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NEWSLETTER OF THE GEOPHYSICAL INSTITUTE

Issue 21, December 2024

DEAR GPI ALUMNI

GEOPHYSIK ALUMNI Karlsruhe

An eventful year 2024 is coming to an end: We are pleased to let you know that GPI is growing and we all welcome Henriette Sudhaus as our new Professor in Seismo-Geodesy. We also had success to publish our research in Science and Nature, showing the breadth and strength of our talented researchers.

On the following pages you will find some of our current activities reaching from the stars to evaluating new seismic acquisition systems in close collaboration with industry.

Additionally, after a few years of relatively small intake in our BSc and MSc programs, our intake numbers are back on a growth track. All these achievements could only be reached due to the strong commitment of our staff.

May the year 2025 bring you health, joy and many wonderful moments. On behalf of the entire GPI, we wish you a happy holiday and a good start into the new year!

Andreas Rietbrock

KIT COURSE EVALUATION RESULTS

The year 2024 was again very successful for GPI lecturers. In the mandatory KIT course evaluations that take place every semester, where students rate the various lectures and exercises, several courses offered by the Geophysical Institute ended up fairly high in the final rankings.

In winter term 2023/24, the award for the best lecture in Geophysics and Meteorology went to Prof. Thomas Bohlen and Dr. Ya-Jian Gao for the lecture “Full-waveform inversion”. Arash Rezaei Nevisi (PhD student in applied geophysics) won the award for the best exercise in Geophysics and Meteorology for the exercises accompanying the full-waveform inversion lecture.

In summer term 2024, Dr. Thomas Hertweck received the award in the category “Best lecture in Geophysics and Meteorology” for the lecture part of the course “Seismic Data Processing”, and the award for the best exercise in Geophysics and Meteorology went to Dr. Lars Houpt and Dr. Thomas Hertweck for the exercises accompanying the aforementioned course. This course is held in cooperation with Institut Teknologi Bandung (ITB) and students from GPI alumnus Dr. Rachmat Sule who is a senior lecturer at ITB.

Congratulations to all winners and also all other GPI personnel who contributed to the great overall results but aren’t explicitly mentioned here.

Applications for the Bachelor's and Master's program in Geophysics

By Thomas Hertweck

After several years with fairly low application and enrollment numbers, also – at least partly – caused by the Corona pandemic, we received quite a few applications for winter term 2024/25. For the Bachelor's program in Geophysics, there were in total 43 applications. The vast majority received positive admission letters and 14 candidates ultimately enrolled in our program, which is a significant increase (175%) compared to last year. It is worthwhile to note that, in contrast, the study programs in Physics and Meteorology and Climate Physics have a lower intake of new students this year compared to last year.

It now needs to be seen how our new students progress through the upcoming semesters and how many of them finally receive a degree in a few years' time. In the Bachelor's program taught in German language, all candidates submitting applications were from Germany and predominantly from the state of Baden-Württemberg (see Fig. 1 for details). In other words, when moving from school to university many candidates prefer to stay relatively close to what might be called 'home'.

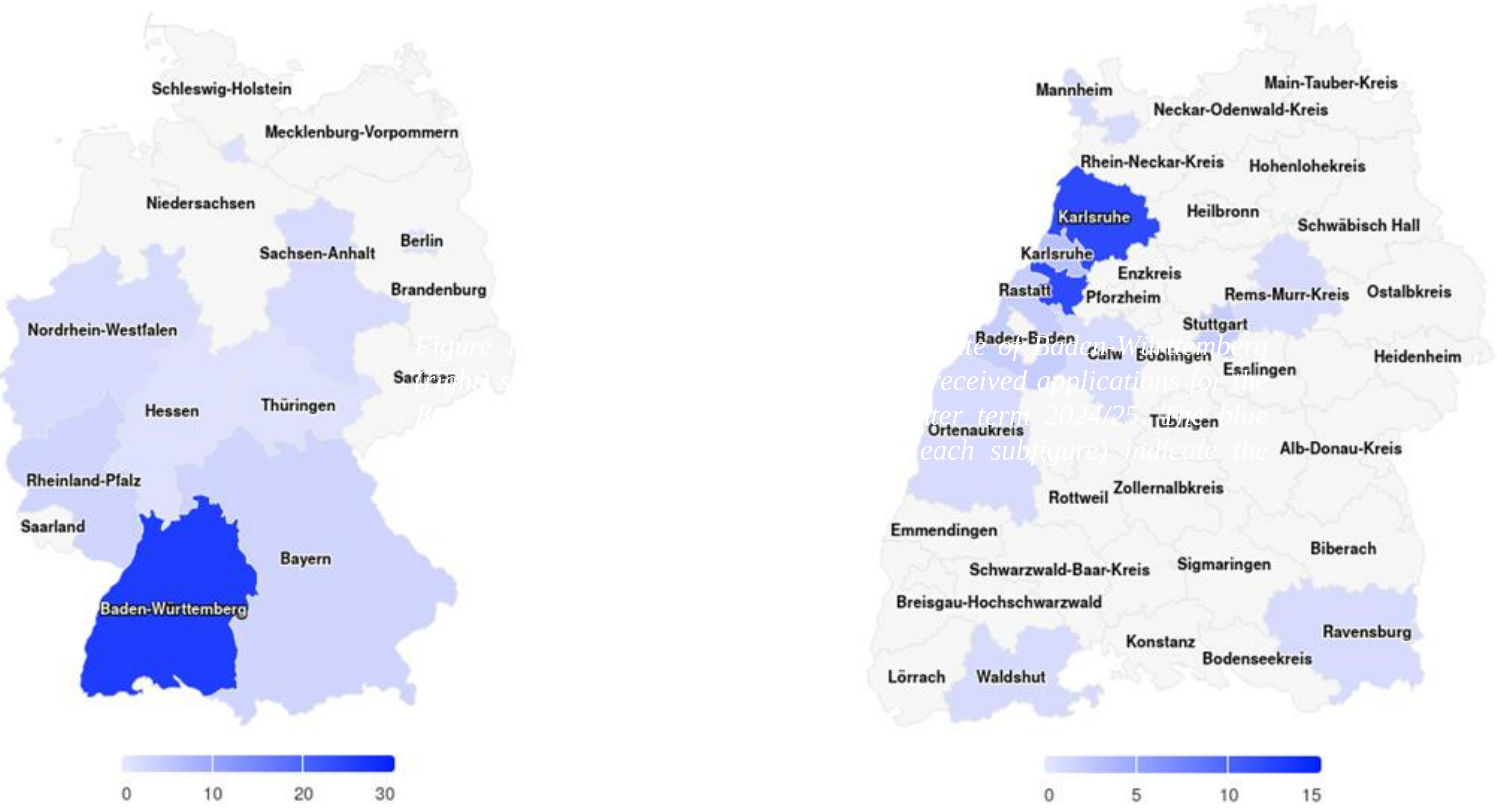

Figure 1: Map of Germany (left) and the state of Baden-Württemberg (right) showing the regions from where we received applications for the Bachelor's program in Geophysics in winter term 2024/25. The blue colors (see color bar at the bottom of each subfigure) indicate the number of applications from that region.

