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Geophysics and Meteorology at the University of Leipzig

On the Occasion of the 100th Anniversary
of the Foundation of the Geophysical Institute
in 1913

with contributions by

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Preface

The early years of the 20th century saw a rapid and vigorous development of the natural sciences and technology in Germany, and the University of Leipzig was involved in the fast moving evolution. In this quickly changing environment, the Geophysical Institute was established at the University of Leipzig on January 1, 1913. At that time geophysics and meteorology were considered subsections of physics and geosciences. They were divided into Physics of the Solid Earth (Geophysics), Physics of the Atmosphere (Meteorology), and Physics of the Hydrosphere (Oceanography). The goal of the new Geophysical Institute was the joint treatment of all three scientific branches, beginning with meteorology. Although traditions in geosciences and meteorology in Leipzig reach much further back in time, the foundation of the new Geophysical Institute promoted the rapid advancement of these disciplines in Leipzig itself and beyond. The institute was the first in Germany to deal specifically with meteorology and the second, after Göttingen, devoted specifically to geophysics.

Over its history, the institute has experienced several periods of heartening growth followed by phases of frustrating decline. Apart from the war years, we must particularly mention in this context the various restructurings and the closure of study programmes by the governments. On the other hand, teaching and research in meteorology and geophysics was strongly invigorated after the German unification by the foundation of the Institute for Meteorology and the Institute of Geophysics and Geology.

Since the foundation of the Geophysical Institute one hundred years ago, meteorology and geophysics have evolved to become highly specialised and autonomous branches within modern natural science, and therefore have been organized into two separate institutes (Institute for Meteorology and Institute of Geophysics and Geology) within the Faculty of Physics and Earth Sciences since 1993. These have developed into nationally and internationally respected institutes, and have become core research and teaching units within the faculty and the university as a whole. A large number of students study meteorology and geophysics, receiving their bachelor/master/diploma degrees or doctorates from the University of Leipzig. The two institutes also offer courses for students of other disciplines.

Both institutes are characterised by high-level national and international research activities, which are documented in a large number of peer-reviewed publications. There are also numerous collaborations with non-university research institutions such as the Leibniz-Institut für Troposphärenforschung, TROPOS (Leibniz Institute

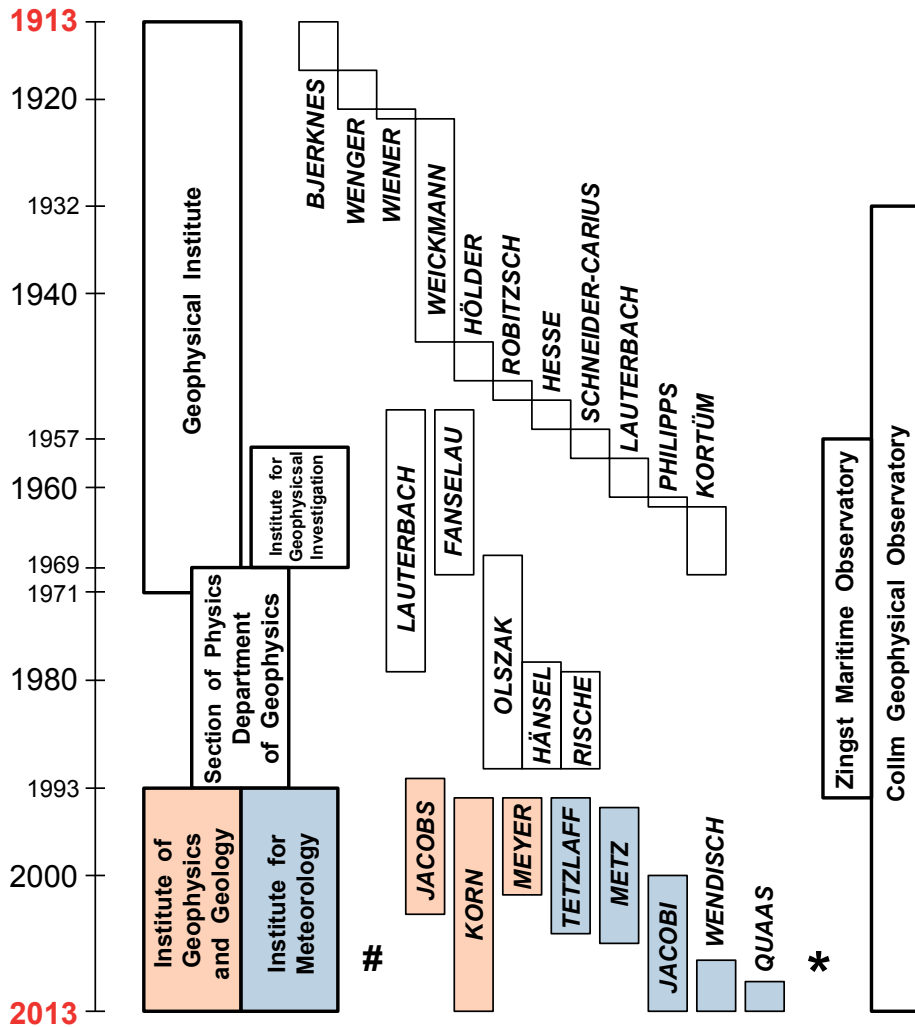
for Tropospheric Research), the Helmholtz-Zentrum für Umweltforschung, UFZ (Helmholtz Centre for Environmental Research), and the Helmholtz-Zentrum Potsdam Deutsches GeoForschungZentrum, GFZ (Helmholtz Centre Potsdam, German Research Centre for Geosciences). Furthermore, many fruitful co-operations exist with other national and international universities and with scientific institutes and agencies, for example Deutscher Wetterdienst, DWD (German Weather Service).

