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Title: NEW TESTS OF THE FİXED HOTSPOT APPROXİMATİON AND İMPLİCATİONS FOR CİRCUM-PACİFİC PLATE RECONSTRUCTİONS AND TECTONİCS
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Abstract: We present new methods for estimating uncertainties in plate reconstructions relative to the hotspots and new tests of the fixed hotspot approximation. We find no significant motion between Pacific hotspots, on the one hand, and Indo-Atlantic hotspots, on the other, for the past ~50 Myr, but large and significant apparent motion before 50 Ma. Whether this motion is truly due to motion between hotspots or alternatively due to flaws in the global plate motion circuit can be tested with paleomagnetic data. These tests give results consistent with the fixed hotspot approximation and indicate significant misfits when a relative plate motion circuit through Antarctica is employed for times before 50 Ma. If all the misfit to the global plate motion circuit is due to motion between East and West Antarctica, then that motion is 800 ± 500 km near the Ross Sea Embayment and progressively less along the Trans-Antarctic Mountains toward the Weddell Sea.

Further paleomagnetic tests of the fixed hotspot approximation can be made. Cenozoic and Cretaceous paleomagnetic data from the Pacific plate, along with reconstructions of the Pacific plate relative to the hotspots, can be used to estimate an apparent polar wander (APW) path of Pacific hotspots. An APW path of Indo-Atlantic hotspots can be similarly estimated (e.g. Besse & Courtillot 2002). If both paths diverge in similar ways from the

north pole of the hotspot reference frame, it would indicate that the hotspots have moved in unison relative to the spin axis, which may be attributed to true polar wander. If the two paths diverge from one another, motion between Pacific hotspots and Indo-Atlantic hotspots would be indicated. The general agreement of the two paths shows that the former is more important than the latter. The data require little or no motion between groups of hotspots, but up to ~10 mm/yr of motion is allowed within uncertainties.

The results disagree, in particular, with the extreme interpretation of Tarduno et al. [2003], who assume (1) that motion of the Indo-Atlantic hotspots relative to the spin axis can be ignored during the past 85 Myr, and (2) that the Hawaiian hotspot has been fixed relative to the spin axis since the age of the Hawaiian-Emperor bend. Our results indicate that both of their assumptions are false.

Thus, for times older than the bend in the Hawaiian-Emperor chain (~48 Ma), circum-Pacific plate reconstructions are best estimated by assuming fixed hotspots. Some specific implications will be discussed.