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In the Master's program in Geophysics, we received a total of 57 applications. Admission letters were sent to 27 candidates, and 13 started to enroll for winter term 2024/25. If all of them had managed to finalize their enrollment, it would have been a class of significant size. Unfortunately, at the time of writing, only 5 actually enrolled. The reasons are manifold: Some candidates received stipends for other universities and decided to abort their enrollment at KIT to go somewhere else, some students decided to avoid the tuition fee of 1500 € per semester in Baden-Württemberg and went to other German or European universities without such fees, and quite a few international candidates faced again issues with getting a student visa in time to be able to join us for the lecture period which started mid of October. They then had to abort their enrollment as it would not make sense to only join us, for instance, in December, half-way through the lecture period.

Although the Corona pandemic is over, it still seems to take a rather long time in some countries to get an embassy appointment. Still, the number of new students increased compared to last year and the relatively large number of high-quality applications (which led to a comparatively large number of positive admission letters) looks encouraging. The demographic data in the Master's program looks very different compared to the Bachelor's program. The vast majority of applications stems from outside Europe (see Fig. 2 for details), with India leading the chart.

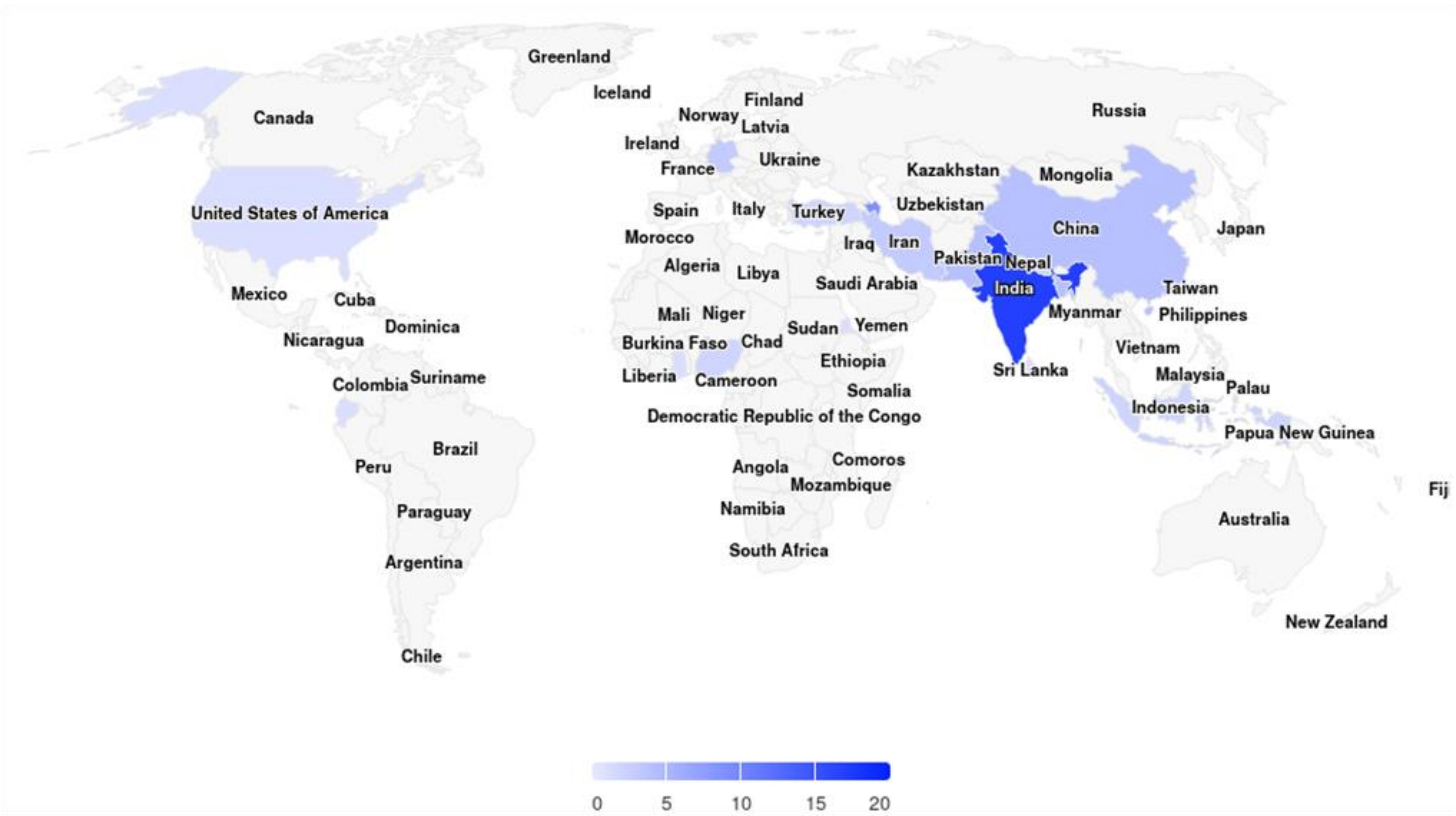

Figure 2: World map showing the countries from where we received applications for the Master's program in Geophysics in winter term 2024/25. The blue colors (see color bar at the bottom) indicate the number of applications from that region.

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URBAN VIBROSEIS TRUCK (UVT) – Validation of the new mobile Vibroseis Truck

By Lars Houpt

Overview

Figure 1: View of the Urban Vibroseis Truck (UVT) from a model study by Herrenknecht AG.

Society will face some major challenges in the coming decades. These include fighting climate change and the associated reduction in greenhouse gas emissions, but also dealing with the radioactive waste from Germany's now decommissioned nuclear power plants. Geophysical and geological investigations of the subsurface are of central importance both for the energy transition to sustainable sources such as geothermal energy and for the search for a suitable final storage site for radioactive waste. As seismics offers the highest resolution and spatial coverage of all geophysical methods, the need for 2D and 3D seismic acquisition campaigns in Germany is expected to increase in the coming decades. Especially in populated areas, Vibroseis trucks are the only option as a seismic source and generally offer excellent data quality. However, there are currently only two manufacturers of such mobile vibrators worldwide. In addition, they are only suitable for use in urban regions to a limited extent, as they were primarily developed for oil and gas exploration in open areas such as, for instance, deserts. Herrenknecht AG would like to overcome this shortage and expand its product portfolio with new innovative mobile vibrators (Figure 1) whose design is optimized for urban environments. This would also minimize the service providers’ heavy dependence on the two existing suppliers.

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The Geophysical Institute (GPI) of the Karlsruhe Institute of Technology (KIT) is supporting Herrenknecht AG in the construction of the Urban Vibrator Truck (UVT) by evaluating the radiation pattern and the quality of the source signal in the various development phases. In addition to classical methods for recording the ground forces of the source by means of sensors on the base plate and the reaction mass, an innovative approach is used in which the source signal is determined from data measured by geophones that are spatially distributed around the UVT. The aim is to gain a better understanding of the energy emitted into the subsurface and information about the radiation and signal characteristics.

To achieve this, however, a detailed model of the subsurface is required. For this purpose, two orthogonally aligned 2D seismic profiles were acquired on the site of the future test station in order to gain first knowledge on the subsurface structure and properties. In each case, 72 receivers were deployed at 1 m intervals. 20 hammer blows at a distance of 4 m each served as the seismic source (see Figure 2).

Figure 2: View of the two orthogonal measurement profiles (P1 and P2) on the site of the future measurement stand. Bild: "Messprofile.png".

Using the Multichannel Analysis of Surface Waves (MASW) method, a 1D model of the shear wave velocity of the subsurface was determined for each profile. This method uses a dispersion analysis to analyze the surface waves (primarily Rayleigh waves). This utilizes the fact that the surface waves are dispersive, i.e., their speed and penetration depth vary with frequency.

