GRAVITY DATA: EVIDENCE OF DOWNWELLING ON RIDGE

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Gravity studies undertaken in conjunction with a wide-angle seismic refraction survey during the Mantle Electromagnetic and Tomography (MELT) experiment find evidence for denser, colder mantle near a small Over-lapping Spreading Center (OSC) on the East Pacific Rise (EPR) at approximately 15° 55' S (Forsyth, et al., 1998). The direct quote from page 1217 is, "Wide-angle seismic refraction data recorded on secondary Ocean Bottom Seismic (OBS) array show that crustal thickness and structure

near this small OSC is normal. Therefore, the gravity anomaly probably is caused by denser and perhaps colder mantle near the OSC. P and S wave arrivals from teleseismic earthquakes are earlier along the secondary array than at comparable distances from the axis in the primary array, consistent with lower temperatures or lower melt fractions near the OSC. Finally, Rayleigh wave phase velocities show a pronounced, along-axis increase beginning in the vicinity of the OSC, suggesting that melt concentrations are lower beneath the OSC and northward."

This evidence is contrary to upwelling mantle under a ridge, which should be hotter and less dense, characteristics of a buoyant mantle. No attempt is made by investigators to explain this contrary piece of evidence or incorporate it into any modeling efforts.

The data is basically reported, but ignored. This is a reminder of the humorous adage field data collectors sometimes use in reference to in-house modelers, in that "if the data doesn't fit the model something must be wrong with the data." Of course in this case nothing is wrong with the data, it is irrefutable, the mantle is denser under the OSC. How could mantle possibly downwell under the ridge, especially in the vicinity of an OSC where all plate tectonic models predict mantle upwelling? The answer is found with a surge tectonic interpretation of converging mantle flow along axis under a pressurized ridge. The ridge pressure forces denser mantle downward and volatile magmas upward in a counter-flow pattern very similar to atmospheric dynamics.

FORSYTH, D.W., SCHEIRER, D. S., WEBB, S. C., DORMAN, L. M., ORCUTT, J. A., HARDING, A. J., BLACKMAM, D. K., DETRICK, R. S., SHEN, Y., WOLFE, C. J., CANALES, J. P., TOOMEY, D. R., SHEEHAN, A. F., SOLOMON, S. C., and WILCOCK, W. S. D., 1998. Imaging the deep seismic structure beneath a mid-ocean ridge: The MELT experiment. *Science*, v. 280, p. 1215-1217.