This volume outlines the important stages in the history of geophysics and meteorology at the University of Leipzig from the Geophysical Institute in 1913 to the Institute of Geophysics and Geology and the Institute for Meteorology in 2013.

Manfred Wendisch
Institute for Meteorology

Werner Ehrmann
Institute of Geophysics and Geology

Institutes and Professors



#Geology professors at the Institute for Geophysics and Geology:
EISSMANN, GLÄSSER, PIOTROWSKI, EHRMANN, MELLES, BRACHERT

*Joint appointments with the Leibniz Institute for Tropospheric Research:
HEINTZENBERG, RENNER, ROLLE, TEGEN, HERRMANN, MACKE

Compiled by Werner Ehrmann and Franz Jacobs.

The Institute of Geophysics and Geology since 1993

Franz Jacobs and Michael Korn

December 2, 1993 was the 584th anniversary of the foundation of the University of Leipzig “Alma mater Lipsiensis” and also the day several new faculties and institutes were established. They originated out of the Faculty of Mathematics and Sciences that had been revived (after 1990) under the Deanship of Franz Jacobs. Among the new faculties and institutes was the Faculty of Physics and Earth Sciences and, within it, the Institute of Geophysics and Geology (IGG)/the Geological-Palaeontological Collection (Fig. 7.1). The institute hosted the following geo-



Figure 7.1: The Institute for Geophysics and Geology. Establishment document. 1993.



Figure 7.2: Helmut Meyer (1947–2011).

physics professorships: Physics of the Earth (Franz Jacobs, first director), Theoretical Geophysics (Michael Korn), and Engineering and Environmental Geophysics (Helmut Meyer; Fig. 7.2). Since 1993, the Collm Geophysical Observatory has been shared with the Institute for Meteorology.

During the 1990s, geophysics developed rapidly thanks to considerable support from the state and as a result of the high levels of motivation among professors, scientific and technical staff and students. Enrolments in geophysics and geology rose to about 70–80 per year, success in attracting external funding allowed dozens of PhD students to be employed. At the same time, the technical apparatus was upgraded and the less than satisfactory state of repair of the buildings at Talstraße 35 and the Collm Geophysical Observatory were considerably improved by means of third-party funding and financial support from the Free State of Saxony.

Several main research themes were established within international networks:

- Geophysics at deep drilling sites for investigation and usage of geothermal energy, earthquakes und palaeo-climate (KTB continental deep drilling site, geothermal and research drill holes in Gross-Schönebeck and Baruth) (Fig. 7.3)
- Geoelectrical tomography with projects in abandoned mining areas, in the Long Valley Caldera (California) and at Mount Merapi (Figures 7.4, 7.5, 7.6)
- Seismology and seismic monitoring (Saxonian Seismological Network)
- Geophysics at geological barriers (subsurface waste deposits, final storage sites in salt domes, flooding embankments in Saxony) (Fig. 7.7)
- Seismic wave propagation in complex structures
- Volcano seismology
- Seismic tomography on different scales