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An inversion algorithm can then be used to calculate a 1D velocity profile of the subsurface from the dispersion curve. Figure 3 a-d shows the measured and synthetic data of a shot from profile 1 and their dispersion curves. The agreement between the synthetic and measured data is good. For simplicity in this first test, the final 1D shear-wave velocity model of the subsurface was averaged from the results of profiles 1 and 2 (Figure 3e).

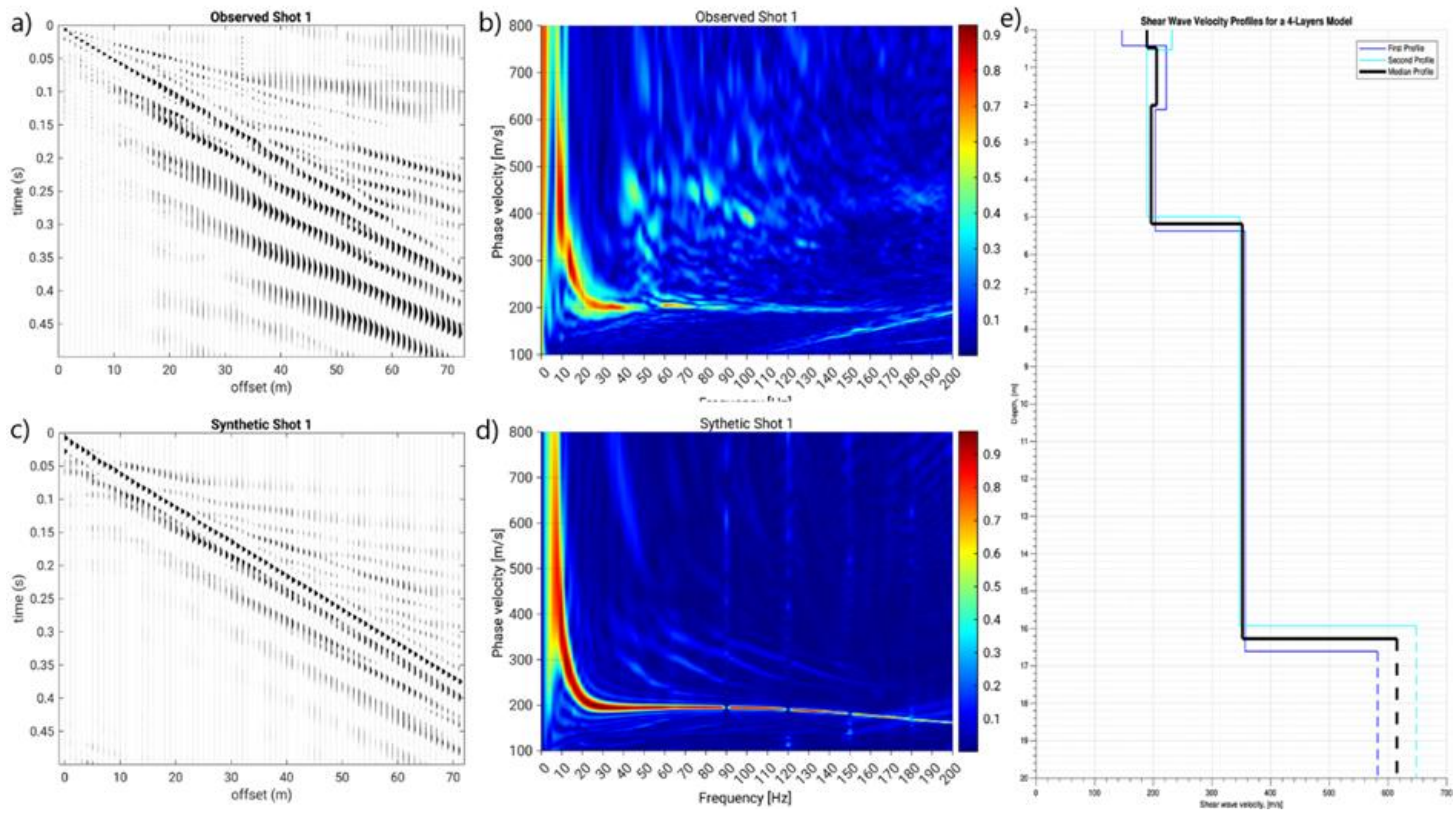

Figure 3: Dispersion analysis of the seismic measurements at the future monitoring station. a) Exemplary shot gather of the measured data; b) dispersion curve of the exemplary shot gather; c) corresponding shot gather of the modelled data; d) corresponding dispersion curve of the modelled shot; e) 1D seismic velocity models (profile 1 - blue; profile 2 - cyan; model averaged from profiles 1 and 2 - black).

Photo 3: "1D-Profil.png"

This 1D velocity model can now be used to carry out initial synthetic tests for a source time function inversion and to analyse the sensitivity of the method to errors in the model before a more refined Earth model and analysis method is employed. The first field tests with the new UVT are planned for early 2025.

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Magmatic Fluids and Melts may lie Beneath Dormant Westeifel Volcnoes

By Dario Eickhoff and Joachim Ritter

From the perspective of volcanic risk, Central Europe is not a region that is typically on the mind of most people. However, geochronical evidence indicates that volcanoes have erupted in the Eifel Volcanic Fields in Germany as recently as 11,000 years ago.

Presently, the Eifel Volcanic Fields are in a state of quiescence. However, a multitude of lines of evidence suggest the potential for future eruptions (degassing, uplift, low-frequency seismicity etc.). Together with colleagues from the University of Freiberg, Dario Eickhoff and Joachim Ritter have employed advanced seismic imaging techniques and petrophysical modelling to examine the crust beneath the region with unparalleled precision. This study reveals numerous sill-like structures in the crust that appear to be magma and magmatic fluid reservoirs originating from the upper mantle.

The new analysis using Fresnel Zone Migration, revised seismic velocity models and amplitude polarity information revisits seismic data gathered 35 years ago. In addition to imaging previously detected subsurface structures in higher resolution, these researchers were also able to delineate previously unobserved features.

