

## Low Secular Variation in the Pacific

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There are many hints that the temperature of the lower mantle affects core convection and the geomagnetic field. One of these is the lack of secular variation throughout the Pacific sector of the core-mantle boundary during the last 500 years of direct observation. It is difficult to explain permanent blocking of secular change from this hemisphere using lateral variations of core-mantle boundary temperature inferred from seismic velocities in the mantle because the latter are roughly symmetrical about the Pacific rim, with a fast ring beneath the subduction zones and slow regions in the central Pacific and from Africa through the Atlantic. Such a geometry could lock the core flow or produce symmetrical thermal winds, but would not be expected to permanently eliminate secular variation from just one of the two hemispheres. Thermal wind calculations confirm this view, as does a recent geodynamo simulation that produces a time average resembling the paleomagnetic time average but never a snapshot of the field that looks like the present geomagnetic field. However, simple convection calculations do show rolls that drift through the Atlantic region but are suppressed in the Pacific. This is because the lower mantle seismic velocity pattern is not perfectly symmetric: the Pacific slow anomaly is extended longitudinally more than the one in the Atlantic and is capable of completely suppressing convection in the upper layers of the core.

Data from C14-dated lava flows on Hawaii show that low secular variation has persisted there for at least 5 kyr and probably 10 kyr. An excursion was recorded at 20 ka, but in the last 5000 years the magnetic direction has changed by significantly less, and much more slowly, than it has throughout most of the Atlantic region in the last 200 years. This suggests Hawaiian secular variation may reflect a different physical process from that in the Atlantic - a process with a longer inherent time scale. For example, the Atlantic may be dominated by MAC waves or westward drift of small scale magnetic features, while the Pacific may see drift of convection rolls or dynamo waves. In this talk I shall review the available data and examine possible sources for the weak Hawaiian secular variation, including whether it can be

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**explained entirely by magnetic changes outside the "Pacific" sector of the core-mantle boundary.**