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Kinematic and dynamic implications of terrane transfer, a study of Baja California, Mexico

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Diffuse plate boundaries are often composed of several microplates that behave as rigid blocks and move with respect to each other. One example is the plate boundary zone between North America and Pacific plate, with the Baja California peninsula, among others, being a microplate located in between. Normally this microplate is considered to be part of the Pacific plate, ignoring possible motion between Pacific and Baja California and causing a discrepancy between geologic and geodetic estimates of the North America - Pacific plate motion. We use GPS geodetic measurements to study the Pacific plate rigidity and for testing for residual motion between Pacific plate and Baja California. Computation of the Baja California microplate motion in a North American reference frame gives the current opening rate of the Gulf of California. We compare this motion to our estimate of Pacific-North America motion and to geologic estimates from different models to evaluate possible biases in relative plate motions. We present a finite-element-analysis on the dynamic implications of the Pacific-North American plate boundary kinematic and geometry. In particular the effects of the Baja California microplate motion into North America and the restraining bend (Transverse Range) on the development of the Western Baja California shear zone and the Eastern California shear zone.