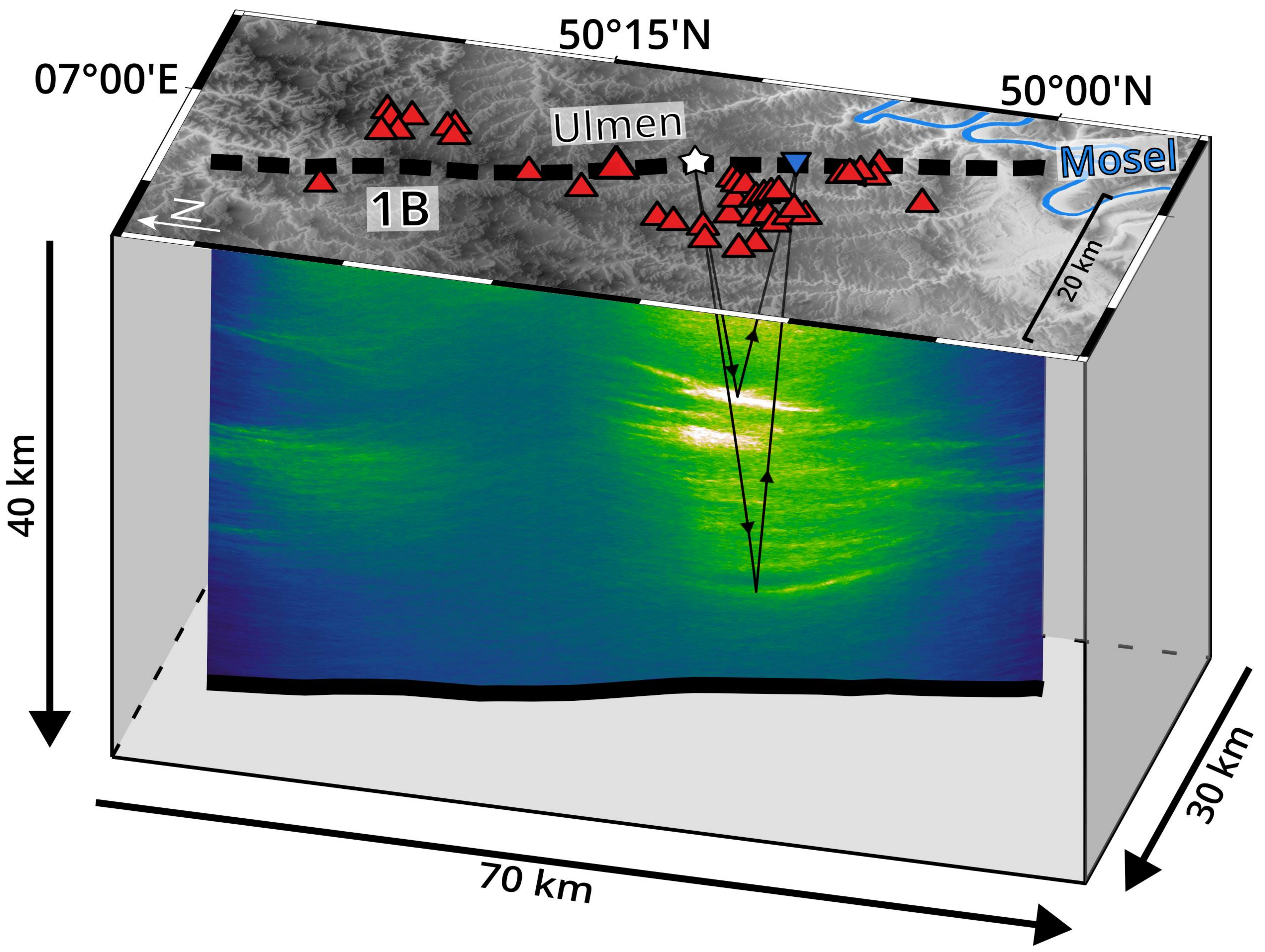

Figure 1: Sketch of the subsurface reflection structures below the north-south seismic line DEKORP 1B (dashed black line). Red triangles mark Quaternary volcanic eruptions in the West Eifel Volcanic Field. The image shows the reflection amplitude from blue (low amplitude) to yellow (high amplitude). Note the colocation of volcanic eruptions (<100,000 years) and the highest amplitude reflections underneath © D. Eickhoff, KIT-GPI.

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The existence of these prospective crustal magmatic accumulations suggests the possibility of future eruptions in the Eifel region. However, before this can happen, the melts need to gain sufficient buoyancy to ascend to the surface. Therefore, we advocate for additional research applying state-of-the-art geophysical and volcanic assessment methodologies to enhance the understanding of the region's volcanic hazards.
(Highlighted article in *Geophysical Research Letters,* https://doi.org/10.1029/2024GL111425, 2024)

EAVESDROPPING ON STARLINK FALL

By D. Eickhoff and J. Ritter

At the end of August (August 27, 2024), the SpaceX company crashed one of its Starlink satellites. Upon entering the Earth's atmosphere, it behaved like a meteor and caused the molecules in the atmosphere to light up. Thousands of people in southern Germany, Switzerland and Austria were able to observe this as a brief spectacle of light in the sky. Within our project on studying meteoroid falls with seismological methods, we were also interested in the satellite fall. Immediately we used open data from the European Integrated Data Archive (EIDA) to determine the trajectory.

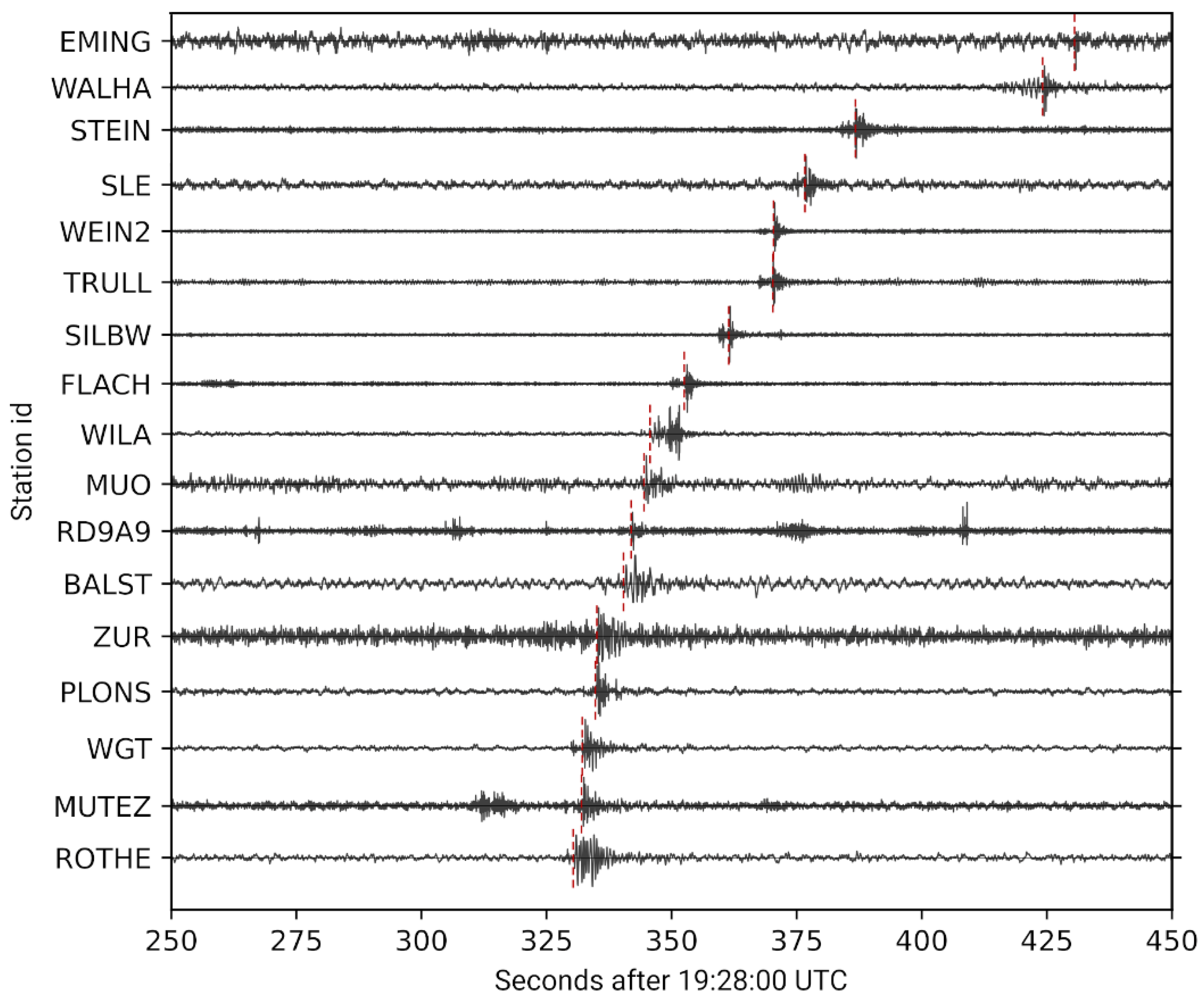

Figure 1: 200 seconds of vertical component recordings at seismometer stations with station identification as shown on the y-axis. Note the large time differences between stations, indicating a very slow acoustic wave propagation.

