



Generic earthquakes

Vaclav Vavrycuk

Institute of Geophysics, Academy of Sciences of the Czech Republic, Prague 4, Czech Republic (vv@ig.cas.cz, 00420 2 71761549)

Generic earthquakes are the earthquakes that occur on optimally oriented fault planes with respect to the tectonic stress regime. They display two different focal mechanisms and are fundamental characteristics of each seismically active region. Theoretical stability analysis of differently oriented fault planes under a given stress reveals that the focal mechanisms connected to unstable fault planes are close to those of the generic earthquakes. The P/T axes form clusters with a typical two-wing or butterfly pattern. This pattern is particularly visible when constructing the failure curves defined as a projection of the Mohr-Coulomb failure line in the Mohr's diagram onto the focal sphere. The position, shape and size of the failure curves depend on stress orientation, shape ratio, friction and on size of an instability area in the Mohr's diagram.

The theoretical analysis is validated on accurately determined focal mechanisms of 99 micro-earthquakes that occurred during the 2008 earthquake swarm in the West Bohemia/Vogtland region. The distribution of P/T axes reveals the butterfly wing pattern predicted in numerical modelling. The activated fault planes concentrate in the area of validity of the Mohr-Coulomb failure criterion. The average friction of faults is 0.5 and corresponds to the deviation 32° of the generic faults from the σ_1 axis. The left-lateral strike-slip generic fault was the most active fault during the swarm. It has little geological evidence but it is mapped by clustering of hypocentres. The right-lateral strike-slip generic fault was less active but it is geologically well manifested on the Earth's surface.