World Stress Map Beyond Orientations - The First Quality Ranking Scheme for Stress Magnitude Data

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The World Stress Map (WSM) compiles orientations of the maximum horizontal stress $S_{\text{Hmax}}$ and provides the only public global database of this kind. To make the $S_{\text{Hmax}}$ orientation data from a wide range of stress indicators comparable, a quality ranking scheme has been developed. However, for the assessment of subsurface stability, not only the orientations but also data of the principal stress magnitudes are essential to calibrate 3D geomechanical-numerical models that deliver a continuous description of the complete 3D stress tensor. Thus, a comprehensive extension of the WSM database with quality-ranked stress magnitude data is needed. In a pilot study, we compiled an open-access stress magnitude database for Germany and adjacent regions, consisting of 568 data records. Indicators of stress magnitudes are diverse and include e.g. hydraulic fracturing and overcoring. To make data from different sources comparable, we developed a quality ranking scheme for stress magnitude data for the first time. In contrast to the established WSM quality ranking for $S_{\text{Hmax}}$ orientation data records, estimates of stress magnitudes cannot be averaged over large rock volumes or depth ranges. Instead, each point-wise information has to be considered separately. Thus, we developed a new approach for the quality ranking scheme of $S_{\text{hmin}}$ magnitude data records which considers both the type of stress magnitude indicator and the degree of information availability. We present the results of our work including the data quality ranking scheme, which will serve as a template for a global stress compilation within the framework of the WSM project. The next countries and regions that we will explore are Australia, Scandinavia and India. We invite you to contribute to this project in your area or country of interest and to join the WSM team as an official collaborator.