

Café Scientifique Headingley

Monday 9th December 2024

Cosmic dust: what is it; where does it come from; and what impacts does it have in our atmosphere?

By: John Plane



*The Zodiacal light photographed after sunset from Chile
[credit: Y. Beletsky, Southern European Observatory]*

One of the very interesting questions in solar system science is the quantity of cosmic dust, expelled from old giant stars, that enters the Earth's atmosphere each day. Estimates have ranged from 3 to 300 tons, depending on whether the measurements are made by dust detectors on orbital spacecraft, in the atmosphere itself, or by measuring the accumulation of cosmic elements in polar ice cores. Dust particles enter the atmosphere at enormous speeds (40,000 – 260,000 km hr⁻¹). This causes the larger and faster particles to flash heat to over 1800° C, leading to complete evaporation. This process of ablation causes the optical phenomenon of a “shooting star” and leads to the deposition of metal atoms in the atmosphere between 80 and 105 km. The global layer of metal atoms thus formed floats at the boundary on the edge of space. Layers of metallic ions play an important role in radio communications. The metal vapours eventually oxidize and condense into tiny particles termed “meteoric smoke particles”, which take roughly 5 years to reach the Earth's surface. There is great interest in the role they play as condensation nuclei of noctilucent ice clouds which are about 50 km higher than other clouds and provide an unambiguous indicator of rapid climate change in the middle atmosphere.

John Plane has been Professor of Atmospheric Chemistry in the School of Chemistry at Leeds since April 2006. He studies the aeronomy of planetary atmospheres and the chemistry of the interstellar medium. His specialisation is cosmic dust: its formation around evolved stars, and the effects of cosmic dust ablation in planetary atmospheres - using a combination of experimental and theoretical studies of neutral and ion-molecule reactions in the gas phase, satellite observations, and global modelling. John is the author of over 410 peer-reviewed papers and 17 book chapters. He was elected a Fellow of the American Geophysical Union (2017), a Fellow of the Royal Society (2020), and a member of the Academia Europaea (2022).

Venue: The New Headingley Club, 56 St Michaels Road, LS6 3BG

Time: Room opens 7:30pm, Talk begins promptly at 7:45pm

Entry: Donation please for room hire and expenses: £4 at the door



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