Geophysical Research Abstracts, Vol. 8, 09808, 2006
SRef-ID: 1607-7962/gra/EGU06-A-09808
© European Geosciences Union 2006

Energy transfer processes that reach deep into the solid Earth: amplification of stresses that might trigger earthquakes

Friedemann T. Freund (1), Bobby W.S. Lau (1), Akihiro Takeuchi (2), and Gerald Duma (3)

(1) Department of Physics, San Jose State University, NASA Ames Research Center, MS 242-4, Moffett Field, CA 94035-1000, USA, ffreund@mail.arc.nasa.gov, (2) Dept. of Chemistry, Niigata University, Ikarashi-ninocho, Niigata 950-2181, Japan, (3) Central Institute for Meteorology and Geodynamics, Department of Geophysics, Hohe Warte 38, A-1190 Vienna, Austria

The flow of energy from the Sun to the Earth gives rise to large ionospheric current vortices above the sun-lit northern and southern hemispheres, which induce powerful currents into the Earth's crust and upper mantle. As Duma and Ruzhin [Natural Hazards and Earth System Sci. 3, 171-177, 2003] have pointed out these induced currents generate a torque which may play a role in triggering earthquakes. Freund et al. [Phys. Chem. Earth to be publ. 2006] have recently shown that stress activates dormant electronic charge carriers in igneous rocks, thereby increasing their electrical conductivity manyfold. Increased conductivity of the rocks, however, will lead to a better coupling to the ionospheric current vortices. We can therefore postulate a positive feedback comprised of the following steps: (i) enhanced coupling to the ionospheric current vortices increases the magnitude of the induced telluric currents and, hence, their torque; (ii) the higher torque increases the stresses acting on the rocks, which in turn leads to a higher conductivity of the rocks, and (iii) higher conductivity further increases the coupling to the ionospheric currents and, hence, the torque. Such a positive feedback suggests that the Earth's crust responds dynamically to the flow of energy from the Sun reaching deep into the solid Earth. It may also provide an explanation why ionospheric currents seem to trigger earthquakes. (also see R. Kessel et al. in session SM11 "Sun-Earth Connection Triggers Earthquakes").