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The World Stress Map Database Release 2016 - Global Crustal Stress Pattern vs. Absolute Plate Motion

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The World Stress Map (WSM) Project was initiated in 1986 under the auspices of the International Lithosphere Program in order to compile the global information on the contemporary crustal stress state. The data come from a wide range of stress indicators such as borehole data (e.g. hydraulic fracturing, borehole breakouts), earthquake focal mechanism solutions, engineering methods (e.g. overcoring), and geological data (e.g. inversion of fault slip measurements). To guarantee the comparability of the different data sources each data record is assessed with the WSM quality ranking scheme. For the 30th anniversary we compiled a new WSM database with 42,410 data records which is an increase by >20,000 data records compared to the WSM 2008 database. In particular we added new data from more than 3,500 deep boreholes and put special emphasis on regions which previously had sparse or no published stress data such as China, Australia, Brazil, Southern Africa, Middle East and Iceland. Furthermore, we fully integrated the Chinese stress database and the Australian stress database. The resulting data increase reveals several areas with regional and local variability of the stress pattern. In particular we re-visited the question whether the plate boundary forces are the key control of the plate-wide stress pattern as indicated by the first release of the WSM in 1989 [Zoback et al, 1989]. As the WSM has now more than 10 times data records and thus a better spatial coverage we first filter the long-wave length stress pattern on a regular grid. We determine at these grid points the difference between absolute plate motion azimuth using the global plate model HS3-NUVEL1A [Gripp and Gordon, 2002] and the mean orientation of the maximum horizontal stress. The preliminary results show that the earlier findings are still valid in principal. However, all plates show in some parts significant deviations from this general trend; some plates such as the Australian Plate show hardly any correlation at all. These deviations seem to be either due to mantle drag forces, different plate boundary forces acting in different directions, additional internal body forces or major structural inhomogeneity's.