

# **2021 Workshop: AMGeO**

Long title

Accelerating Your Science With Assimilative Mapping of Geospace Observations (AMGeO): Tutorial and Interactive Demos

Conveners

T. Matsuo

L. Kilcommons

W. Mirkovich

Description

[AMGeO](#) is a collaborative data science platform for the geospace science community for bringing together a diverse set of heterogeneous geospace observations from NSF-funded facility programs, such as SuperDARN, AMPERE and SuperMAG, and individual community users to obtain complete maps of high-latitude ionospheric electrodynamics for scientific discovery and space weather research. The platform is made of the Python open-source software and web application services that facilitate the data acquisition and pre-processing steps that are otherwise prohibitively labor-intensive. AMGeO helps accelerate your data science processes by streamlining data access, collection, pre-processing, integration, and analysis stems and by transforming raw data into discovery enabling forms with nice visualization.

The workshop participants will learn how to use AMGeO interactively on the Jupyter notebook environment via a web browser for different use case scenarios.

Agenda

- Welcome - Tomoko Matsuo (AMGeO Overview, Rules of Road, Workshop Goals & Logistics)
- How to get started with AMGeO - Liam Kilcommons (Registrations (AMGeO, SuperMAG, and AMPERE), User Guide, GitHub)
- How to use AMGeO in a Jupyter Notebook - Willem Mirkovich
- Open discussion & exploration, demos
  - Mainroom - Open Discussion - Liam, Tomoko
  - Breakout Room 1 - More Demos (e.g., CPCP time series) with Willem

- Breakout Room 2 - Help desk (e.g., Python questions) with Jason Li & Nick Bartels
- Breakout Rooms 3-5 - One-on-one troubleshooting as needed

## Justification

The most dynamic electromagnetic energy and momentum exchange processes between the upper atmosphere and the magnetosphere take place in the polar ionosphere. One example of such a process is the aurora, involving the ionization and excitation of atmospheric constituents due to energetic charged particles precipitating into the upper atmosphere from the magnetosphere along geomagnetic field lines, which in turn modulates the ionosphere's ability to conduct electric currents. High-latitude ionospheric electrodynamics play an important role in the Sun-Earth connection chain, acting as one of the major driving forces of the upper atmosphere and providing us with a means to probe physical processes in the distant magnetosphere. Accurate specification of the constantly changing conditions of high-latitude ionospheric electrodynamics has been of paramount interest to the geospace science community. In spite of its well-recognized merit, running assimilative mapping procedure for high-latitude ionospheric electrodynamics successfully is a labor-intensive process, mainly due to the data collection, pre-processing and quality-control steps. Interpretation of the resulting assimilative maps should ideally be accompanied by measures of analysis errors and goodness of fit, which may not necessarily be graspable for novice users. The NSF-funded EarthCube Assimilative Mapping of Geospace Observations (AMGeO) project's goal is to remove these obstacles by allowing the latest data assimilative mapping tools available to the community as open-source software. The workshop will help the community members learn how to use AMGeO for their scientific applications and accelerate their data science processes for scientific discovery.

## Workshop format

### Short Presentations

[View PDF](#)