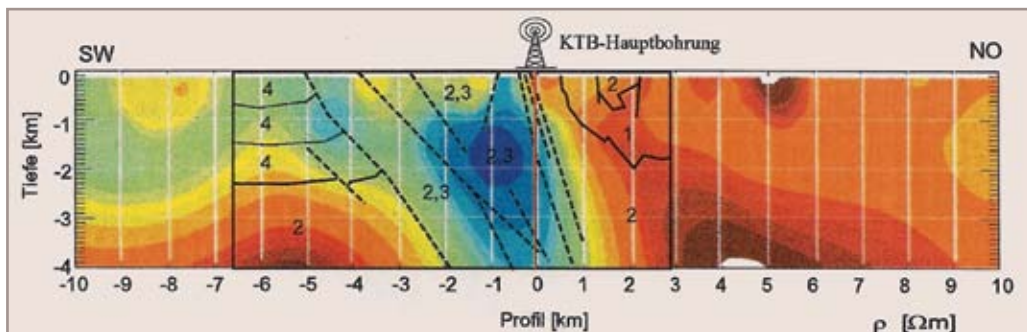


Figure 7.3: German Continental Deep Drilling Project (KTB). Electrical Resistivity Tomography (ERT), 1994.

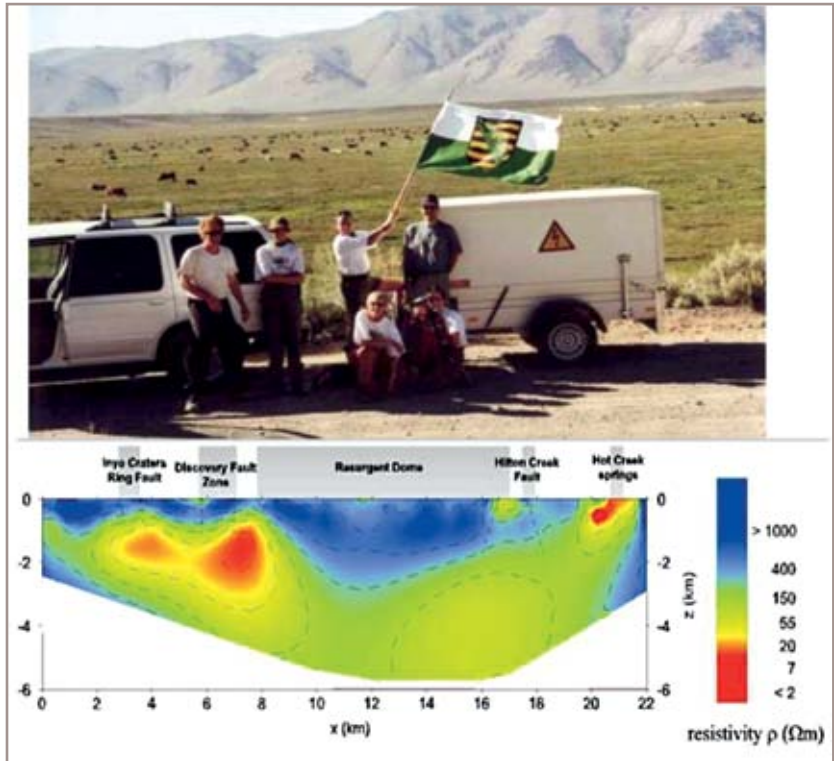


Figure 7.4:
Long Valley Caldera
(California).
The team and
the geophysical
resistivity distribu-
tion in the under-
ground. 2000.

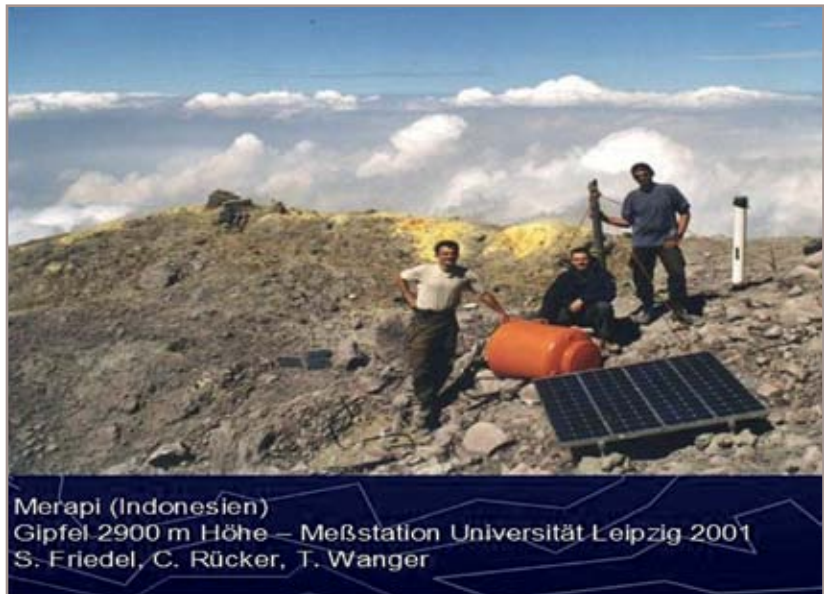


Figure 7.5:
Geophysical
monitoring station.
Summit Volcano
Merapi (Indonesia),
2900 m asl, 2001.

