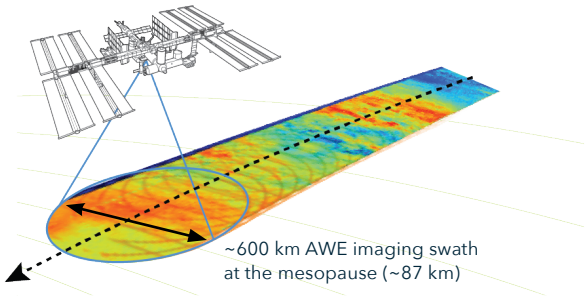
AWE

Atmospheric Waves Experiment

The Atmospheric Waves Experiment (AWE) is a NASA Mission of Opportunity with the primary goal to help quantify, for the first time, how small-scale atmospheric gravity waves (AGWs), originating from Earth's weather, affect the edge of space and contribute to space weather.

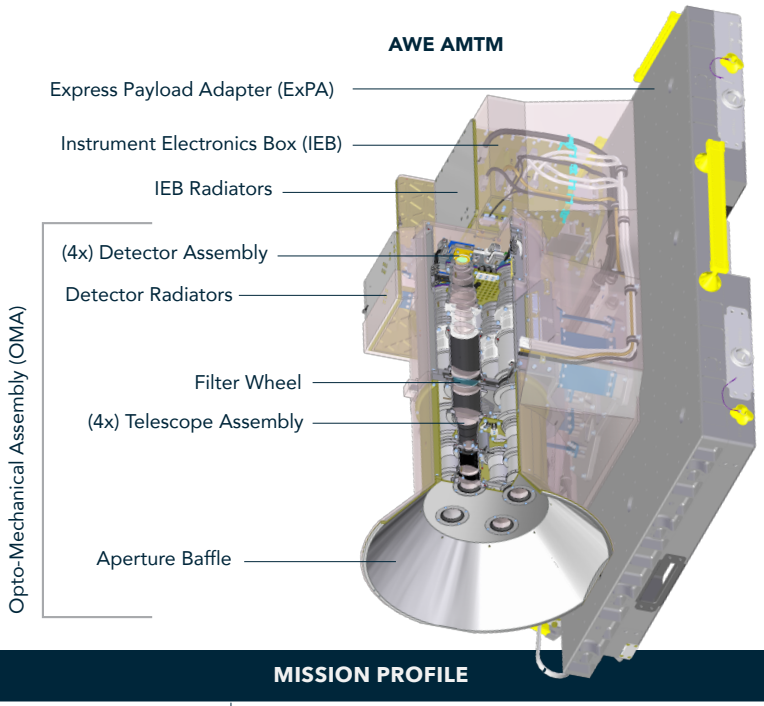
AGWs are mainly caused by disturbances in the troposphere, ranging from strong winds flowing over steep mountains to powerful thunderstorms, tornadoes, and hurricanes. As they propagate upward, they grow rapidly in amplitude and can quickly transport energy and momentum from the troposphere (surface to ~10–15 km) into the ionosphere-thermosphere-mesosphere (ITM; 50–500 km). Hence, AGWs can cause significant disturbances with far-reaching effects.

AWE's Advanced Mesospheric Temperature Mapper (AMTM), a wide field of view imaging radiometer with four identical telescopes, will be installed in a nadir-viewing configuration on the International Space Station. The AMTM will characterize AGWs propagating upward within the ITM system by producing high-quality temperature maps of gravity wave structures visible in the hydroxyl OH airglow emission layer near the mesopause (~87 km altitude).



Scientists will use the data to estimate disturbances at higher altitudes and identify how AGWs in the mesopause vary based on geographic location and season. The data will also show how AGWs relate to sources near the ground.

Ultimately, the knowledge gained from AWE will help experts to better understand and predict how AGWs affect GPS navigation, tracking, and communication systems.



MISSION PROFILE	
Launch	November 9, 2023
Mission Duration	2 years
Primary Measurements	Continuous nighttime observation of AGWs with horizontal wavelengths 30–300 km & amplitudes >3K
Science Data Products	Band intensity & temperature
Temperature Precision	<4K
Swath Size	~600 x 15,000 km
Spatial Resolution	6.5 km cross-track; 10.3 km along-track
Revisit Time	Complete coverage of mesopause every 4 days (over +/- 54° latitude)
Geolocation Uncertainty	<30 km

INSTRUMENT SPECIFICATIONS	
Mass	58 kg
Volume	0.30 m^3
Power	20 W (orbit average)
Data Rate	5.40 Mb/s
Frame Rate	1 image per second
Field of View	90 degrees