When the satellite burned up in the atmosphere, it produced supersonic waves along a Mach cone that traveled as pressure waves through the air. Stronger waves can be perceived as noise or whistle-like sound, while weaker pressure pulses are recorded only by barometers. In some cases, these pulses also appear as signals on seismograms (Figure 1). Using the arrival times of these signals at various seismological stations, we were able to calculate the satellite's trajectory in a similar way like earthquake sources. However, one has to deal with a moving source generating a Mach cone and sometimes a point source, if an explosion-like fragmentation takes place. Another influence is wind, meaning that we have a moving medium during wave propagation.

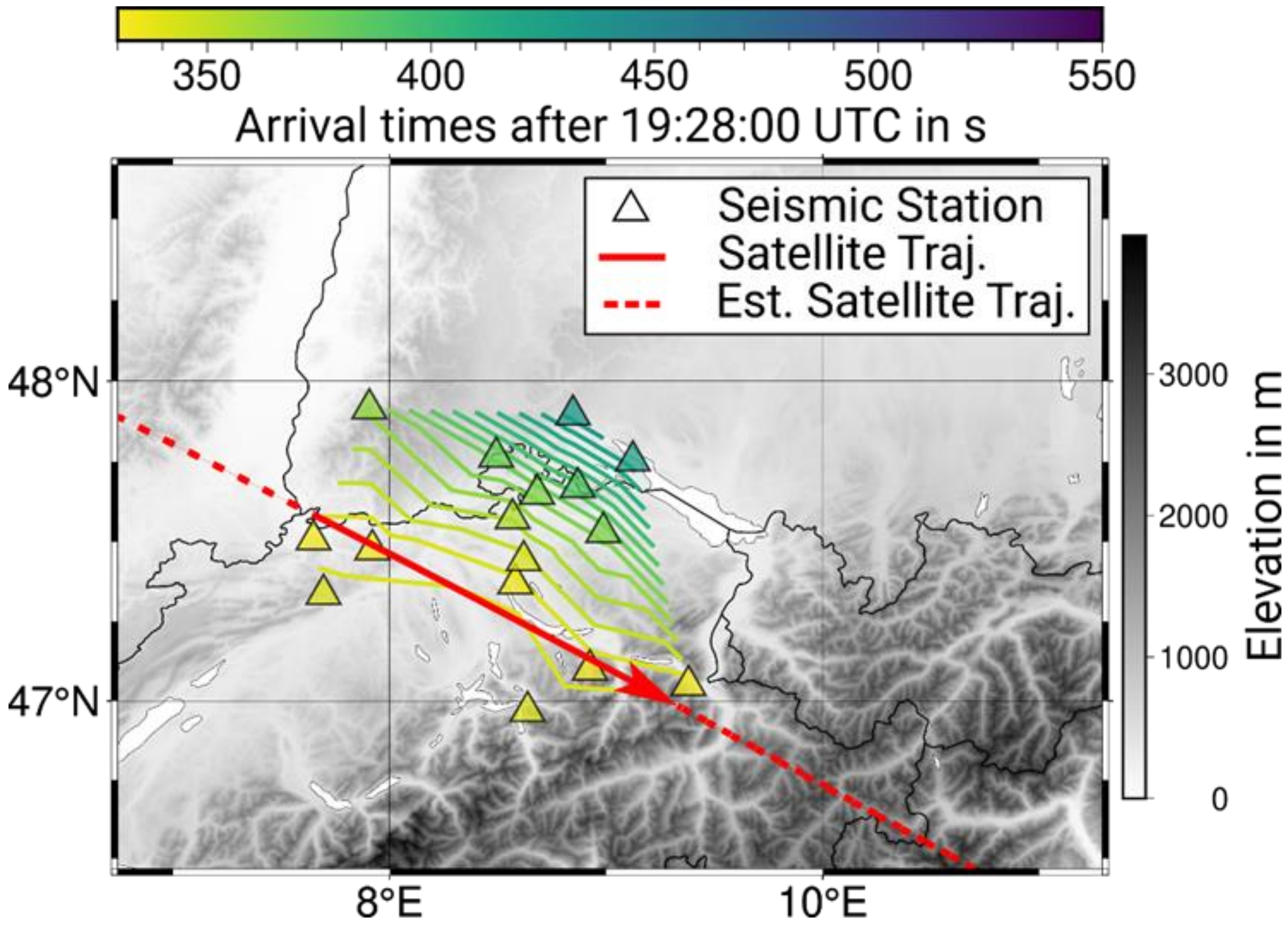

Figure 2: Map showing Starlink trajectory in the French-German-Swiss border region. The colored triangles are used seismometer stations with color representing the arrival time in seconds after 19:28:00 UTC. From these arrival times the trajectory of the falling satellite (red arrow) is calculated. A linear extrapolation of this trajectory is shown as dashed red line.

New method for meteorite research

In the future, this method could be increasingly applied to meteorites. Larger meteorites, which don't fully burn up in the atmosphere, often reach Earth and break into fragments that scatter over an area. Finding these fragments is an important scientific goal, as understanding the exact trajectory of a meteorite can reveal information about its origin and fundamental astrophysical properties. E.g., we could determine the strew field of the Brandenburg meteorite, January 2024, as a confined area (https://www.youtube.com/watch?v=frINxn7Tuiw), talk held at the International Meteor Conference 2024 by Dario Eickhoff). With some advancements, even the mass of meteorites will be estimated from atmospheric data including seismograms. By calibrating the measurements with the known mass of the Starlink satellite, we have already taken steps in this direction. Our research is supported by the Vector Foundation, Stuttgart.

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The cause of the enigmatic 9 days long monochromatic seismic signal observed in September 2023.

By Thomas Forbriger

On September 16th, 2023, we observed an enigmatic seismic signal. The signal, of which a recording from Black Forest Observatory (BFO) is shown in Fig. 1, consisted of one dominant harmonic signal near 10.88 mHz. It was phase coherent apart from a slight semi-diurnal frequency modulation. The signals amplitude decay was extremely slow. If expressed by the decay of a linearly damped harmonic oscillator the initial Q was about 500 and converged to about 3000 over some hours. The signal propagated predominantly as Rayleigh- and Love-waves, which emerged from an inland source near the coast of Northeast Greenland. The waves were observed globally as far as the Antarctic and at some stations could be detected for up to nine days. No reports of a signal with these characteristics are known in the scientific literature, and no such phenomenon has been reported anecdotally either.

The mystery attracted about one hundred scientists from different fields of Earth sciences, who started a joint effort to identify the source mechanism. In this collaboration we combined seismic data from global and regional networks, on-site and satellite imagery, measurements of water level and other parameters inside the fjord system, and numerical modeling to unravel the underlying phenomenon.

