The Heliophysics' AIM mission celebrates 10 illuminating years of discovery in atmospheric phenomena

Launched on April 25, 2007, the NASA Heliophysics Aeronomy of Ice in the Mesosphere (AIM) mission has provided 10 years' worth of cutting-edge science on the dynamics and composition of Earth's upper atmosphere. AIM has helped scientists understand a wide range of atmospheric phenomena, including how bright, night-shining – or noctilucent – clouds form and how meteoric smoke interacts with the atmosphere.

AIM has helped scientists answer a whole host of questions and mysteries in atmospheric science over the past 10 years, including how ice crystals that make up Earth's hauntingly beautiful noctilucent clouds are formed – by combining with meteoric smoke. Credit: NASA/Dave Hughes

A recent paper using data from AIM helped scientists explain a puzzling discrepancy in atmospheric models predicting meteoric smoke. In these models, smoke density throughout the year correlated with AIM's observations in most of Earth's atmosphere – but not at the stratopause.

AIM infers smoke by measuring how much sunlight is decreased at a certain wavelength and relating this to meteoric smoke particles that would block the light. This blockage of light is referred to as atmospheric extinction. AIM observations show that atmospheric extinction at this altitude, the boundary between the stratosphere and the mesosphere, increased in autumn rather than winter as the models predicted. Dr. Mark Hervig from GATS, Inc. used AIM data and improved photochemistry in an atmospheric model to explain what was happening.

In this paper, the authors describe how the smoke's interaction with stratospheric sulfate aerosols (SSA) can explain the apparent increase in extinction in the autumn. These aerosols, a mixture of sulfuric acid and water, form primarily from sulfur dioxide ejected into the stratosphere by volcanic eruptions.

The study describes how during the fall, the temperatures near the South Pole drop below the saturation point for sulfuric acid aerosols; this causes the aerosols to condense onto the meteoric smoke metals. The condensation of sulfuric acid causes the particles to grow in size, which increases the observed extinction – making it appear as if more smoke is present than actually is. When the scientists adjusted the model for time of year, sulfuric acid density and altitude, the model successfully produced results consistent with the AIM observations.

Please visit https://science.nasa.gov/Heliophysics/HelioConnects to view an interactive version of this PowerPoint with click-able hyperlinks.