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A Kinematic Reconstruction of Jurassic ocean spreading from the ophiolites of California, the western U.S. using structural geology and paleomagnetism.

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The western edge of the North America plate contains geological records that formed during the long-lived convergence between plates of the Panthalassa Ocean and North America. The geology of different segments along western North America indicates different polarities (eastward and westward) for subducted slabs and thereby various tectonic histories and settings. The western United States (together with Mexico) plays a key role in this debate, many geologic interpretations assume continuous eastward subduction in contrast to observations within proximal geologic segments and tomographic images of the lower mantle below North America and the eastern Pacific Ocean which suggest a more complex subduction history. In this study, we aim to evaluate the plate tectonic setting in which the Jurassic ophiolites of California formed. Geochemical data from these ophiolites suggest that they formed above a nascent intra-oceanic or continental margin subduction zone. We first developed a kinematic reconstruction of the western US geology back to the Jurassic based on published structural geological data. Importantly, we update the reconstruction of the various branches of the San Andreas fault system to determine the relative position of the ophiolite fragments and adopt a previous restoration of Basin and Range extension which we expand northward towards Washington state. We then reconstruct North American margin deformation associated with Cretaceous to Paleogene shortening and strike-slip faulting. We find no clear candidates in the geological record that may have accommodated major subduction between the Jurassic ophiolite belt and the North American margin and consequently concur with the school of thought that considers that the ophiolite belt, as well as the underlying subduction-accretionary Franciscan Complex, likely formed in the North American fore-arc. We collected paleomagnetic data to reconstruct the spreading direction of the Jurassic Californian ophiolites, by providing new paleomagnetic data from sheeted dykes of the Josephine and Mt. Diablo Ophiolites. These suggest a NE-SW paleo-ridge orientation, oblique to the North American margin which may be explained by partitioning of a dextral component of subduction obliquity relative to North America. We used this spreading direction in combination with published ages of the ophiolites and our restoration of the relative position of these ophiolites prior to post-Jurassic deformation to construct a ridge-transform system at which the Jurassic ophiolites accreted. The

results will be used to evaluate which parts of the subduction systems that existed in the eastern Panthalassa Ocean may reside in the western US, and which parts may be better sought in the northern Canadian Segment or/and in the southern Caribbean region.