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# The presence of and effects from meteoric-sulphuric particles within the stratospheric aerosol layer

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In-situ measurements in the Arctic, Antarctic and at mid-latitudes suggest a widespread presence of meteoric smoke particles (MSPs), as an inclusion within a distinct class of stratospheric aerosol particles.

We apply the UM-UKCA stratosphere-troposphere composition-climate model, with interactive aerosol microphysics, to map the global distribution of these “meteoric-sulphuric particles” and explore the implications of their presence.

Comparing to balloon-borne stratospheric aerosol measurements, we indirectly constrain the uncertain MSP flux into the upper stratosphere, and assess whether meteoric inclusion can explain observed refractory/non-volatile particle concentrations.

Our experiments suggest meteoric-sulphuric particles are present at all latitudes, the Junge layer transitioning from mostly homogeneously nucleated particles at the bottom, to mostly meteoric-sulphuric particles at the top.

We find MSPs exert a major influence on the quiescent Junge layer, with meteoric-sulphuric particles generally bigger than homogeneously nucleated particles, and therefore more rapidly removed into the upper troposphere.

Resolving the smoke interactions weakens homogeneous nucleation in polar spring, reduces the quiescent sulphur burden, and improves comparisons to a range of different stratospheric aerosol measurements.

The refractory nature of meteoric-sulphuric particles also means they “survive” ascent through the uppermost Junge layer, whereas homogeneously nucleated particles evaporate completely.

Simulations through the Pinatubo-perturbed period are more realistic, with greater volcanic enhancement of effective radius, causing faster decay towards quiescent conditions, both effects matching better with observations.

Overall, our experiments suggest meteoric-sulphuric particles are an important component of the Junge layer, strongly influential in both quiescent and volcanically perturbed conditions.