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Model Presentation for Displacements Between Western North America, Eastern Eurasia, and Adjacent Oceanic Plates for the Past 180 Million Years

A model is presented for the displacements between western North America, eastern Eurasia, and adjacent oceanic plates (Pacific, Farallon, and Kula) for the past 180 million years. The model is based on the assumption that the hot spots in the Atlantic region have remained fixed relative to the hot spots in the Pacific basin (although not necessarily relative to the spin axis) and uses a new determination for relative motion between the Kula, Pacific, and Farallon plates. Reconstructions of the major elements of the Pacific basin are derived.

The results indicate that between 180 and 53 m.y.B.P. the Kula plate moved in a general south to north motion through the Pacific basin, implying rapid subduction beneath Eurasia and right lateral oblique subduction with respect to North America. In contrast, the Farallon plate swept from west to east across the basin and allowed for rapid subduction beneath North America, with a left lateral oblique component and predominantly left lateral strike slip in Eurasia. The motion of the Farallon plate relative to North America after 53 m.y.B.P. changed to right lateral oblique subduction. The oceanic-continental linear velocities are given as diagrams showing at selected points around the Pacific margin the azimuth and speed of the relative motion as a function of time.

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Geology of Offshore New Ireland Basin in Northern Papua, New Guinea

The 62-mi (100 km) wide New Ireland basin extends northwestward from southwest of Bougainville to north of the Admiralty Islands. We have studied some 5,000 mi (8,000 km) of geophysical data from the basin north of Bougainville to west of Manus Island. The data were gathered by CCOP/SOPAC, the Australian Bureau of Mineral Resources, Gulf Oil Co., and a French Consortium.

The part of the New Ireland basin studied here is a fore-arc basin which contains Neogene sediments, and lies between two ridges formed as part of an old north-facing arc-trench system in the Oligocene and Miocene. The southern ridge is the old volcanic axis and consists of volcanic rocks forming New Ireland, New Hannover, and the Admiralty Islands. The northern ridge appears to be an accretionary prism which forms the southern flank of the West Melanesian Trench uplifted during its active phase in Oligocene-Miocene times.

The central New Ireland basin is generally a simple, little-deformed synclinal basin, with as much as 3 mi (5 km) of well stratified sediment along its axis. The basin fill contains several seismic discontinuities and unconformities and probably consists of Miocene-Pliocene-Quaternary volcaniclastic and carbonate sediments. The older sequences are lateral equivalents of sediments outcropping on New Ireland and other islands, but younger flat-lying carbonate oozes and turbidites are ponded in the basin. North of New Ireland a number of volcanic islands consisting largely of pyroclastic rocks and lavas have cut through the basin.

Northeast of Manus Island, folding and faulting in the basin increase markedly, with faults forming large scarps on the sea floor. Volcanism may have had a more active role in sedimentation, reducing seismic penetration in the sediments in areas of extensive flows. North of Manus Island, young deformation and volcanism have replaced the flat-lying strata common to the central basins area, obliterating further traces of the deeper basin, if it exists.

The thickness of the sedimentary sequence, and the possible presence of some carbonate buildups at depth in the central basin, indicates that the basin may have some petroleum potential. Major unknowns are source rock potential, and the thermal gradient history in the basin. Carbonate buildups are the most likely reservoir rocks for any petroleum generated in the basin.

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Paleomagnetic Evidence for Large Microplate Rotations in the Southwest Pacific

The Bismark Archipelago of northern Papua New Guinea shows evidence of an Eocene to Holocene island-arc system. Originally north-facing, the arc reversed in the late Miocene, and was partly disrupted by marginal basin sea-floor spreading in the Bismark basin from late Pliocene to Recent.

Paleomagnetic data has been collected and analyzed from over 200 sites throughout the archipelago. Principal component analysis has shown moderate angular motion of New Britain, associated with back-arc spreading. Large angular rotation of island-arc microplates has been detected from earlier epochs. These microplates appear not to be disrupted by internal block rotations, but appear amenable to conventional plate tectonic analysis techniques.

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Burial and Thermal Geohistory Analysis at Passive Continental Margins

Burial geohistory analysis involves progressive stripping of sediment bodies defined by well chronostratigraphic horizons. Underlying section, to basement, is corrected for compaction effects and paleo-water-depth, and plotted as a "paleowell" section in a time-depth framework. The procedure is amenable to computer processing.

Given a tectonic model for basin subsidence, a theoretical paleobent flow function can be applied to the calculation of integrated thermal and maturation history of the well section as a function time and depth. The procedure may be extended to cross sections providing migration direction relative to trap formation. Our examples, from the southern and southwestern margins of Australia, illustrate these applications, and provide constraints to passive margin formation processes.

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Petroleum Exploration Strategies in Developing Countries

The petroleum industry strategy of most developing countries is not clearly defined. Strategies can differ significantly, because of differences in potential, willingness to accept risk, distance to markets, etc. from country to country. Further differences result from the degree to which governments are knowledgeable as to the significance of their own data. It can be said that the