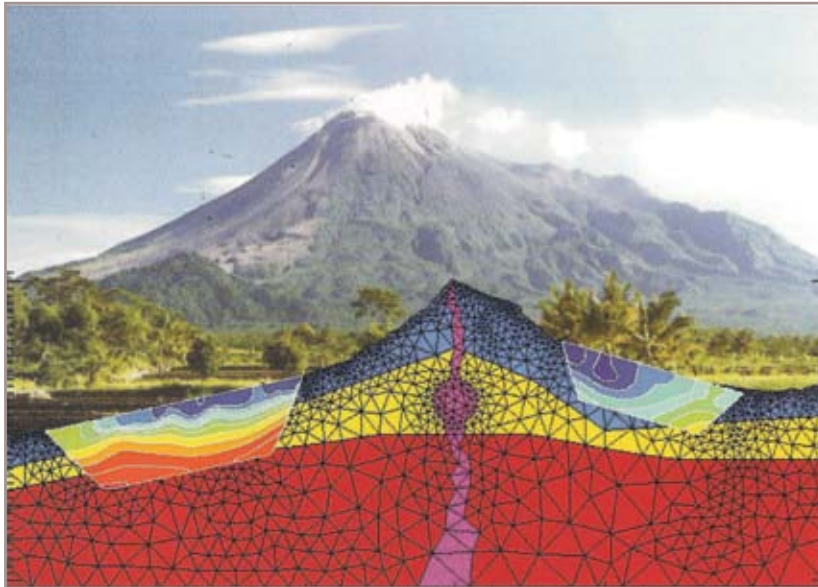



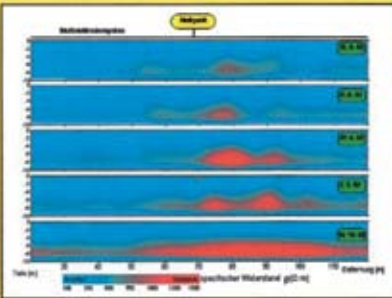
Figure 7.6: Vulcano Merapi. Finite-Element Model and Electrical Resistivity Tomography (ERT).

Hochwasserschutz durch geoelektrische Deichdiagnose

Protection of floods by geoelectrical dike diagnostics



Multielektrodensystem auf einem Elbedeich bei Torgau ...



... und Ergebnisse nach dem Augusthochwasser 2002

Hält der Deich?

- Bauweise
- Material
- Durchfeuchtung

sind mit elektrischer Leitfähigkeit verknüpft

Zerstörungsfreie Diagnose?

- Geoelektrik
- Multielektrodensysteme
- Leitfähigkeitstomographie

Technische Ausrüstung?

- Messapparatur, tragbar, batteriebetrieben, programmgesteuert
- Edelstahl Elektroden, vieladrige Kabelbäume
- Interpretationssoftware

Figure 7.7: Protection of floods by geoelectrical dike diagnostics, 2002.

Of special interest were the annual workshops on high resolution geoelectrics that took place near Leipzig since 1992. They became known as the Bucha Seminars, and attracted about 50 participants each year who discussed the progress of electrical resistivity methods in science and practical application (Fig. 7.8).

Since 1996, the institute published *Leipziger Geowissenschaften*, a journal appearing in 1–2 volumes per year (Fig. 7.9) in continuation of the tradition of publishing geophysical-geological articles written by researchers at the University of Leipzig. The journal presents pieces on geophysics, geochemistry, geology, palaeontology, geography, environmental science and history of earth sciences and has been edited by, among others, Arnold Müller, Michael Börngen and Frank Bach.

