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The role of inherited rifted lithospheric structure on middle Cretaceous orogeny and Tertiary-present extension, North American Cordillera

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While the Eastern North American margin exhibits evidence of the rifted margin on subsequent deformation, this record is more obscure along the western Cordilleran margin. We recently conducted paleomagnetic and geochronologic analyses along the abrupt, boundary between cratonic North American and accreted terranes in Idaho. In this location, the abrupt boundary is designated by geochemical gradients (Sr, Nd, O) that are spatially coincident with major, regional-scale (western Idaho, Ahsahka) shear zones. The boundary is oriented NS in central-southern Idaho, and then abruptly changes 90° near Orofino, ID, to become EW oriented. Recent paleomagnetic data indicates that ∼30° clockwise rotation of the entire margin occurred post ∼85 Ma. Reconstruction of this rotation orients the margins at ∼060 (transform) and ∼330 (extensional), parallel to the inferred orientation of the Precambrian rifted margin elsewhere in the US Cordillera. The geometry would cause a structural syntaxis during northward (right-lateral) translation of accreted terranes. Northward terrane motion at ∼100 Ma result in dextral transpressional kinematics along the 330-oriented western Idaho shear zone and contractional deformation in the EW-oriented Ahsahka shear zone (Cretaceous orientations) in this syntaxis. This middle Cretaceous orogeny occurs at the other major structural syntaxis, south of the Sierra Nevada batholith in southeastern California, as a result of a ∼100 Ma worldwide plate re-organization. The Idaho syntaxis also acts as a fulcrum for Tertiary-present rotation, explaining the current displacement field in the northern US Cordillera. Overall, the study indicates that the inherited Precambrian rifted margin of the North American Cordillera exhibited a significant influence on subsequent deformation, despite overprinting of abundant magmatism, margin parallel terrane translation, and subsequent rotation.