WSM Transfer to the GFZ German Research Centre for Geosciences

In 2009 the transition of the World Stress Map Project to the GFZ German Research Centre for Geosciences (www.gfz-potsdam.de) has been accomplished. Neither politics nor strategy of the project has changed. It remains an independent research project with an open database access free of charge. Please update your internet link to www.world-stress-map.org.

Publications

Special issue*:* In February 2010 the Tectonophysics special issue on *Frontiers in Stress Research* has been published (Vol. 482). Here, you find 20 papers related to stress research divided into three main sections. We thank all contributors and reviewers for their great effort. For your convenience, please find attached to this newsletter the content and the editorial of the special issue.

Book: Arno Zang and Ove Stephansson published at Springer in 2010 an excellent book on *"Stress Field of the Earth's Crust"*, 322 pages and a DVD including 17 video lectures and the WSM database. Further details are given at:
www.springer.com/earth+sciences+and+geography/geophysics/book/978-1-4020-8443-0

Achievements of the WSM database release 2008

In the special issue paper of Heidbach et al. (2010) details of the latest WSM database release 2008 are described. In particular we present the refinement of the WSM quality ranking scheme and the treatment of the orientation of maximum horizontal stress (S_H) from single focal mechanisms near plate boundaries, the so-called Possible Plate Boundary Events (PBE). Furthermore we present in this paper a dataset of mean S_H orientations on a global 0.5° grid that is calculated with an advanced application of the statistical analysis of bimodal data. Further description of this analysis and the PBE is given in Heidbach et al. (2010); the dataset can be downloaded from our website.

Update of the online WSM database interface CASMO

The service of CASMO (*Create A Stress Map Online*), our web-based database interface, has been updated. In particular the selection of stress orientations derived from single earthquake focal mechanisms has been extended significantly. Furthermore, instead of sending the produced user-defined stress map via e-mail it is now provided for download from our website.

WSM visualization with Google Earth

On our website we now provide a Google Earth kmz-file of the WSM database. This is the fastest way to check the availability of stress data in your area of interest. After import into Google Earth a simple mouse click on a stress symbol will generate a pop-up window that provides all details of the data record.

Conferences and other dates

- ISRM conference in China, 25.-27. August 2010, (www.rockstress2010.org)
- Anderson conference on "*Stress controls faulting, fracturing and igneous intrusion in the Earth's crust"*, 6.-8. Sept. 2010, University of Glasgow, Scotland, (www.gla.ac.uk/events/andersonconference)
- Compact course on "*Crustal Rock Stress"*, 13.-15. Sept. 2010, Ostrava, Czech Republic, (www.ugn.cas.cz/link/crs10)

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Special Issue

Frontiers in Stress Research

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Preface

Frontiers in Stress Research

1. Introduction

Knowledge of the stress state and its link to deformation is important for a wide range of practical applications, including the stability of underground openings, enhancing productivity from hydrocarbon and geothermal reservoirs and seismic hazard assessment. Stress information is also critical for resolving questions related to the driving forces of plate tectonics and intraplate deformation. The systematic global compilation of in-situ stress information began in 1986 with the World Stress Map (WSM) project as a Task Force of the International Lithosphere Program (ILP) under the leadership of Mary Lou Zoback. The ILP was established in 1980 by the International Council of Scientific Unions (ICSU) at the request of the International Union of Geological Sciences (IUGS) and the International Union of Geodesy and Geophysics (IUGG). In 2008 the WSM project was appointed as a member of the Federation of Astronomical and Geophysical Data Analysis Services (FAGS) that is currently transferred to the new ICSU World Data Service (http://wds.geolinks.org).

First results of the WSM project were presented in 1992 in a special volume of the *Journal of Geophysical Research* (Zoback, 1992). The 1992 WSM database release contained 7300 data records. From May 1995 to December 2008 the WSM continued as a research project of the Heidelberg Academy of Sciences and Humanities located at the Geophysical Institute of the Universität Karlsruhe, Germany. The current 2008 WSM database release contains 21,750 stress data records (Heidbach et al., this issue). The WSM database release 2008, its detailed description and a service to plot user-defined stress maps are provided at http://www.world-stress-map.org.

This special issue *Frontiers in Stress Research* is an assemblage of papers that have been presented at the 3rd World Stress Map conference in Potsdam, Germany, 15–17. October 2008. The strategic

