

Sparkling Geomagnetic Field: Involving Schools In Space Weather Observations



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Setting up geomagnetic stations across Austria with the help of local schools as part of Austria's Sparkling Science programme.



Geomagnetic Observations

- Observations of the variations in the Earth's magnetic field are important to study the inner processes of our planet, as well as to determine the effects space weather has on human life.
- Space weather, largely the result of solar radiation, which will be peaking in 2013/2014, is of great interest to researchers due to how it affects our planet. Solar radiation manifests itself as "magnetic storms" in the Earth's magnetosphere, and large amounts of radiation can negatively affect electronics and navigation/communication systems on Earth.
- Austria currently has two active geomagnetic observatories, the long-active Wien Cobenzl (WIK), and the Conrad Observatory (COBS), which is beginning operation.
- Through this project, the hope is to establish a network of geomagnetic observatories spanning the length of the country.

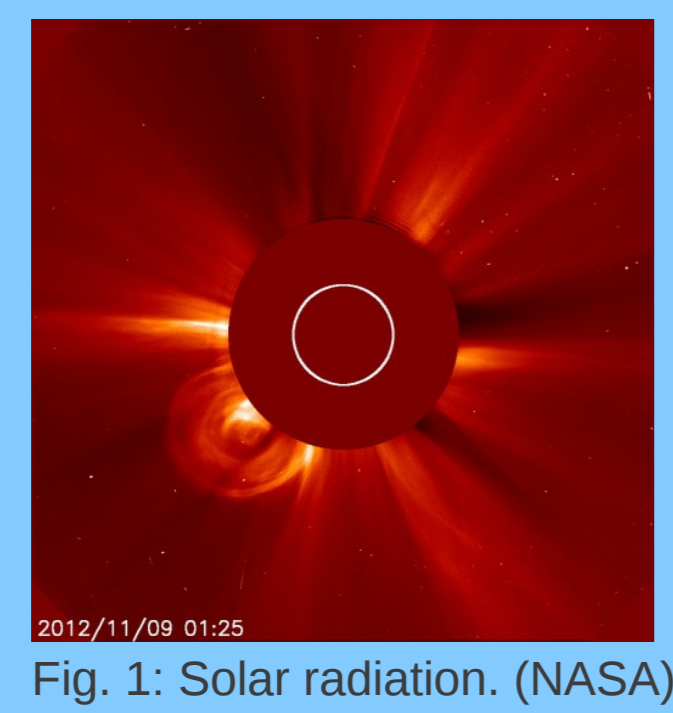


Fig. 1: Solar radiation. (NASA)

Mission: Sparkling Geomagnetic Field
Location: Austria
Target: regional geomagnetic variations