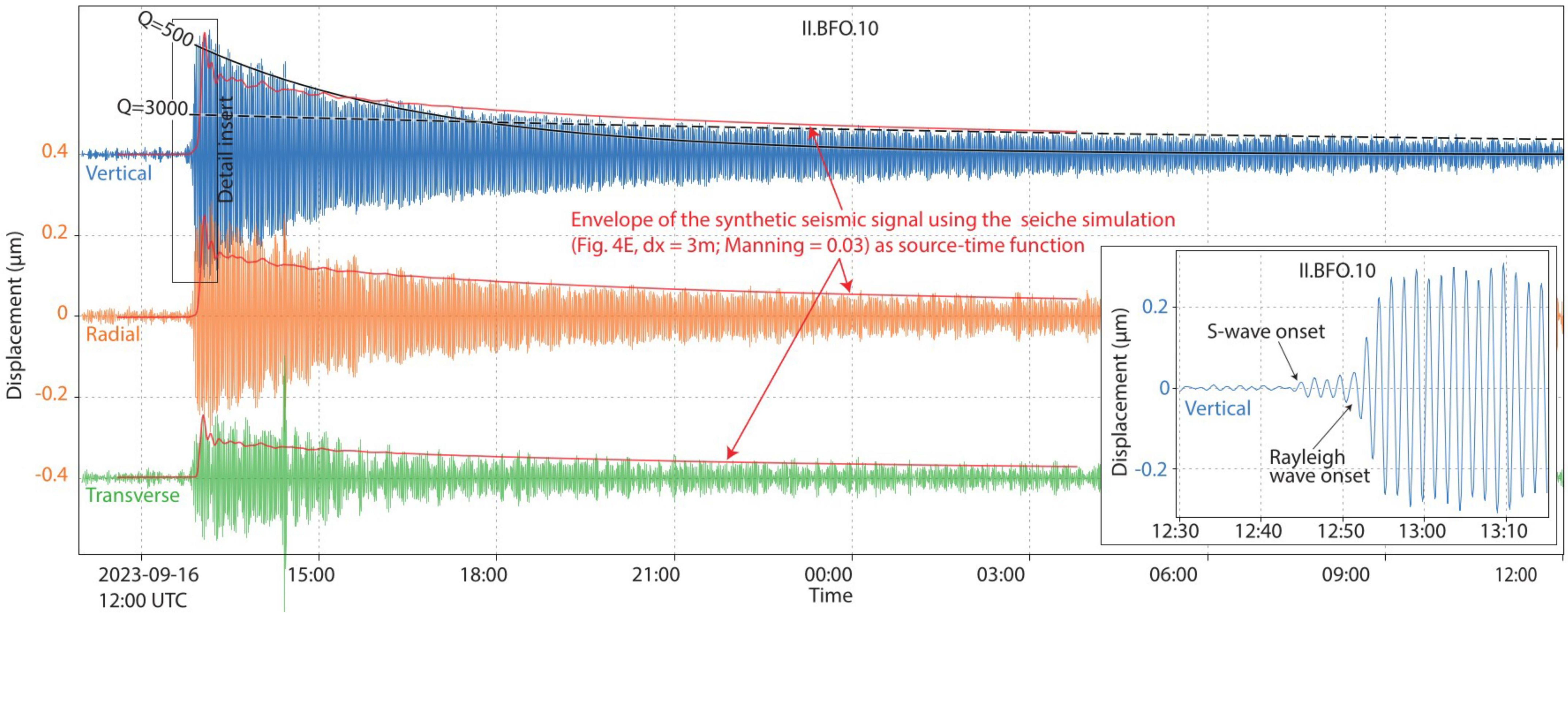

Fig. 1: The enigmatic seismic signal, a slowly decaying oscillation at a signal period of about 92 s. The waves predominantly propagate as Love-waves in the azimuth of Dickson Fjords long axis, and as Rayleigh-waves perpendicular to the fjord. The contribution of shear-waves is obvious due to their early arrival at distant stations. The envelope of the signal matches the wave radiated by the seiche simulated with a spatial resolution of 3 m and a dissipation coefficient (Manning) of 0.03 in total amplitude and decay.

The collapse of a mountain, as shown in Fig. 2, had resulted in a massive landslide into the fjord. This generated a huge tsunami (initial backsplash was 200 m high and runup in 70 km distance still was 4 m high) in the fjord system, which soon converged into a seiche oscillation transverse to Dickson Fjord. A seiche is a resonance of a confined water body, a standing wave of water which sloshes back and force from one shore to the opposite. Very high resolution time-stepping models of the water body in the fjord let us convince ourselves, that Dickson Fjord indeed is capable of maintaining a long-lasting free seiche oscillation, which, if excited by a landslide of the observed dimensions, would be strong enough to excite the observed seismic signal.

Other characteristics of the observed signal, like radiation pattern and frequency, match as well. There are no known reports of seiches with such properties in the literature, which makes this observation a discovery. Remarkably, less than three weeks later, in the same fjord, another such event occurred with an amplitude half as large. The results of this investigation have been published in Science at the anniversary of the September 2023 event.

Kristian Svennevig et al., A rockslide-generated tsunami in a Greenland fjord rang Earth for 9 days.
Science 385, 1196-1205 (2024). DOI:10.1126/science.adm9247

A ten-minute long summary with animations and footage from Greenland is available on youtube:
https://youtu.be/60T9TKuuujs

