The GeoLab - a practical model for extramural senior high school education in geosciences

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Attracting young students with high capabilities to a tertiary education in geosciences constitutes a central goal in geo-education and is of paramount importance for the future progress of our various fields of scientific interest. In the GFZ GeoLab, a set of six thematic ‘lab days’ has been developed aiming at senior high school students aged 14 to 18, preferably with a background of advanced courses in natural sciences, mathematics or informatics. Courses were drawn up to be available in German and English. Student groups came from all over Germany and several European countries, as well as from South East Asia. Bookable as single day courses with extension on request or as an ensemble, the lab days were each designed to combine classroom with hands-on outdoor field experience. From the start, the lab days were envisaged to be led by scientists with the help of university student assistants using original instruments and materials, original software and data from GFZ satellites, as well as from worldwide observation networks. For the analysis, presentation and debriefing, the computer pool with 25 desktop workstations was made available. Starting with an overview over specific science history, the main characteristics of thematic and disciplinary fields could be described. This was followed by examples of the practical applications including their societal impacts, an introduction to the instrumentation and the use in the field plus the data management. More in detail, the profile encompassed six thematic lab days:

Magnetic field of the Earth: the different components of the global magnetic field and their dynamic influence form the core of this lab day. Based on their own measurements on the experimental field with the gradiometer, instrumentation on Telegraphenberg (e.g., a fluxgate magnetometer), observatory data and data from the GFZ’s CHAMP satellite mission the participants were able to study not only the different measuring principles and methods but also the management and processing of data and the interpretation. With some guidance, interference fields and strange spots were to be discovered.

Gravity field of the Earth: the nature of the gravity field of the Earth, its components and the processes leading to the changes which have their influence on our daily life. Starting with some classical indoor experiments with different pendula and in free fall, different types of modern instrumentation from Sodin-gravimeter to observatory superconducting gravimeters were introduced and compared to the gravimeters mounted as payloads on GFZ’s satellites CHAMP and GRACE on their missions.

Geodynamics: the principles of seismology and geodynamics, in particular plate tectonics were first introduced, together with the methods of determining energy and focal processes of large earthquakes. As an active seismic experiment, hammer seismic imaging was applied.

Geographical Information Systems: the perception of the Geographical Information System as a computer based compositum of hardware, software and digital information initiated the entry into systems which allow us to capture and record, administrate and analyse the information. After an exciting geocaching experience outside in the woods, participants take home a large number of new references and web links leading to the most valuable freely accessible geodata resources.

Geodata Brandenburg: Geological mapping with aerophotographs, remote sensing and underground data

processing plus the GNSS assisted search for a hidden virtual gold deposit outside

Geological history and geography of Germany and Central Europe: A general introduction to geology and its methods, complemented by outdoor field demonstrations.

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