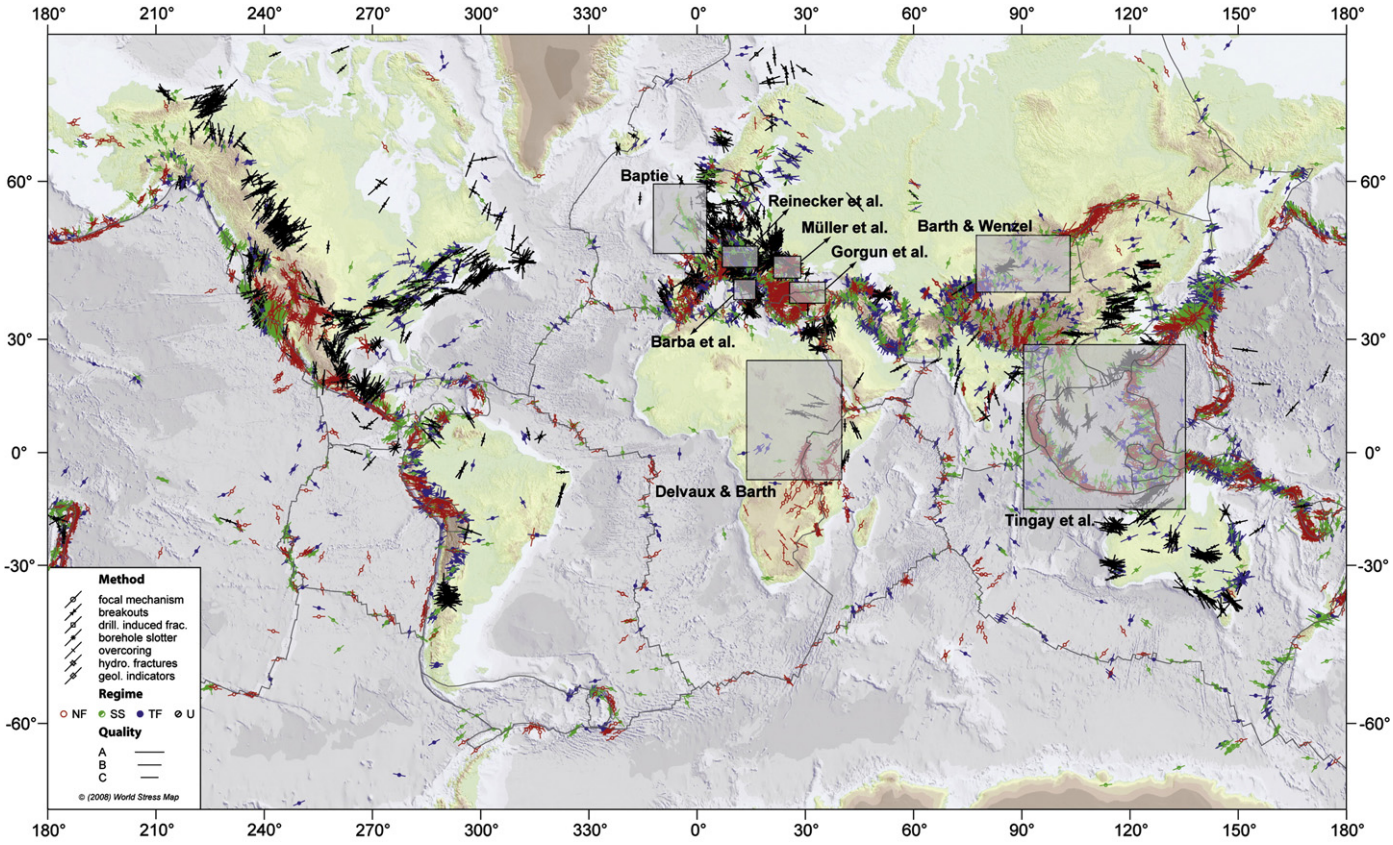

Fig. 1. Global stress map based on the WSM database release 2008 using the 11,346 stress data records with of A–C quality, but excluding all possible plate boundary events (PBE) (Heidbach et al., this issue). Lines represent the orientation of maximum horizontal compressional stress S_H, line length is proportional to data quality. Colours of the symbols indicate stress regimes with red for normal faulting (NF), green for strike–slip faulting (SS), blue for thrust faulting (TF), and black for unknown regime (U). Boxes indicate regional stress studies in this special issue.

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aim of the conference was to announce the transition of the WSM as a research project of the Heidelberg Academy of Sciences and Humanities to the GFZ German Research Centre for Geosciences. Here, the future of the WSM project is secured as the GFZ has agreed to incorporate the WSM project into its research structure and will provide resources for ongoing maintenance and development.

2. This volume

Following the three main objectives of the 3rd World Stress Map conference, the special issue aims to present modern concepts on stress and strain measurement techniques, analysis of stress information and integrated regional studies including numerical modelling. Thus, the special issue is divided into three sections. The first section focuses on stress and strain measurement, analysis and interpretation. It begins with the paper of Heidbach et al. on the revised quality ranking scheme of the WSM project, the new WSM database release 2008 (Fig. 1) and a global statistical wave-length analysis of the contemporary crustal stress pattern. The following articles deal in detail with new advancements in measurement techniques such as the methods for interpreting stress orientations from volcanic vent alignments (Paulsen and Wilson, this issue) and the measurement of present-day stress in the Taiwan Chelungpu-fault Drilling Project (Haimson et al., this issue; Lin et al., this issue).

The second section comprises a number of regional studies of the stress pattern in regions where stress information was either sparse or non-existent, such as the compilation of the first stress map of the Sunda plate in Southeast Asia (Tingay et al., this issue). Fig. 1 displays the location of these studies. Most of the new stress data presented in these papers is included in the 2008 WSM database release except for the new data in Great Britain (Baptie, this issue) and Italy (Barba et al., this issue) that will be added to the next WSM database release.

The third section is dedicated to numerical modelling of tectonic stresses. Modelling can provide an important tool for predicting the state of stress in regions of sparse geological data and near geological features. Furthermore, only numerical modelling can unravel the open question of the stress sources and the geodynamic processes that drive plate tectonics. However, the quality of the model results depends on the number and quality of model-independent constraints, such as stress and strain observations. Thus, one of the future challenges is to combine stress models with the rapidly increasing observations of Earth's surface deformation through satellite geodetic techniques such as GPS, InSAR and Persistent Scatterer InSAR. In this sense this section presents the results from models that simulate the contemporary strain-rate and the crustal stress state and their changes on a wide range of spatial and temporal scales. For example, Flesch and Kreemer (this issue) present a model that links the gravitational potential energy to the stress observations of the World Stress Map and the strain derived from GPS velocities.

3. Thanks to reviewers

This special issue could not have been produced without the effort and expertise of the reviewers of the articles herein. We thank

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