

Geophysical Institute, KIT-Department of Physics Hertzstr. 16, 76187 Karlsruhe www.gpi.kit.edu/index.php

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NEWSLETTER OF THE GEOPHYSICAL INSTITUTE

Issue 11, July 2017

Page 1

DEAR GPI ALUMNI

After a busy and also exciting summer lecture period to which many of our PhD students have contributed significantly to meet our teaching obligations, most of us are now looking forward to the vacation time and/or the "free" time for individual research and project-related work.

I want to thank all PhD students, Post-Docs and permanent employees for the good and inspiring working atmosphere, their engagement and excellent work in both teaching and research during the first half of this year. In this current issue of our newsletter we have documented a few recent teaching and research activities. We hope that you will enjoy reading about them.

I wish everyone a beautiful rest-summer season.



Thomas Bohlen

DGG-Teaching Award For Thomas Forbriger

At the 77th Annual Meeting of the Deutsche Geophysikalische Gesellschaft (DGG) in Potsdam, the prize for outstanding teaching was awarded for the first time on March 27th 2017 to Dr. Thomas Forbriger. This award acknowledges special engagement in academic teaching combined with high-quality teaching skills. Dr. Forbriger was nominated by students of geophysic. Congratulations!

M.Sc. Michael Grund

M.Sc. Michael Grund won the EGU Photo Contest 2017. He took the winning photo *Symbiosis of Fire, Ice and Water* during a service tour to the seismic stations of the ScanArray experiment (see last newsletter) in Scandinavia. See also: https://imaggeo.egu.eu/view/4839/





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NEWSLETTER OF THE GEOPHYSICAL INSTITUTE

Issue 11, July 2017

Page 2

TEACHING By Andreas Barth

iBRIDGE

iBRIDGE is an interactive online course for new master students and means Interaktiver BRückenkurs In Das GEophysik-Masterstudium. It is a preparatory course to bridge the entrance into master studies in Geophysics at KIT and will consist of 50 learning units on an online platform. Each unit includes a video with a length of around 10 minutes to prepare to relevant topics in seismology, seismics, and computer applications. Additionally, students will find exercises to check their learning progress and textbook readings to deepen their knowledge. Videos are prepared in cooperation with the KIT Center for Technology-Enhanced Learning (ZML). While the whole contents will be open to students of Geophysics students at KIT, selected videos will be presented on open platforms – free for everybody interested. The first course will be held in September/October 2017 including the first 20 units on seismology. With the iBRIDGE project we also start an attempt to gather teaching material for geophysics from and for lecturers in Germany. Often diagrams, graphics, exercises, and even lecture notes are prepared for individual use only. Sharing this material with others will enhance teaching

possibilities and increase the quality of teaching. This platform will be realised in the beginning of 2018 and we are looking forward to achieve high participation. iBRIDGE is financed by the ministry for science, research and arts Baden-Württemberg until end of 2018.



Photo: University of Freiburg

a) A. Barth presenting iBRIDGE at the workshop "Dialog Lehre: Kleine Fächer", 12/2016 in Freiburg; b) video: the earth is an orange; c) video: magnitudes and intensities





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NEWSLETTER OF THE GEOPHYSICAL INSTITUTE

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Page 3

3D 9-C SHALLOW SEISMIC MEASUREMENTS IN RHEINSTETTEN USING A 3-COMPONENT SOURCE AND 3-COMPONENT RECEIVERS

By Svenja Schaneng and Tilman Steinweg



Overview of the investigation area "Ettlinger Linie" at the glider airfield near Rheinstetten Photo: Marwan Irnaka

Over the last couple of years, the "Ettlinger Linie" at the glider airfield near Rheinstetten has become an established investigation area of the GPI's Applied Geophysics group. The "Ettlinger Linie", a trench which crosses the airfield, was built to defend against the French military forces during the War of the Spanish Succession (1701 - 1714) and originally ranged from the fortress in Phillipsburg to the Black Forest. The section of the "Ettlinger Linie" which we are investigating is nowadays, however, completely levelled and the trench is filled with sediments.

