PhD positions - AWE #1 and #2

Starting date
Fall 2023

Duration
3 years

The Atmospheric Waves Experiment (AWE)
The Atmospheric Waves Experiment (AWE) is the first dedicated NASA mission to investigate global gravity waves (GWs) properties in the upper atmosphere and their impacts on the ionosphere-thermosphere-mesosphere (ITM). An Infrared imager (Advanced Mesospheric Temperature Mapper or AMTM) will operate onboard the International Space Station during two years, measuring the intensity of selected spectral lines of the hydroxyl (OH) emission layer, around 87 km altitude. The raw image data will be processed to derive the mesospheric temperature, and to measure GW parameters with a near-global coverage. The USU Physics department will host the AWE Science Operations Center (SOC).

As part of this project, two doctorate candidates will be closely involved with AWE data processing and analysis. Their tasks will include:

• Processing of the different AWE data levels,
• Implementation of an algorithm to automatically extract the GW parameters,
• Investigation of atmospheric dynamics to answer the AWE science objectives: 1. Quantify the seasonal and regional variabilities and influences of GWs near the mesopause (~87 km altitude), 2: Identify the dominant dynamical processes controlling GWs, 3: Estimate the wider role of GWs in the ITM,
• Publication of results in scientific journals and presentation at national and international conferences.

Qualifications
• Good background knowledge in atmospheric physics,
• Basic knowledge in signal/image processing,
• Familiarity with programming (e.g., C++, IDL, Python…),
• Good self-organization,
• Good written and spoken English (TOEFL internet-based (iBT) exam score of 79 or paper-based exam score of 550).

Candidates must be accepted in the USU Physics graduate program.
Application to USU School of Graduate Studies: https://gradschool.usu.edu/admissions/
PhD position - AWE #3 (Student collaboration)

Starting date
Fall 2023

Duration
3 years

The Atmospheric Waves Experiment (AWE)
The Atmospheric Waves Experiment (AWE) is the first dedicated NASA mission to investigate global gravity waves (GWs) properties in the upper atmosphere and their impacts on the ionosphere-thermosphere-mesosphere (ITM). An Infrared imager (Advanced Mesospheric Temperature Mapper or AMTM) will operate onboard the International Space Station during two years, measuring the intensity of selected spectral lines of the hydroxyl emission layer, around 87 km altitude. The raw image data will be processed to derive the mesospheric temperature, and to measure the GW parameters with a near-global coverage. A student collaboration (SC) program will complement this mission. It will involve Utah State University (USU) and Embry-Riddle Aeronautical University (ERAU, Daytona Beach, Florida). The main goal will be to relate the AWE measurements at 87 km altitude with measurements in the thermosphere and ionosphere at ~250 km altitude. USU students will operate an imaging system at the Bear Lake Observatory (BLO), identify GW signatures and compare them with AWE measurements. Similarly, ERAU students will obtain and process GNSS Total Electron Content (TEC) data over the US. Each group will be composed of a graduate and 2-3 undergraduate students, and will be under the supervision of a senior researcher. They will analyze and interpret the data to understand connections between the mesosphere and the thermosphere/ionosphere. The SC will engage students in compelling science, and reinforce primary educational objectives such as understanding atmospheric physics or developing skills to analyze and visualize scientific data, preparing these students for careers in STEM.

As part of the AWE student collaboration, the doctorate candidate’s work will include the following tasks:

- Operating an airglow imager at BLO,
- Analyzing the airglow image data,
- Investigating the connection between the GW events observed at 87 km and at 250 km,
- Working closely with the ERAU team to establish relations between neutral atmosphere (imaging) and ionosphere (TEC),
- Managing and mentoring a team with several undergraduate students,
- Publication of results in scientific journals and presentation at national and international conferences.

Qualifications

- Good background knowledge in atmospheric physics,
- Basic knowledge in signal/image processing,
- Familiarity with programming (e.g., C++, IDL, Python…),
- Good self-organization and management skills,
- Good written and spoken English (TOEFL internet-based (iBT) exam score of 79 or paper-based exam score of 550).

Candidates must be accepted in the USU Physics graduate program.
Application to USU School of Graduate Studies: https://gradschool.usu.edu/admissions/
PhD or Master position - AWE #4 (Computer Science)

Starting date
Fall 2023

Duration
3 years

The Atmospheric Waves Experiment (AWE)
The Atmospheric Waves Experiment (AWE) is the first dedicated NASA mission to investigate global gravity waves (GW) properties in the upper atmosphere and their impacts on the ionosphere-thermosphere-mesosphere (ITM). An Infrared imager (Advanced Mesospheric Temperature Mapper or AMTM) will operate onboard the International Space Station during two years, measuring the intensity of selected spectral lines of the hydroxyl emission layer, around 87 km altitude. The raw image data will be processed to derive the mesospheric temperature, and to measure the GW parameters with a near-global coverage. Data storage, processing, and distribution will be performed within the AWE Science Operations Center (SOC) located in the USU Physics department. Information about this mission will be accessible on a website, and the data will be disseminated to the science community through a searchable database.

As part of the AWE mission, the doctorate or master candidate’s work will include the following tasks:

• Supervision of the data processing,
• Maintenance and upgrade of the AWE website and database, under the supervision of Logan Software Inc. personnel,
• Maintenance and upgrade of the AWE hardware located inside the USU data center, also under the supervision of Logan Software Inc. personnel,
• Regular transfer of the AWE data to the NASA Space Physics Data Facility (SPDF) for backup,

Qualifications
• Good knowledge and experience in website and database maintenance,
• Basic knowledge in signal/image processing,
• Good self-organization,
• Good written and spoken English (TOEFL internet-based (iBT) exam score of 79 or paper-based exam score of 550).

Candidates must be accepted in a USU graduate program.
Application to USU School of Graduate Studies: https://gradschool.usu.edu/admissions/