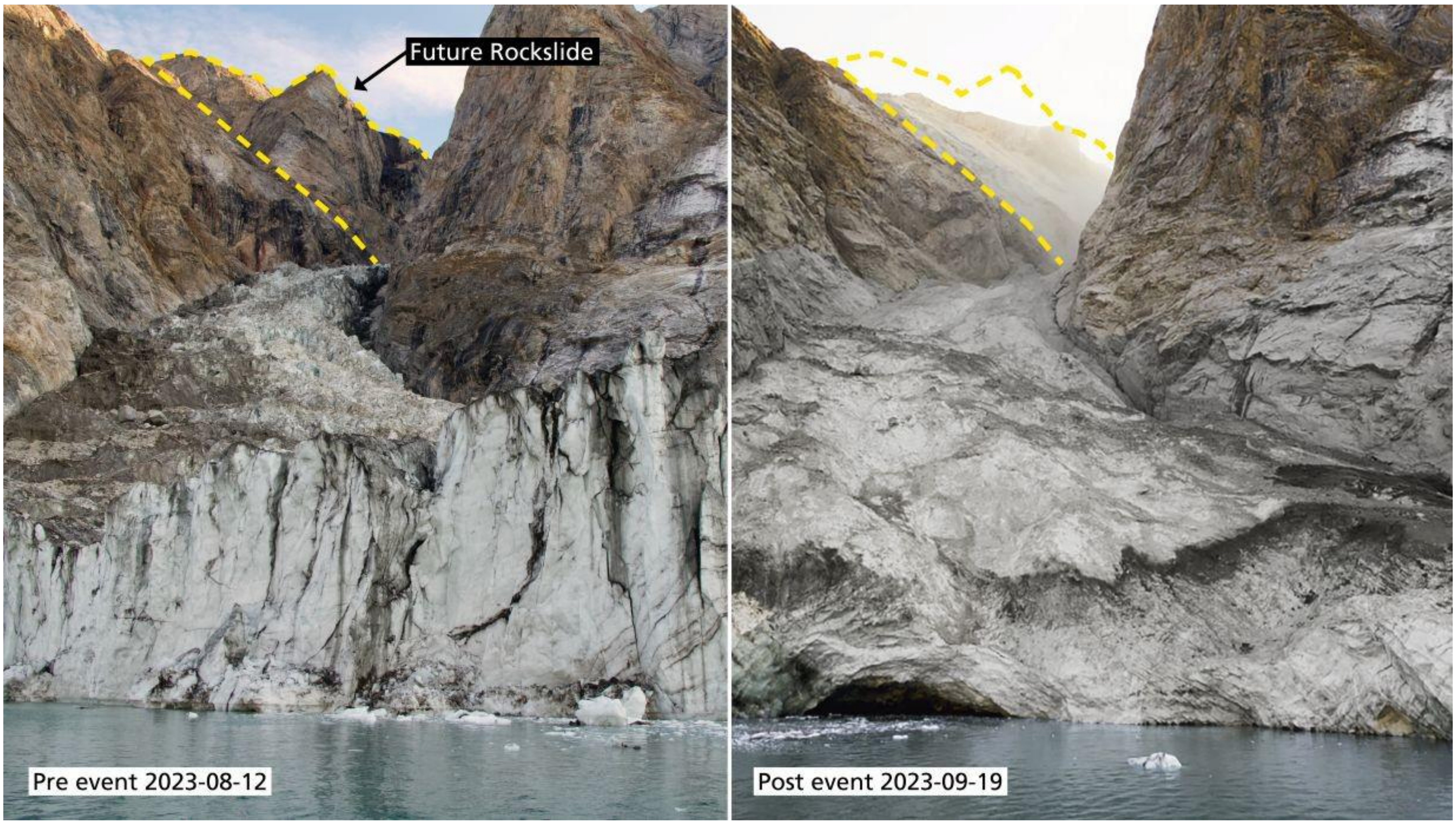

Fig. 2: A mountain towering 1200 m above the water level of Dickson Fjord collapsed on September 16th, 2023, due to the retreat of the glacier and loss of permafrost as consequence of global warming (Courtesy of Søren Rysgaard (left) and Danish Army (right) / modified by: Elias Kobel, KIT).

New Professorship in Seismo-Geodesy at GPI

In June 2024 I took on a new professorship at GPI in the field of Seismo-Geodesy. I have been at GPI already more than 20 years ago as a student. Coming from the university of Potsdam I studied my final semesters here with a focus on seismology. I did my Diploma at the GPI in 2004 supervised by Joachim Ritter. Some of you may know me from these times.

From here I went to ETH Zurich as a PhD candidate and learned about new radar satellite observation methods that allow to measure surface displacements caused by shallow and large enough crustal earthquakes. I specialized in the use of space-borne interferometric synthetic aperture radar (InSAR) to infer the source characteristics of larger earthquakes, e.g. the rupture dimensions, mechanism and fault slip based on the measured ground displacement. However, InSAR measurements only reveal the static and final status of earthquake deformation and not any of the dynamic earthquake characteristics, e.g. the nucleation, rupture evolution and rupture speed.

Combining seismic waveform observations and static surface displacement maps to study the earthquake sources enables us to get a more complete image of rupture processes of large earthquakes

In my PostDoc projects in Potsdam at GFZ and the University of Potsdam and while leading a DFG funded Emmy-Noether Project at Kiel University from 2016 to 2020 I worked with my group members and cooperation partners on such a deep-rooted combination of seismic waveform observations and geodetic measurements based on InSAR and GNSS (Global Navigation Satellite Systems) to best exploit the partly complementary information that these different measurements contain.

Here, I lead the implementation of those methods in the open-source seismological community software pyrocko. An important component of my work has been to best propagate data errors towards a better estimation of model uncertainties using Bayesian methods. In many different collaborations and projects I could show how much the combination of seismological and geodetic data helps to obtain more robust estimations of processes buried at depth.

But there is always room for improvement and interesting discoveries are waiting to be studied in more detail. For instance, having implemented more observations for studying the earthquake source, I believe the medium information we use mostly, which are standard 1D velocity models, may be insufficient in our effort to better describe deformation sources.

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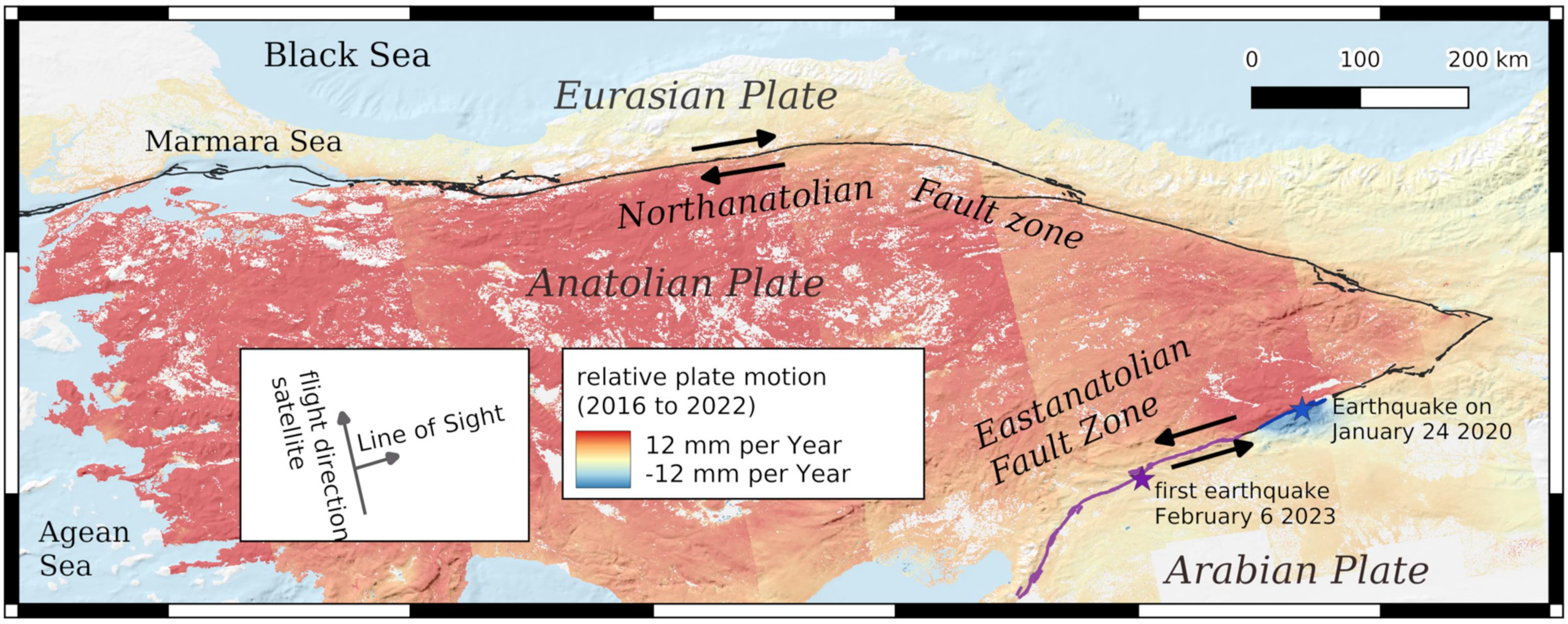
Here we need to work on upgrades and method development to progress. Also, the now 10-years long space-geodetic observation with the European Sentinel-1 radar mission, allows for a continental-wide observation of slow tectonic motion and real-time deformation observation at fault zones (see figure below). Can we obtain a three-dimensional estimate of seismic potential based on these data? In cooperation with the German Aerospace Center DLR that provides these data presented in the figure below. I am working on such questions and others concerning the earthquake deformation cycle.