Multiple investigations and analyses such as refraction seismics, dispersion curve inversion, 2D full-waveform inversion and ground-penetrating radar have been performed in this study area as part of recent Master and PhD theses. However, during spring 2017 we accomplished for the first time a 3D field campaign of huge dimension, at least for our Applied Geophysics group. The aim of the field campaign was to gather a 3D data set to perform 3D full-waveform inversion to determine a detailed velocity model of the near surface and image the old "Ettlinger Linie" in the subsurface.

We acquired 28 profiles with a length of 31 meters with one meter spacing and covered an area of 27x31square meters with 52 shot positions distributed equally in this area.

In comparison to the previous 2D acquisitions, there was a massive increase in the demands on the amount of equipment and, obviously, on the required preparation and fieldwork. Actually, it was quite a challenge to secure enough equipment.





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NEWSLETTER OF THE GEOPHYSICAL INSTITUTE

Issue 11, July 2017

Page 4

At the end, we got it from five institutes in Germany, France and Switzerland. On six measurement days we performed a total of approx. 2800 single hammer blows on a new pyramid-shaped 3-component source. Each shot was recorded by 144 geophones, leading to a total of 6.5 GB of 3-C data.

The acquisition was done with the help of four PhD students from the Université Grenoble Alpes and five students from our institute. We are now in the process of screening and processing the data. Together with the research group in Grenoble we will apply 3-D (visco-)elastic Full Waveform Inversion to this data to infer 3D shallow multi-parameter models of seismic velocities and attenuation.



Photo: Svenja Schaneng

Excitation of wavefield by hitting the pyramid-shaped 3-component source





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Issue 11, July 2017





Photos: Marwan Irnaka





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NEWSLETTER OF THE GEOPHYSICAL INSTITUTE

Issue 11, July 2017

Page 6

SEISMOLOGY

By Joachim Ritter

The seismology group is involved in the international AlpArray experiment. The heart of this international project is a broadband network to image the deep structure of the Alpine arc. One main question is the direction of the subduction process underneath the Alps. By "broadband" it is considered that seismometers have a corner period of at least 30 s. This allows one to record teleseismic body waves and many instruments (up to 240 s corner period) also record surface waves. The network is composed of 341 permanent broadband stations which are owned by 32 institutes or observatories and 235 temporary broadband stations operated by 17 institutions incl. KIT-GPI. In addition, there is a joint German-French OBS (ocean bottom seismometer) deployment in the Ligurian Sea with 32 stations since June 2017. The land-based AlpArray deployment duration is about 2.5 years from January 2016. Data becomes publicly available 3 years after acquisition ends. Later this year, KIT-GPI will deploy 15 more seismic recording stations for an experiment on local / regional seismicity in the Alpine foreland. Our research is financed by DFG, SPP 2017 "4D Mountain Building" within a cooperation project with RWTH Aachen. More information on AlpArray: www.alparray.ethz.ch



Fig.: Map with the AlpArray experiment. The continuous waveforms are stored at distributed data centres and are accessible for involved scientists by internet (EIDA data archival/dissemination). Map courtesy of G. Hetenyi (Uni Lausanne) and the AlpArray Seismic Network Core Group Team.





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NEWSLETTER OF THE GEOPHYSICAL INSTITUTE

Issue 11, July 2017

Page 7

GUESTS HOSTED BY GPI

Apl. Prof. Dr. Joachim Ritter

Mr. Chuanbin Zhu

M.Sc. Chuanbin Zhu (Queensland University of Technology) visited GPI from May to July 2017. He presented his work on wave amplification effects and started a study on wave amplification in the Central Upper Rhine Graben. After 10 years as German titular member at the European Seismological Commission, J. Ritter quitted this position.

On 7th June 2017 Joachim Ritter was appointed "Außerplanmäßiger Professor" at KIT.

