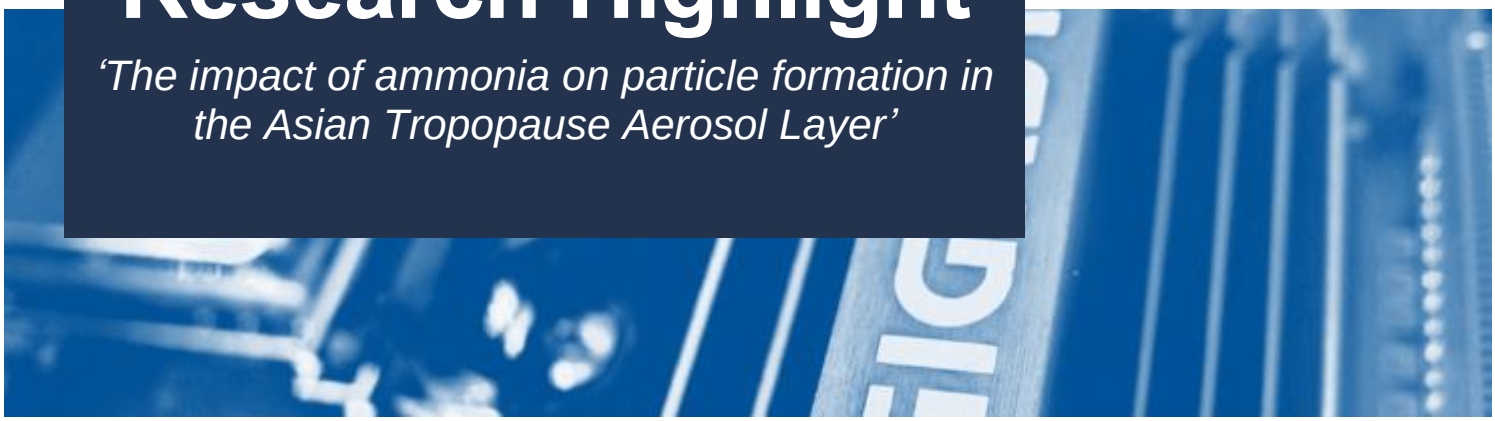
CARE-C
CLIMATE AND ATMOSPHERE RESEARCH CENTER

THE CYPRUS INSTITUTE
RESEARCH·TECHNOLOGY·INNOVATION

Research Highlight

'The impact of ammonia on particle formation in the Asian Tropopause Aerosol Layer'



Summary

Every summer, the South Asian monsoon in Southeast Asia lifts ground-level pollution, including ammonia, into the upper atmosphere. This affects air quality and cloud formation. Ammonia, mainly from agriculture, is carried by the monsoon into the upper troposphere and lower stratosphere (UTLS), forming the Asian Tropopause Aerosol Layer (ATAL). This study uses advanced Earth system modeling to understand how ammonia influences particle formation in the ATAL, which spans from the East Mediterranean to West China.

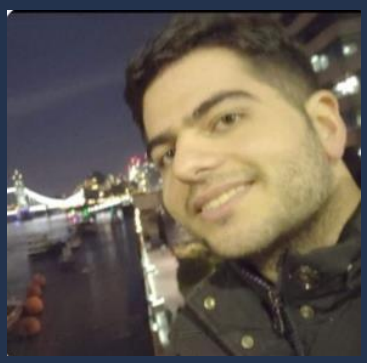
Impact

This research, for the first time, explores the synergistic effects of ammonia, nitric acid, and sulfuric acid in the upper troposphere, as discovered by CERN CLOUD experiments. These interactions significantly enhance particle formation, adding complexity to our understanding of ammonia's role in the Asian Tropopause Aerosol Layer (ATAL).

Using the EMAC chemistry-climate model and CERN CLOUD data, researchers found that during daylight, particle formation in the UTLS region increases tenfold during the South Asian monsoon. This is due to deep convection, which lifts high levels of ammonia from the ground to the UTLS.

Authors' bios

Christos Xenofontos is a PhD student at the Environmental Predictions Department of the Cyprus Institute's Climate and Atmosphere Research Center (CARE-C). His research focuses on modelling new particle formation in the upper troposphere. He holds a Marie Skłodowska Curie Actions (MSCA) Fellowship.



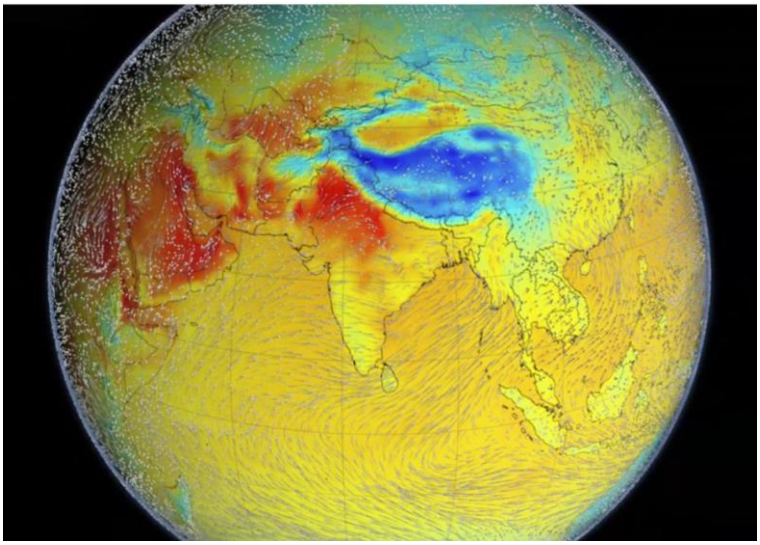
Reference

Xenofontos, C., Kohl, M., Ruhl, S., Almeida, J., Beckmann, H. M., Caudillo-Plath, L., Ehrhart, S., Höhler, K., Kaniyodical Sebastian, M., Kong, W., Kunkler, F., Onnela, A., Rato, P., Russell, D. M., Simon, M., Stark, L., Umo, N.S., Unfer, G.R., Yang, B., Yu, W., Zauner-Wieczorek, M., Zgheib, I., Zheng, Z., Curtius, J., Donahue, N. M., El Haddad, I., Flagan, R. C., Gordon, H., Harder, H., He, X.-C., Kirkby, J., Kulmala, M., Möhler, O., Pöhlker, M. L., Schobesberger, S., Volkamer, R., Wang, M., Borrmann, S., Pozzer, A., Lelieveld, J., and Christoudias, T. The impact of ammonia on particle formation in the Asian Tropopause Aerosol Layer. *npj Clim Atmos Sci* **7**, 215 (2024). https://doi.org/10.1038/s41612-024-00758-3

Read the full article here: https://doi.org/10.1038/s41612-024-00758-3

Contact details

Christos Xenofontos – c.xenofontos@cyi.ac.cy



Credit: NASA Goddard Space Flight Center

Dr Theodoros Christoudias is an Associate Professor at the CARE-C, where he leads the Earth System Modelling Group.

Prof Jos Lelieveld is Director at the Max Planck Institute for Chemistry in Mainz, and Professor at the Cyprus Institute where he leads the Environmental Prediction Department of CARE-C.

Dr Andrea Pozzer is an Adjunct Associate Professor at CARE-C, and atmospheric modelling Group Leader at the Max Planck Institute for Chemistry, Mainz.