AWE

Atmospheric Waves Experiment

The atmospheric region where Earth meets space is shrouded in mysteries. NASA's Atmospheric Waves Experiment (AWE) mission is unraveling a few of these mysteries by quantifying how small-scale atmospheric gravity waves (AGWs) that originate from Earth's weather affect the edge of space and contribute to space weather. Scientists will use AWE data to better understand and predict how AGWs affect GPS navigation, tracking, and communication systems.

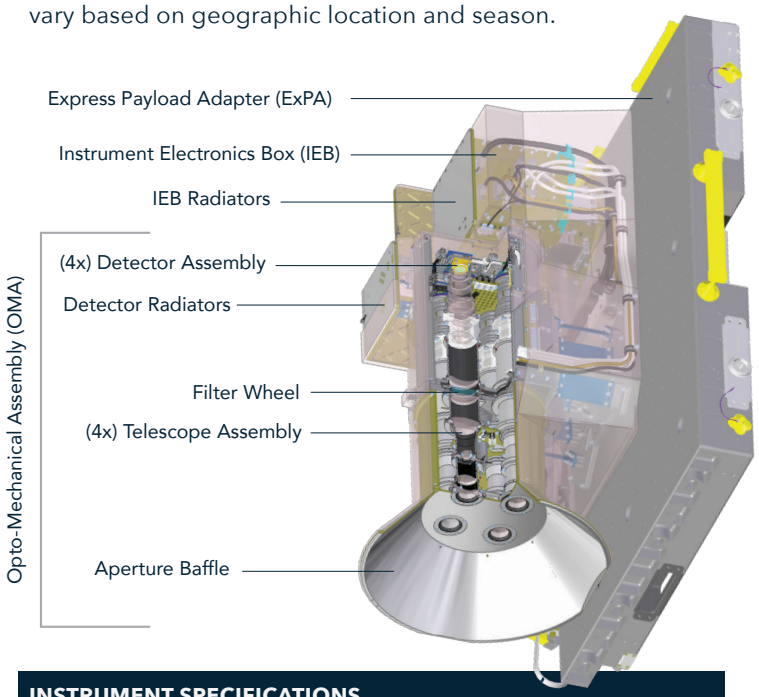
MISSION PROFILE	
Launch	November 9, 2023
Mission Duration	2+ years
Primary Measurements	Continuous nighttime observation of AGWs with horizontal wavelengths 30–300 km & amplitudes >3K
Science Data Products	Band intensity & temperature
Temperature Precision	<4K
Swath Size	~600 x 15,000 km
Spatial Resolution	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

ATMOSPHERIC GRAVITY WAVES

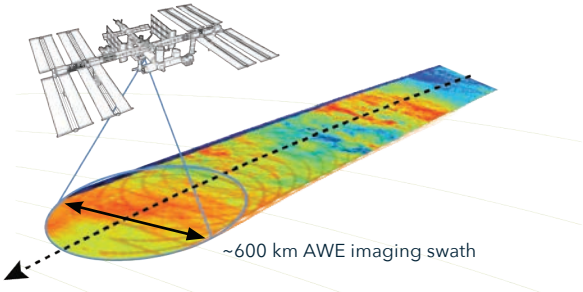
AGWs are mainly caused by disturbances in the troposphere (surface to ~10-15 km). Disturbances range from strong winds flowing over steep mountains to powerful thunderstorms, tornadoes, and hurricanes. AGWs propagate upward, increase in amplitude, and transport energy and momentum from the troposphere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

THE INSTRUMENT

AWE's Advanced Mesospheric Temperature Mapper (AMTM) is attached to the exterior of the International Space Station in a nadir-viewing configuration, pointed at Earth. The AMTM's wide field of view imaging radiometer has four telescopes that each observe a different infrared wavelength. The AMTM images and characterizes propagating AGWs by producing high-quality temperature maps of their structure visible in the hydroxyl OH airglow emission layer near the mesopause (~87 km altitude). Scientists use the data to estimate disturbances at higher altitudes and identify how AGWs vary based on geographic location and season.



INSTRUMENT SPECIFICATIONS	
Mass	58 kg
Volume	0.30 m³
Power	20 W (orbit average)
Data Rate	5.40 Mb/s
Frame Rate	1 image per second
Field of View	90 degrees



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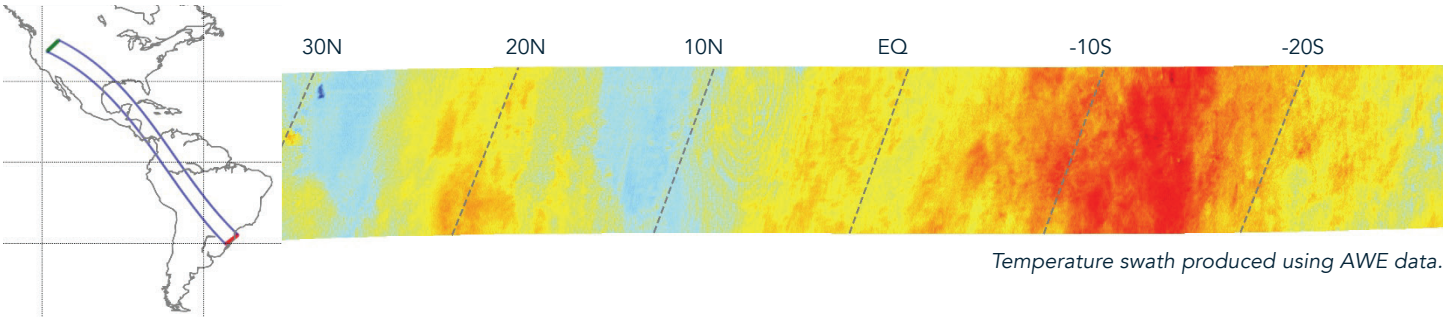
SDL/22-3701 Rev. D

MISSION MANAGEMENT, ENGINEERING, & SCIENCE

The Space Dynamics Laboratory (SDL) manages the mission. SDL designed, built, and tested the AMTM and directs the Mission Operations Center. Utah State University leads the science team and directs the Science Operations Center.



Temperature swath produced using AWE data.

Using the Canadarm2, NASA installs the AWE instrument on the International Space Station. Credit: NASA.

SDL engineers environmentally test the AWE flight model.

SDL engineers work on AWE's OMA in a cleanroom.

SDL