

Abstract ID: 227

Title: GLOBAL PLATE CIRCUIT RESULTS FOR WESTERN NORTH AMERICA: PROGRESS AND PROBLEMS

Student: No

Topic: Tectonics

Medium: Invited Oral Presentation

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Keywords: plate tectonics, plate reconstruction, global plate circuit, Farallon plate, Pacific plate

Abstract: Reconstructions of the Pacific, Farallon, and Kula plates with respect to North America have long been used to address a variety of tectonic issues: direction and rates of convergence through time at subduction zones, the past locations of oceanic plate features such as fracture zones and aseismic ridges relative to the North America plate, the locations of past plate boundaries entering the subduction zone, and the amount of Pacific-North America plate boundary motion that occurred during specific past time intervals. These calculations depend on reconstructing the Pacific plate back to the Antarctica plate, Antarctica back to Africa, and Africa back to North America. Newly published reconstructions based on better data in these individual ocean basins allow an overall re-assessment of the quality and reliability of the Pacific-North America reconstructions. Cande et al. (Nature, 2000) showed that Antarctica was 2 plates prior to ca 28 Ma, with a seafloor spreading center acting as an additional boundary active within this plate circuit. Because the E. Ant.- W. Ant spreading system was relatively short, its rotations have large uncertainties, which are somewhat reduced by constraints through the E. Ant-W. Ant.-Australia plate circuit back to about 40 Ma. There have been recent updates to the Africa-Antarctica rotations, for two reasons. Africa has been two separate plates (Nubia and Somalia) since slightly before 11 Ma, requiring the use of Nubia-E Antarctica data for determination of this part of the plate circuit for these very young times (Royer et al., 2006 Geology). Reconstructions of Africa-Antarctica for times from 96 Ma to 39 Ma have also been considerably revised based on improved satellite gravity observations which show highly curved fracture zones and a very complex spreading history of the Southwest Indian Ridge from 76-52 Ma (Bernard et al. GJI 2005). I combine these with other published reconstructions from the Atlantic and Pacific oceans to give a set of updated reconstructions for Pacific-North America for selected times between 15 and 70 Ma, and compare these to previously published results. The main assumptions lie in two areas. First, Africa-Antarctica rotations using the most recent observations of fracture zone geometries still have not been published for times between chrons 5 (11 Ma) and 18 (39 Ma), so I use interpolations that are consistent with the fracture zone geometries seen in the satellite gravity data. Second, assumptions have to be made regarding the tectonic integrity of the Antarctica plate prior to 40 Ma.