In 2023 I have been accepted into the DFG Heisenberg program and got funded to follow up on the tasks sketched above and others. The Heisenberg funding also opened the door for me to get permanently appointed as a KIT professor in the framework of its 100-Professorship-Program. The new working group at GPI under my lead shall support and strengthen the seismological profile of GPI and add a geodetic observational component to our research. I am very much looking forward to my time here!

WINSENT Large-N Experiment

By Hans Agurto-Detzel, Joachim Ritter & Andreas Rietbrock

Wind turbines emit ground motions which can be measured at several hundreds to thousands of meters distance depending on their size and the underground conditions. Although these ground motions cannot be felt, they can disturb seismic stations or other high-sensitive instruments. Therefore, such emissions are a concern for the currently planned Einstein Telescope to observe gravity waves.

In order to understand the seismic wave field excited by wind turbines we installed a network of more than 560 seismometers at the WINSENT test site, which hosts two wind turbines on the Swabian Alb. KIT is a member of the WindForS consortium, which runs WINSENT, and GPI has access to the technical and environmental data from WINSENT. For example, in the foundations of each wind turbine there are six manholes equipped with pressure sensors, extensometers and seismometers as part of a joint project on the soil-structure interaction by GPI and the KIT Institute of Soil Mechanics and Rock Mechanics.

Fig. 1: Map with seismic stations (orange: SmartSolo 5 Hz, blue: geophone 4.5 Hz, yellow: broadband) at the WINSENT test site (Agurto-Detzel & Ritter; Google Earth Pro)

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In the first two weeks of December 2024, we started the field work together with colleagues from the Koninklijk Nederlands Meteorologisch Instituut, Liège University and LMU Munich. GPI provided 100 short-period and 12 broadband seismic stations, KMNI and U Liège brought 395 3-D SmartSolo seismic sensors and LMU installed 3 rotational sensors in the foundations. In addition, 50 broad band stations were borrowed from the Geophysical Instrument Pool at GFZ Potsdam. The field experiment will last for about 5-6 weeks with continuous recording at 200 Hz to cover different wind situations and operational phases of the wind turbines.

The field team consisted of Hans Agurto-Detzel (KIT), Falco Bentvelsen (KNMI), Felix Bernauer (LMU), Felix Bögelsbacher (KIT), David Caterina (U Liège), Philipp Fesseler (KIT), Thomas Forbriger (KIT), Marius Grimmeisen (KIT), Leon Merkel (KIT), Hadrien Michel (U Liège), Andreas Rietbrock (KIT), Joachim Ritter (KIT), Shahar Shani-Kadmiel (KNMI) and Joachim Wassermann (LMU).

Fig. 2: Impressions from the fieldwork, J. Ritter, KIT).

RECENT PUBLICATIONS

In this section we would like to inform about recently published peer-reviewed journal papers authored by current members of GPI:

Svennevig K., Hicks S. P., Forbriger T., Lecocq T., et al. (+64): A rockslide-generated tsunami in a Greenland fjord rang Earth for 9 days. Science, 385(6714), 1196-1205. (doi: 10.1126/science.adm9247), 2024.

Chalumeau C., Agurto-Detzel H., Rietbrock A., Frietsch M., Oncken O., Segovia M., Galve A. (2024). Seismological evidence for a multifault network at the subduction interface, Nature, 628 (8008), pp. 558 - 562, DOI: 10.1038/s41586-024-07245-y

Forbriger T., Karamzadeh N., Azzola J., Gaucher E., Widmer-Schnidrig R., Rietbrock A.: Calibration of the strain amplitude recorded with DAS using a strainmeter array. preprint on arxiv. (doi: 10.48550/arXiv.2408.01151), 2024.

Fröhlich Y., Grund M., Ritter, J.R.R.: Lateral and vertical variations of seismic anisotropy in the lithosphere–asthenosphere system underneath Central Europe from long-term splitting measurements. *Geophys. J. Int.*, 239, 112–135, https://doi.org/10.1093/gji/ggae245, 2024.

Mader S.M., Ritter J.R.R., Brüstle, A.: Fault imaging using earthquake sequences: a revised seismotectonic model for the Albstadt Shear Zone, Southwest Germany. *J. Seismology*, 28, 1105–1146, https://doi.org/10.1007/s10950-024-10241-4, 2024.

Koushesh, K., Ritter, J.R.R.: An adaptive 6-dimensional floating-search multi-station seismic-event detector (A6-DFMSD) and its application to low-frequency earthquakes in the East Eifel Volcanic Field, Germany. *J. Applied Volcanology*, 13:9, https://doi.org/10.1186/s13617-024-00147-8, 2024.

Ritter J.R.R., Koushesh K., Schmidt B., Bühler J., Föst J.-P., Hensch M., Mader, S.: Seismological monitoring of magmatic and tectonic earthquakes in the East Eifel Volcanic Field, Germany. *J. Seismology*, https://doi.org/10.1007/s10950-024-10257-w, 2024.

Eickhoff D., Ritter J.R.R., Hloušek F., Buske S.: Seismic reflection imaging of fluid-filled sills in the West Eifel Volcanic Field, Germany. *Geophys. Res. Lett.*, https://doi.org/10.1029/2024GL111425, 2024.

Ritter J.R.R.: Zoeppritz, Karl Bernhard. Neue Deutsche Biographie, 28. Band, Duncker & Humblot, Berlin, 743-744 &eine Photgraphie, 2024.

Fuchs S., Ritter, J.: Windkraft in schwierigem Gelände – Das weltweit einzigartige Forschungstestfeld WINSENT startet den Betrieb unter Beteiligung des KIT. Campus-Report am 13.02.2024, Repository KITopen, https://publikationen.bibliothek.kit.edu/1000168401, 2024.

Niederhuber T., Müller B., Schilling F.R., Röckel T., Kalabegishvili M., Tsereteli N., Aberle B., Rebmeister M., Schenk A., Weisgerber J., Westerhaus M., Rietbrock A.: Monitoring concept for the Enguri Arch Dam, Georgia [Monitoringkonzept für die Enduri-Bogenstaumauer, Georgien], WasserWirtschaft, 114 (7-8), pp. 25 - 30, DOI: 10.1007/s35147-024-2368-y, 2024.

Bornstein T., Lange D., Münchmeyer J., Woollam J., Rietbrock A., Barcheck G., Grevemeyer I., Tilmann F. (2024). PickBlue: Seismic Phase Picking for Ocean Bottom Seismometers With Deep Learning, Earth and Space Science, 11 (1), art. no. e2023EA003332, DOI: 10.1029/2023EA003332, 2024.

Lindner M., Rietbrock A., Bie L., Gao Y.-J., Goes S., Frietsch M.: Complex Martinique Intermediate-Depth Earthquake Reactivates Early Atlantic Break-Up Structures, Geophysical Research Letters, 51 (11), art. no. e2024GL108922 ,DOI: 10.1029/2024GL10892, 2024.

Leon-Rios S., Reyes-Wagner V., Calle-Gardella D., Rietbrock A., Roecker S., Maksymowicz A., Comte D. : Structural Characterization of the Taltal Segment in Northern Chile Between 22°S and 26°S Using Local Earthquake Tomography, Geochemistry, Geophysics, Geosystems, 25 (5), art. no. e2023GC011197, DOI: 10.1029/2023GC011197, 2024.

Braszus B., Rietbrock A., Haberland C., Ryberg T.: AI based 1-D P- and S-wave velocity models for the greater alpine region from local earthquake data, Geophysical Journal International, 237 (2), pp. 916 - 930, DOI: 10.1093/gji/ggae077, 2024.

We wish all of you
Happy Holidays
and a wonderful