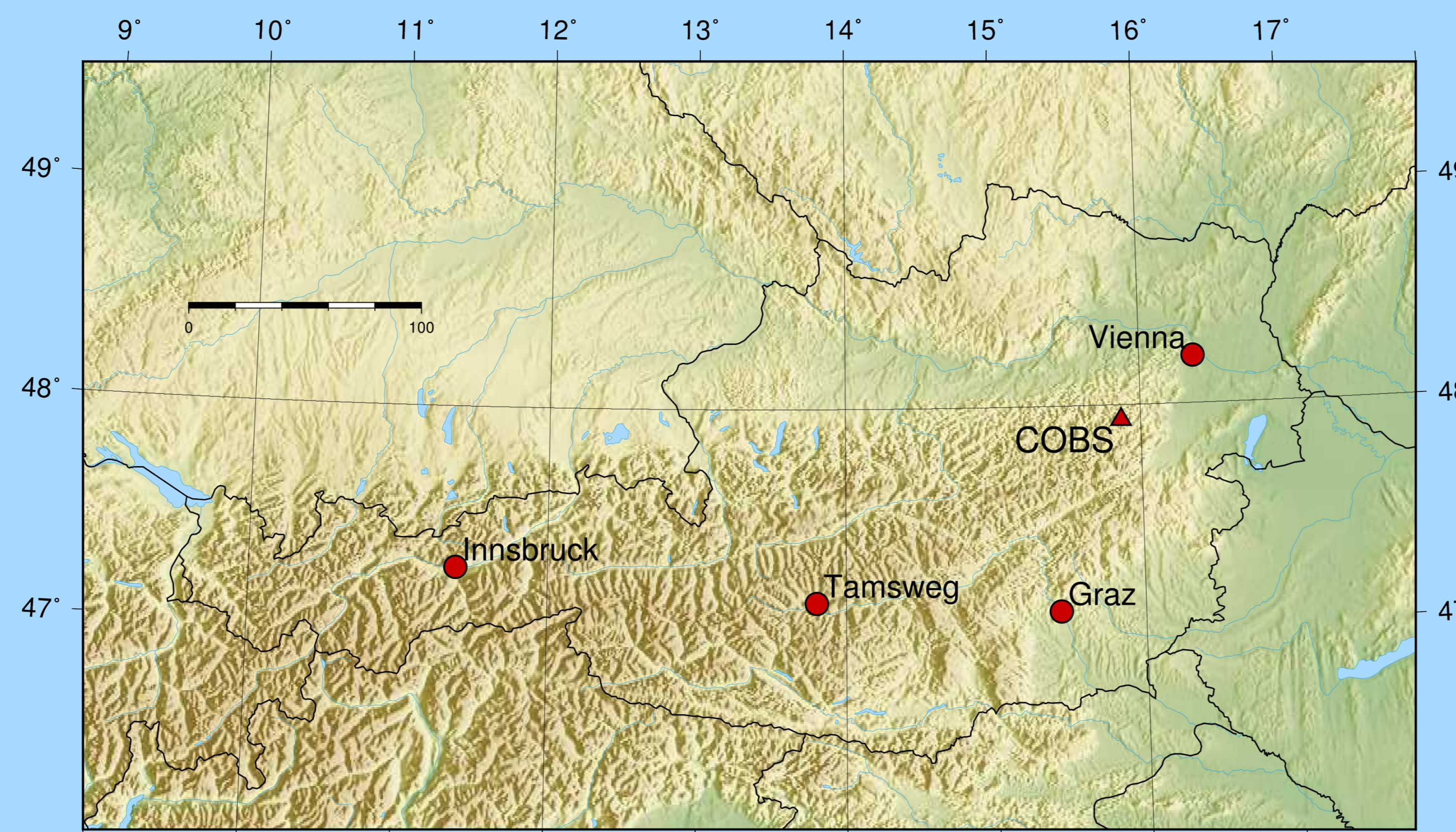


Fig. 2: The locations of the current geomagnetic station (COBS) and the participating schools (Innsbruck, Tamsweg and Graz).

Project Aims

1. To observe the solar maximum (occurring 2013/2014) and the effects of "space weather" on the geomagnetic field, both in field strength and direction across the regions of Austria.
2. To investigate the consequences of spatial and temporal variations in the magnetic field, i.e. "magnetic storms," and their effect on communications systems.
3. To investigate temporal variations in detail to better understand the magnetic system Earth and its importance to humans.

Moving Forward

- **Phase 1: Location** – Currently students are in the phase of choosing a suitable magnetically quiet location for the running of the magnetometers.
- **Phase 2: Setup** – Once a suitable location has been found and tested, the students will setup the instruments, which are ready to start measuring data and send it to a central storage server.
- **Phase 3: Data** – Data from all stations will be available in real-time over a website to any student or researcher who wishes to view it. The students will be encouraged to monitor the effects of space weather, an exciting aspect of the solar maximum. They will have free access to all the data as well as evaluation software to analyse the data.