OBITUARY

Dipl.-Geophys. Werner Kaminski died on 15th March this year. Werner Kaminski, called Miki, was a scientist at GPI between 1973 and 2000 and a pioneer in digital seismology. An extended obituary is available in the Mitteilungen 2/2017 of the Geophysikalische Gesellschaft.



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RECENT PUBLICATIONS

In this section we would like to inform those of you who are still active in Geophysics about recently published peer-reviewed journal papers authored by current members of GPI:

Birkmann J., Wenzel F., Greiving S., Garschagen M., Vallée D., Nowak W., Welle T., Fina S., Goris A., Rilling B., Fiedrich F., Fekete A., Cutter S. L., Düzgün S., Ley A., Friedrich M., Kuhlmann U., Novák B., Wieprecht S., Riegel Ch., Thieken A., Rhyner J., Ulbrich U. and Mitchell J. K.: Extreme Events, Critical Infrastructures, Human Vulnerability and Strategic Planning: Emerging Research Issues, Word Scientific, J Extreme Events, Vol. 3, No. 4 (2016) 1650017, 2017.

Bonjer K., Fuchs K., Mechie J., Prodehl C., Ritter J., Wilhelm, H. & Zürn, W.: Nachruf auf Werner Kaminski (1935-2017) - Brückenbauer von der analogen zur digitalen Seismologie. Mitteilungen Deutsche Geophysikalische Gesellschaft, 2/2017, 45-47, 2017.

Forbriger T.: Oberflächenwellen - Nutzen und Tücken für die seismische Erkundung. In: DGG-Kolloquium. Neue Entwicklungen in der Angewandten Seismik. Ed.: Deutsche Geophysikalische Gesellschaft. Mitteilungen der Deutschen Geophysikalischen Gesellschaft, Sonderband I/2017, ISSN 0947-1944, 3-19. (urn:nbn:de:swb:90-687063), 2017.

Grimmer J. C., Ritter J. R. R., Eisbacher G. H., Fielitz W.: The Late Variscan control on the location and asymmetry of the Upper Rhine Graben. International Journal of Earth Sciences, 106 (3), 827-853. doi:10.1007/s00531-016-1336-x,2017,23017.

Groos L., Schäfer M., Forbriger T., Bohlen T.: Application of a complete workflow for 2D elastic full waveform inversion to recorded shallow-seismic Rayleigh waves. Geophysics, 82(2), R109-R117. (doi: 10.1190/GEO2016-0284.1), 2017.

Grund M.: StackSplit - a plugin for multi-event shear wave splitting analyses in SplitLab. Computers & Geosciences, 105, 43-50, doi.org/10.1016/j.cageo.2017.04.015, 2017.

Leder J., Wenzel F., Daniell J. E., Gottschämmer E.: Loss of resdiential buirlidngs in the event of a re-awakening of the Laacher See Volcano (Germany), Journal of Volcanology and Geothermal Research, 21017.

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NEWSLETTER OF THE GEOPHYSICAL INSTITUTE

Issue 11, July 2017

Page 9

Lott F. F., Ritter J. R. R., Al-Qaryouti M., Corsmeier U.: On the Analysis of Wind-Induced Noise in Seismological Recordings – Approaches to Present Wind-Induced Noise as a Function of Wind Speed and Wind Direction. Pure and applied geophysics, 174 (3), 1453–1470. doi:10.1007/s00024-017-1477-2, 2017.

Malischewsky P.G., Forbriger F. and Lomnitz C.: Unusual, equivocal Rayleigh-dispersion curves for simple models taking into account the special propagation conditions in the valley of Mexico City (CDMX) – Preliminary results. Geofisica Internacional, 56(1), 7-12. (doi: 10.19155/geofint.2017.056.1.1, 2017.

Roy C., Winter A., Ritter J.R.R., Schweitzer J.: On the improvement of SKS splitting measurements by the Simultaneous Inversion of Multiple Waveforms (SIMW), Geophys. J. Int. 208, 1508-1523, 2017.

