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A review of the tectonic evolution of the Northern Pacific and adjacent Cordilleran Orogen

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Numerous plate kinematic models for the North Pacific realm have been developed since the advent of plate tectonics in the early seventies (e.g Atwater (1970), Mammerickx and Sharman (1988)). Although published kinematic models are consistent with the broad scale features of the North Pacific, the link between plate motions and the evolution of the North American Cordillera remains poorly understood. Part of the problem lies in conflicting interpretations of geological versus paleomagnetic data sets, with the result being a lack of consensus regarding: the paleolocation of key geological units; the paleogeography of terrane formation and amalgamation; the motion, boundaries and even existence of oceanic plates; and the character (e.g. trend of subduction) and position of plate boundaries within the northern Pacific basin.
Remnants of the Farallon and Kula plates, and some short-lived microplates, demonstrate the complicated tectonic evolution of the oceanic realm west of the North American margin (e.g. Rea and Dixon (1983); McCrory and Wilson (2013); Shephard et al. (2013)). The creation and destruction of major tectonic plates and microplates has presumably left a record in the Cordilleran orogen of western North America. However, working backward from the geological relationships to plate reconstructions remains difficult. Here we investigate the relationship between the plate motions of the Pacific Ocean and the terrane movements in the North American Cordillera by revising the marine magnetic and gravity anomalies of the northern Pacific. In particular, we reevaluate plate boundaries at times of major changes in plate geometry of the Pacific, Kula, Chinook and Farallon plates from C34n onward. Our focus is also on the plate geometries of the Resurrection, Eshamy and Siletz-Crescent plates during the time between anomaly C26 and C12, and the links between plate interactions and on-shore tectonic events recorded in the geological record of Vancouver Island, including the accretion of the Pacific Rim and Crescent terranes to Wrangellia between C25 and C18.

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