Using the CLF to study a levitated cooking aerosol proxy

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Aerosols in the atmosphere

- Air quality
- Health
- Climate
Oleic acid – a surfactant cooking emission

Oleic acid lasts longer in the atmosphere than predicted in the lab, why?

Expected condition-dependent phase transformation

- Increase in temperature, surfactant unsaturation, length of hydrophobic tail; addition of hydrocarbons
- Increase in relative humidity, headgroup charge, pH; addition of humectants

Pfrang et al., Nat. Commun., 2017

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Levitated particles
(simultaneous small-angle X-ray scattering (SAXS) and Raman)
The experiment

From Pfrang et al., Nat. Commun., 2017, doi: 10.1038/s41467-017-01918-1
Why CLF? - Slowed reaction kinetics

Milsom et al., Atmos. Chem. Phys., 2021

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Implications and summary

• Crystalline phase significantly increases reactive lifetime of oleic acid.

• Possible inert “crust” forming (first experimental evidence), oleic acid still left after loss of crystallinity (Raman evidence). Longer lifetime for particle contents?

• Complementary SAXS-Raman enabled us to make these conclusions.

• More work to come…

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References

An organic crystalline state in ageing atmospheric aerosol proxies: spatially resolved structural changes in levitated fatty acid particles.

The persistence of a proxy for cooking emissions in megacities: a kinetic study of the ozonolysis of self-assembled films by simultaneous small and wide angle X-ray scattering (SAXS/WAXS) and Raman microscopy.

The impact of molecular self-organisation on the atmospheric fate of a cooking aerosol proxy. [Preprint]