Natural Materials for Stratospheric Aerosol Injection

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Project Timeline

- Balloon launch plan agreed (M3)
- Vessel ready for science flights (M6)
- Design briefing for high pressure slurry pump delivery system + aerosol dispersion system (M6)
- Interim report on comms + engagement (M12)
- Long duration balloon flight plan (M18)
- Batch prototype dispersion + pumping systems available (M24)
- Mid term report (M24)
- Continuous prototype pumping system available (M36)
- Final report (M38)

Programme Alignment

Stratospheric Aerosol Injection (SAI) is one of the most-studied methods to increase planetary albedo, but research has so far been limited to numerical simulations. Most studies look at the effects of sulphur dioxide (SO_2), but this has the potential for undesirable side effects. We will assess alternative materials for SAI.

Summary

Alternative SAI materials (ASAIMs) are solid/crystalline in nature, e.g., alumina, calcite, silicon dioxide, diamond and other materials.

Benefits of ASAIMs may include:

- **Potential to reduce risk** to the chemical balance and the dynamics of the stratosphere.
- Particles engineered to a specific size range which can **optimise their scattering efficiency** and their stratospheric lifetime.
- **Instantaneously effective**, meaning small-scale indoor experiments are relatively easy with ASAIMs.

Aims & Objectives

We aim to advance the field of SAI and expand our knowledge of different candidate particles. We plan to combine outdoor experiments (with no particle release), laboratory work and modelling.

- Set up balloon flights to expose ASAIMs to stratospheric conditions without releasing materials.
- Determine options for dispersal:

✓ Identify candidate particles
✓ Explore surface properties
✓ Test slurry effect in laboratory experiments
✓ Assess plume and particle size distribution.

- Consider plume dynamics, representations, local conditions, and global plume simulations.
- Evaluate which ASAIMs have greatest promise for climate cooling effect.

Milestones

- Balloon flight + launch plan agreed
- Vessel ready
- Design briefing for high-pressure slurry complete
- Interim report on comms + engagement
- Batch prototype dispersion and pumping systems
- Investigate plume effects
- Plan 3-week balloon flight
- Feed long duration balloon flights into modelling
- Conduct annual simulations of ASAIM efficacy
- Final report

Stratospheric balloon flights