National Aeronautics and Space Administration

NASA HELIOPHYSICS

AERONOMY OF ICE IN THE MESOSPHERE

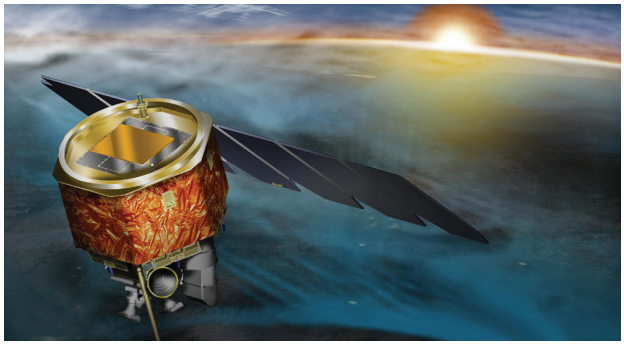
Exploring Clouds at the Edge of Space

Fifty miles above the ground, Earth's highest clouds form an icy membrane at the edge of the atmosphere. AIM's mission is to study the physical and chemical processes that give rise to these mysterious polar mesospheric clouds, or PMCs. Also known as noctilucent clouds, and night-shining clouds, PMCs form high above Earth's surface, and can only be seen near twilight. They have been spotted for over a century during summer months, usually at high latitudes near the North and South Poles. However, in recent years, these clouds are being seen more frequently at lower latitudes.

Launched on April 25, 2007, AIM orbits around Earth in a near-circular, sun-synchronous orbit, which is a low-altitude orbit that passes over any given point on Earth at approximately the same local time. At an altitude of some orbit altitude of 370 miles, AIM can look down on the polar mesospheric clouds from above.

The primary goal of the mission is to determine why these night-shining clouds form. By measuring the thermal, chemical and other properties of the environment in which the mysterious clouds form, AIM provides researchers with a foundation for the study of long-term variations in the mesosphere and its relationship to global climate change. In addition to measuring environmental conditions, AIM collects data on cloud abundance, how the clouds are distributed, and the size of ice particles within them.

AIM's observations have led to more than 200 papers on Earth's upper atmosphere. Some key scientific discoveries, include: Showing that noctilucent cloud



Artist conception of NASA's AIM spacecraft. Credit: NASA

numbers have steadily increased over the past decade; increases in water vapor, a greenhouse gas, and decreasing upper-atmosphere temperatures — a side effect of warming near the surface — may be contributing to the increased presence of PMCs; ice crystals in noctilucent clouds form on a tiny microparticles created when meteors burn up in Earth's atmosphere; and showing that heating in the mesosphere is more likely linked to circulation in the atmosphere rather than direct heating from the Sun. AIM's measurements have also helped scientists track how air in the atmosphere moves vertically, as well as between the hemispheres. This helps scientists understand how events near Earth's surface — like thunderstorms — might trigger changes in the upper atmosphere.

ADDITIONAL RESOURCES:

Mission Project Home Page: *https://www.nasa.gov/aim*

AIM Data: *http://aim.hamptonu.edu/*

FS-2019-1-319-GSFC-2