

# Recently in the Carpathians — tectonic stress data from the Pancardi region

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The World Stress Map Project is a global compilation of data on the recent tectonic stress field in the Earth's crust. It was initiated by a task force of the International Lithosphere Program under the leadership of M.L. Zoback. There are more than 9100 individual measurement locations, each with up to 55 detail entries stored in a digital database. The continuing database is maintained and expanded as a research project of the Heidelberg Academy for the Sciences and Humanities. A basic goal is to fill the existing spatial gaps in data on continents and oceans with new stress measurements encompassing earthquake focal mechanisms, well bore breakouts, in-situ stress measurements (overcoring and hydraulic fracturing), and young geologic data (from fault slip analysis and volcanic vent alignments).

Tectonic stresses and internal plate deformations are caused primarily by plate boundary forces, which are responsible for the movement of the lithospheric plates. These forces include ridge push at the mid-ocean ridges, basal shear stresses acting at the base of the lithospheric plates, and slab pull and trench suction forces at subduction zones. In addition to plate

boundary forces, secondary stress sources can be superimposed, leading to local deviations in stress patterns. Examples of these secondary sources are flexural stresses from lithospheric bending produced by vertical loading of the lithosphere by islands or glaciation, unloading by deglaciation, or bending in subduction zones. Other important secondary stress sources are associated with lateral density contrasts as they occur at passive continental margins.

In Western Europe plate boundary forces are responsible for a large scale homogeneous stress field with NW–SE orientation of maximum horizontal compressive stress ( $S_{Hmax}$ ). In contrast, the Pancardi region which is bordered by young orogens (Eastern Alps, Carpathians, Dinarides, Balkanides) shows a more complicated stress pattern. While the Pannonian Basin is mainly 'occupied' by NE–SW oriented  $S_{Hmax}$ , it changes towards an outward radial orientation in the Outer Carpathians (with  $S_{Hmax}$  perpendicular to the strike of the flysch nappes). Additionally to this regional fluctuation of  $S_{Hmax}$ , new breakout data from the Polish Outer Carpathians indicate varying stress orientations with borehole depth. Local stress decoupling along detachment horizons might be the reason for this stress field disturbance.

Homepage of the World Stress Map:  
<http://www-gpi.physik.uni-karlsruhe.de/pub/wsm>