MECHANISM OF VORTEX GRAVITY/DENSITY OSCILLATION

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An analysis of earthquake data for all convergent margins by Smoot in the Sept.(#4), 1997 issue of New Concepts in Global Tectonics hypothesizes the upper mantle composition between the depths of 80-150 km, may be up to 50% eclogite, a metamorphic high-pressure equivalent of basalt which contains pyroxene and garnet (Ehlers and Blatt, 1982). Wysession (1995) layers earthquake regimes at phase change discontinuities at 450 km, where olivine, a major constituent of basalt, changes to spinel a denser phase of olivine, and another at 650 km, where spinel undergoes a phase change. Less than 1% of earthquakes occurring at convergent margins occur along the 450 km boundary and at the 650 km boundary there is less than 2%. The lithosphere is largely uncoupled below 40 km depth within the asthenosphere where the first phase change is from basalt to eclogite (Smoot, 1997).

Convergent margins or trenches form from deep, denser mantle geostreams flowing counter to lighter upper asthenosphere geostreams, much the same way cooler more saline counter currents run beneath the

Kurushio and Gulf Stream in ocean dynamics. Vortices transfer minerals to and from asthenosphere and mantle geostreams by heat and density driven convection and generally occur along areas with large momentum changes such as geostream divergence/convergence zones and island arcs.

Density oscillations of a mineral slurry associated with up to three phase changes of mineral suites within a vortex seem highly probable especially in conjunction with up to three orders of magnitude variation of viscosity of the lower mantle proposed. These phase changes should be excited during tectonic fronts, especially within a vortex. By definition a tectonic vortex is considered a conduit between mantle and asthenosphere. During an increased seismic event associated with El Ninos, magmas within the vortex phase shift as pressure is released by extrusion through the asthenosphere and lithosphere during magma outpourings along the East Pacific Rise. This expansion decreases density as mineral lattice structures shift phase, which reduces the gravitational attraction by microgals within the region of the vortices and geostreams. The slight weakening of the gravity field is translated to the atmosphere as a pressure drop from expansion or decreasing density. Thus it is teleconnected from tectonic vortex not only to the surface, but also through geostreams to other vortices across basin near Indonesia, explaining the mechanism of the Southern Oscillation controlling El Nino.

CONCLUSIONS

This hypothesis also goes a long way in explaining Milankovitch series correlation with climatic shifts. Orbital changes of the earth which shift the distance from the sun are probably not by themselves enough to invoke the observed temperature changes recorded in climate proxies, but changes in G could invoke a weakening or strengthening of gravitational teleconnection between tectonic vortices thus altering weather pattern in unforeseen ways compared to modern day circulation patterns.

Leading researchers on the El Nino phenomena disagree about the causes of global warming. Some argue that man made gases are linked to global warming through the greenhouse effect (which traps solar heat in the troposphere) and the increased frequency of El Ninos (during the past 15 years El Ninos have occurred in the winters of 1982-83, 1986-87, 1991-92, 1994 and 1997). Others argue that the earth may be naturally warming regardless of man made effects, as historical climate records indicate happened periodically in the past. Still others believe, this may be a temporary warming during a longer cooling trend. Although modeling efforts have met with some success in simulating past results using various climate indicators and precursors to El Ninos are fairly well understood, without concrete evidence and sound theory predictions for long range climate change will still be only opinions.

The creation of a global array of absolute gravity stations located within the Global Oscillation System (GOS) would supply researchers with the concrete information needed to ground-truth satellite altimetry data and determine coefficients of surge to be incorporated into earth-ocean-atmosphere coupled models (Leybourne, 1997) and form sound predictions. This information would map geoid undulations and predict their global trends not only for climate modeling, but for earthquake prediction, coupling of the magnetosphere and sunspot activity, and to discern the expansion/contraction phase of the planet (Smirnoff, 1992; Wezel, 1992). Expansion seems the likely culprit of global warming trends as recent planetary alignments which expands orbits and decreases local planetary gravity strength, coincidently coincides with increase frequencies of El Nino and current warming trends. The strength, magnitude and duration of these expansion/ contraction phases hold the answers which climate researchers have been recently asking. To know the answers with calculations of real numbers, small scale gravity fluctuations within the GOS must be measured and ground truthed to satellite information, whereby true predictive powers will be realized.

The resolution of the gravity field needed for vortex analysis requires having a field that spans the transition from ocean to continents, thus the requirement that data be obtained using non-altimetric techniques with absolute superconducting gravity meters. The first should go near Darwin, Australia as a pilot study and if results are promising establish stations within Easter Island vortex to develop coefficients for the SOI. Then stations within other vortices of the GOS with the most predictive power such as the NOA between Iceland and the Azores could be established.

COMBINED REFERENCES FOR THE ABOVE TWO LEYBOURNE ARTICLES

Ehlers, E.G., and Blatt, H., 1982. Petrology: Igneous, Sedimentary, and Metamorphic. San Francisco. W.H. Freeman and Company. 732 p.

Karato, S., 1981. Rheology of the lower mantle. *Phys. Earth. Planet. Int., v.* 24, p. 1-14.

Leybourne, B.A., 1996. A tectonic forcing function for climate modeling. Proceedings of 1996 Western Pacific Geophysics Meeting, Brisbane, Aust., *EOS Trans.* AGU, Paper # A42A-10. 77 (22):W8.

Leybourne, B.A., 1997. Earth-Ocean-Atmosphere coupled model based on gravitational teleconnection. Proc. Ann. Meet. NOAA Climate Monitoring Diag. Lab. Boulder Co. March 5-6, p. 23. Also: Proc. 1997 Joint Assemb. IAMAS-IAPSO. Melbourne, Australia, July 1-9. JPM9-1.

Meyerhoff, A.A., Taner, I., Morris, A.E.L., Martin, B.D., Agocs, W.B. and Meyerhoff, H.A., 1992. Surge tectonics: a new hypothesis of Earth dynamics, In: S. Chatterjee and N. Hotton III (eds) New Concepts in Global Tectonics (Texas Tech University Press, Lubbock), p. 309-409.

Smirnoff, L.S., 1992. The contracting-expanding Earth and the binary system of megacyclicity. In: New Concepts in Global Tectonics. Eds., S. Chatterjee and N. Hotton, III., p. 441-449. Lubbock. Texas Tech University Press.

Smoot, N.C., 1997. Earthquakes at convergent margins. *New Concepts in Global Tectonics Newsletter*, no. 4, p. 10-12.

Walker, Daniel A., 1995. More evidence indicates link between El Ninos and seismicity. *EOS Trans*. AGU., 76 (33).

Walker, Daniel A., 1988. Seismicity of the East Pacific: correlations with the Southern Oscillation Index? *EOS Trans*., AGU., 69: 857.

Warburton, R.J., and Goodkind, J.M., 1977. The influence of barometric-pressure variations on gravity. *J. R. Astr. Soc*., v. 48, p. 281-292.

Wezel, F.-C., 1992. Global change: shear-dominated geotectonics modulated by rhythmic Earth pulsations. In: New Concepts in Global Tectonics. eds. S. Chatterjee and N. Hotton, III. p. 421-439. Lubbock: Texas Tech University Press.

Wysession, M., 1995. The inner workings of the Earth. *American Scientist*, v. 83, p. 134-147.

Notes: B. A. Leybourne is an employee of the Naval Oceanographic Office. However, this paper was prepared in his personal time. As such, the opinions and assertions contained herein are those of the Author, and are not to be considered as official statements of the US Department of the Navy.