

CLASSIFICATION OF TECTONIC REGIME

Relates to stresses: the stress regime is an expression of the relative magnitudes of the principal stresses (S_1 , S_2 and S_3).

Relates to fault kinematics: the main categories of tectonic regimes are thrust faulting, normal faulting and strike-slip (see **Figure** below), after Anderson (1905). Only when faults are optimally oriented in the stress field, the stress regime is coincident with the tectonic regime (Célérier 1995; Célérier et al. 2012; Hergert and Heidbach 2011).

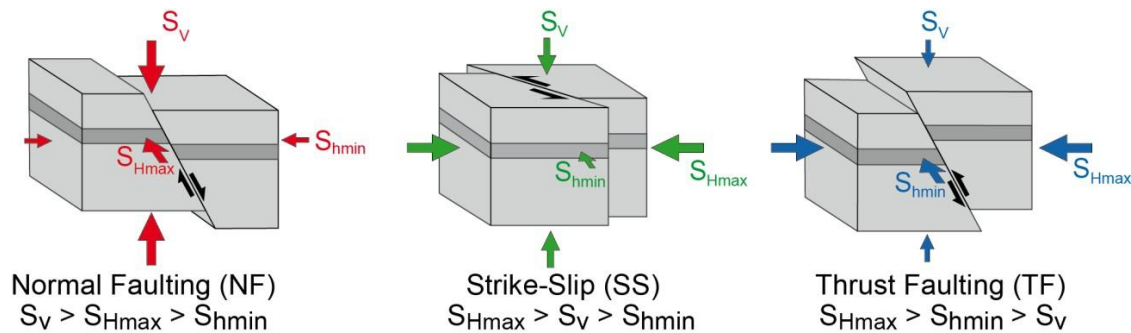


Figure - The three main tectonic stress regimes. After [WSM Technical Report](#).

Assuming that the vertical stress S_v is a principal stress at depth, S_{Hmax} and S_{Hmin} are the other two principal stresses of the stress tensor. S_{Hmax} and S_{Hmin} are the projections of the principal stresses to the horizontal plane.

From the stress indicators that provide absolute or relative stress magnitudes, the tectonic regime is derived according to the WSM stress regime categorization table (Zoback 1992; see **Table** below). The stress magnitudes are defined using the standard geologic/geophysical notation with compressive stress positive and $S_1 > S_2 > S_3$, with S_1 as the maximum, S_2 as the intermediate and S_3 as the minimum principal stress.

Besides the standard regime of normal faulting (NF), thrust faulting (TF), and strike-slip (SS), combinations of NF with SS (transtension, NS) and TF with SS (transpression; TS) are defined.

[WSM guidelines](#), see §2.3 and Table 3.5-1.

Anderson E.M. (1905). The dynamics of faulting, *Trans. Edin. Geol. Soc.*, **8**, 387-402.

Célérier B. (1995). Tectonic regime and slip orientation of reactivated faults, *Geophys. J. Int.*, **121**, 143-161.

Célérier B., Etchecopar A., Bergerat F., Vergely P., Arthaud F., Laurent P. (2012). Inferring stress from faulting: From early concepts to inverse methods, *Tectonophysics*, 1206-1219, doi: 10.1016/j.tecto.2012.1002.1009.

Heidbach O., Barth A., Müller B., Reinecker J., Stephansson O., Tingay M., Zang, A. (2016). WSM quality ranking scheme, database description and analysis guidelines for stress indicator, *World Stress Map Technical Report* 16-01, GFZ German Research Centre for Geosciences. <http://doi.org/10.2312/wsm.2016.001>.

Hergert T. and Heidbach O. (2011). Geomechanical model of the Marmara Sea region -II. 3-D contemporary background stress field, *Geophys. J. Int.*, doi:10.1111/j.1365-1246X.2011.04992.x, 01090-01102.

Zoback M.L. (1992). First and second order patterns of stress in the lithosphere: The World Stress Map Project, *J. Geophys. Res.*, **97**(B8), 11703-11728.

Table - Stress regime assignment for earthquake focal mechanism data (modified from Zoback 1992; see also [World Stress Map project guidelines](#), Table 3.5-1).

P/S1-axis	B/S2-axis	T/S3-axis	Stress regime	S _{Hmax} orientation	S _{Hmin} orientation
$pl \geq 52^\circ$		$pl \leq 35^\circ$	NF	azimuth of B-axis	azimuth of T-axis
$40^\circ \leq pl < 52^\circ$		$pl \leq 20^\circ$	NS	azimuth of T-axis + 90°	azimuth of T-axis
$pl < 40^\circ$	$pl \geq 45^\circ$	$pl \leq 20^\circ$	SS	azimuth of T-axis + 90°	azimuth of T-axis
$pl \leq 20^\circ$	$pl \geq 45^\circ$	$pl < 40^\circ$	SS	azimuth of P-axis	azimuth of P-axis + 90°
$pl \leq 20^\circ$		$40^\circ \leq pl < 52^\circ$	TS	azimuth of P-axis	azimuth of P-axis + 90°
$pl \leq 35^\circ$		$pl \geq 52^\circ$	TF	azimuth of P-axis	azimuth of B-axis

P, B and T axes; pl: plunge of P, B and T-axes; S1, S2 and S3 correspond to sigma1, sigma2 and sigma3 axes; NF: normal faulting; SS: strike-slip faulting; TF: thrust faulting; NS: normal/strike faulting; TS: thrust/strike faulting.