UTAH STATE UNIVERSITY
SPACE DYNAMICS LABORATORY®

416 East Innovation Avenue | North Logan, Utah 84341 | info@sdl.usu.edu | www.sdl.usu.edu

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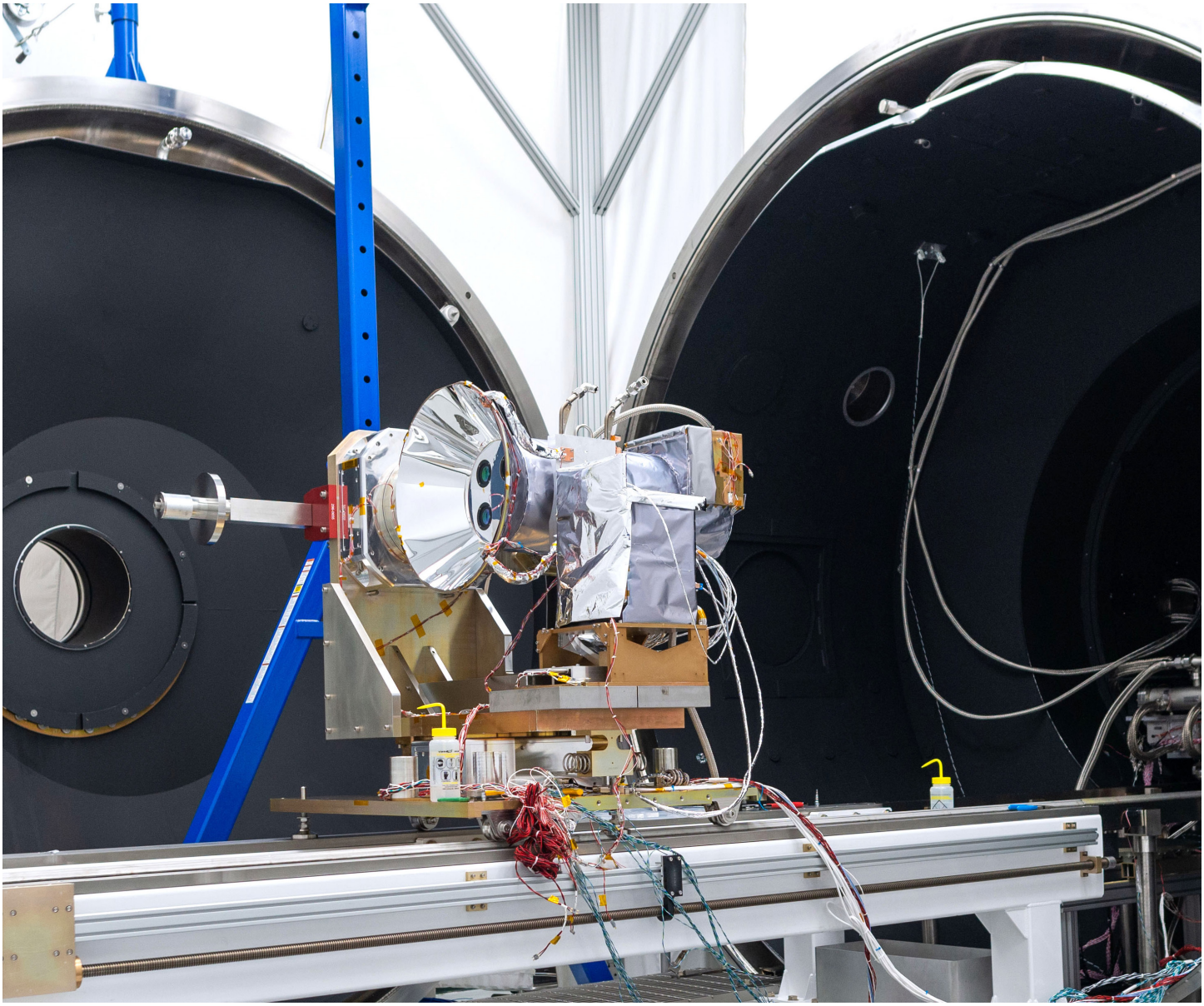

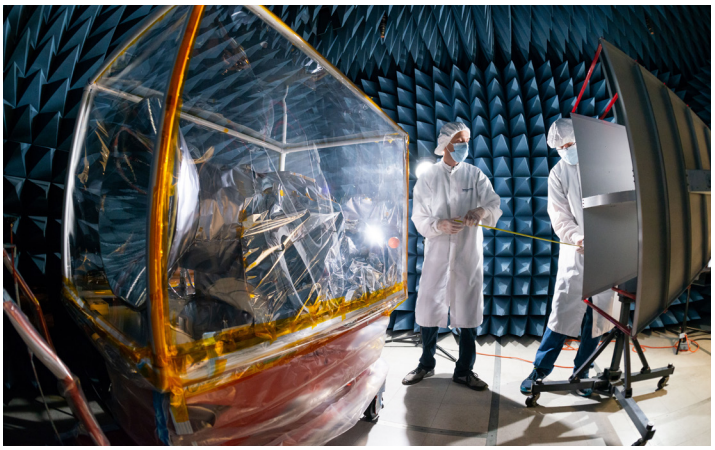

AMTM: Proven Engineering

The Space Dynamics Laboratory (SDL) designed, built, and tested the AMTM instrument, which is the latest in a long line of mesospheric temperature mappers. Utah State University and SDL partnered to develop and deploy several precursor instruments that have made high-resolution AGW measurements on over 20 successful ground- and aircraft-based campaigns.

SDL