In spite of recognized achievements, explicit support from the City of Leipzig and initially unequivocal public affirmations from the university

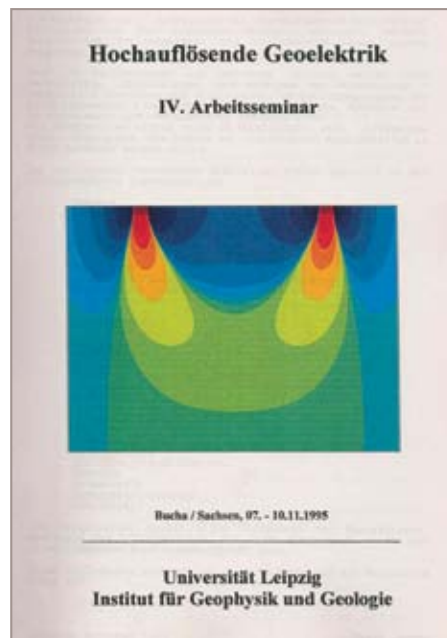


Figure 7.8: Bucha Seminar on high resolution geoelectrics. Program (Cover) 1995.

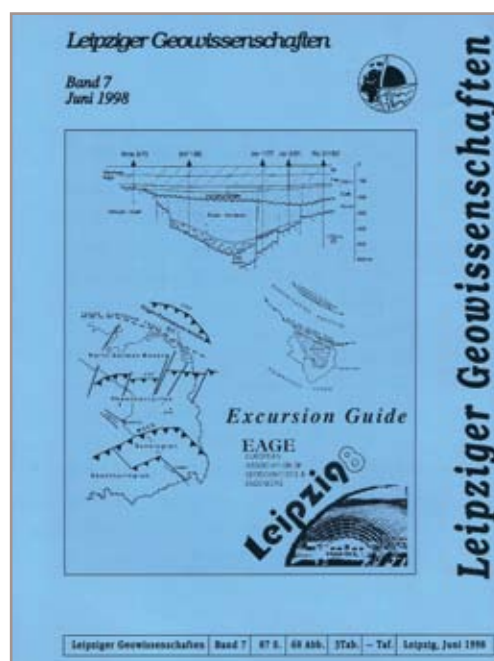
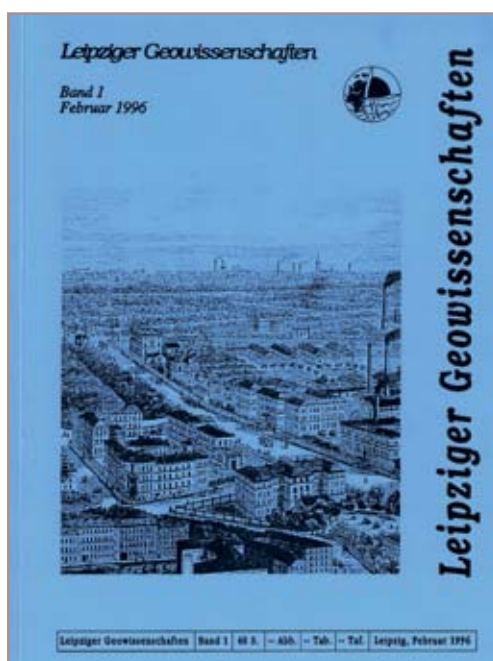


Figure 7.9: Journal „Leipziger Geowissenschaften“. Volume 1, 1996 and Volume 7, 1998. Covers.

Table 7.1: Number of first-semester students for diploma and MSc study programmes since 1990.

	Diploma Geophysics	Diploma Geology	Msc Geosciences
1990	7		
1991	2		
1992	2		
1993	6		
1994	15		
1995	14	9	
1996	11	24	
1997	9	18	
1998	8	35	
1999	14	32	
2000	6	21	
2001	9	45	
2002	14	68	
2003	16	75	
2004			
2005			
2006			
2007			
2008			2
2009			10
2010			10
2011			11
2012			18

and the faculty, 2004 brought deep cuts in budget and personnel that were necessitated by deteriorating financial circumstances. The study programmes in geophysics and geology were closed, staff numbers were reduced by more than 50 per cent and two of the three geophysics professorships were eliminated. As a consequence, nationally and internationally recognized successful and socially relevant research profiles closed down. In 2004, Franz Jacobs retired, and the new director of institute became the geologist Werner Ehrmann. Theoretical geophysics specializing in seismology and including the Collm Observatory remained the only stable research area in geophysics.