Sparkling Science Programme

- Austria's *Sparkling Science* Programme is an initiative funded by the Federal Ministry of Science and Research, started with the intention of breaking down barriers between education and academic institutions to encourage young scientists and involve them in current research.
- Schools apply to take part in a joint research project with scientists. Various areas of science and research are covered, and the students are encouraged to be an active part of the scientific process.

- Three schools are participating in the project, making a total of four geomagnetic stations stretching the length of Austria. These include the three schools along with the Conrad Observatory near Vienna.
- The location of the stations will be chosen by students and should be accessible to them for upkeep. The instruments will also be setup by students, thereby involving them directly in the research process.
- The equipment at each station includes:
 - LEMI-025 fluxgate variometer
 - POS-1 Overhauser magnetometer

... This allows for accurate and continuous measurements of both the field strength and direction of the geomagnetic field. (One station – Graz – will receive only a Cs-magnetometer for field strength.)

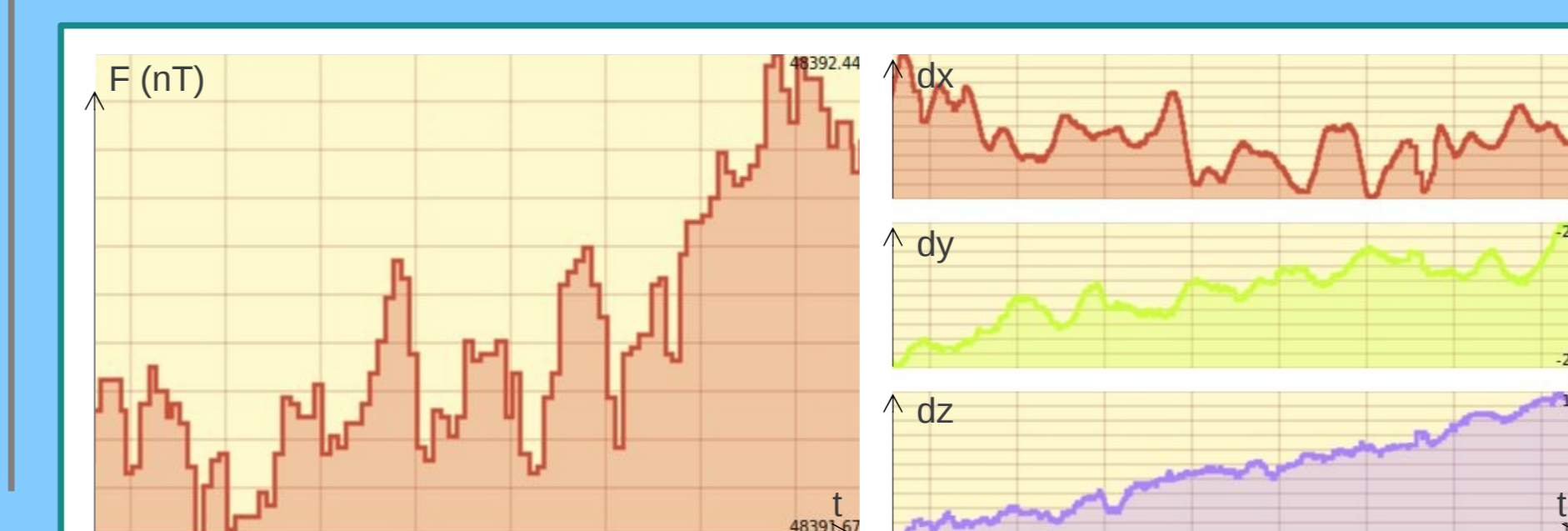


Fig. 3: An example of live station data. Left: field strength (POS-1), right: direction (LEMI).



Fig. 5: Geomagnetic tunnel in the Conrad Observatory.



Fig. 6: One of the student research groups.



Fig. 7: LEMI-025 and POS-1 running in the Conrad Observatory.



Fig. 8: Demonstrating Cs-magnetometer to a class in Innsbruck.