In 2007/2008, a new MSc course entitled „Geowissenschaften: Umweltdynamik und Georisiken“ was established. Specialising in environmental dynamics and geohazards, the programme builds on the long tradition and expertise in geological and geophysical research and teaching in Leipzig. The reconstruction of

environmental dynamics on geological time scales and the investigation of geohazards are topical themes in earth science. As a non-consecutive Msc course this programme is open to students with various backgrounds in geosciences coming from different universities. The annual number of first-semester students and of graduations in the various study programmes are listed in Table 7.1, and 7.2, respectively.

At present, geophysics focuses on risks and opportunities of using subsurface space in exploiting energy and natural resources, the storage and deposit of dangerous wastes, and monitoring subsurface dynamic processes. This includes earthquake monitoring and hazard assessment in central Germany, the use of geophysical techniques for discovering, securing and the long-term monitoring of underground waste deposits (Fig. 7.10), the safe development and usage of

geothermal energy, and carbon dioxide capture and storage. The expertise available at the University of Leipzig in methodological developments as well as the broad technical and instrumental capabilities (seismics, radar, geoelectrics) allows a wide range of projects in both applied and basic sciences to be carried out.

Among ongoing research activities are seismological and geoelectrical investigations of fluid migration in the West Bohemia/Vogtland earthquake swarm area within the framework of the International Continental Scientific Drilling Program (ICDP), the establishment of a permanent earthquake warning service for Saxony (Fig. 7.11), and the development of seismic interferometry for imaging and real-time monitoring for the a variety of applications on different scale-lengths ranging from material testing and geotechnical applications to monitoring of volcanoes and active tectonic areas.

The Institute of Geophysics and Geology has numerous co-operations with national and international research institutions, universities and authorities. Among them are: the Helmholtz Centre for Environmental Research (UFZ); Helmholtz Centre Potsdam, German Research Centre for Geosciences (GFZ); the Alfred Wegener Institute for Polar and Marine Research (AWI); Helmholtz Centre Dresden-Rossendorf (HZDR); Leibniz Institute for Applied Geophysics (LIAG); Universidad de Concepcion, Chile; Tohoku University, Japan; Czech Academy of Sciences, Charles University Prague.

Table 7.2: Number of diploma, MSc, doctoral, and habilitation graduations since 1990 (only Geophysics).

	Diploma	MSc	Doctorate	Habilitation
1990	7		4	1
1991	4		3	1
1992	5		5	
1993			1	
1994	1			
1995	4			
1996	7			
1997	3		1	
1998	2		3	
1999	8		3	1
2000	7		1	
2001	2		2	
2002	5		1	
2003	2		3	
2004	11			
2005	3			
2006	2			
2007	2		2	
2008	3			
2009	5			
2010			3	
2011	2	2		
2012		3		



Figure 7.10: Project Salinar-geophysik. Measurements in a salt mine for investigation of geological barriers, 2007.

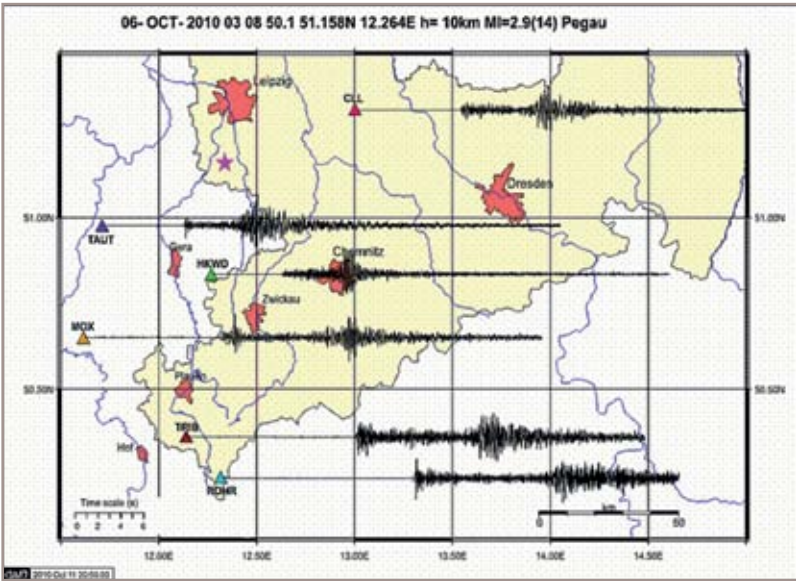


Figure 7.11: Saxony Seismological Network. Seismogram displaying a seismic event near Pegau (ML=2,9), 2010.

Das Buch kann zum
Sonderpreis von 15,-- Euro
bezogen werden über:

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