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Title: TECTONIC EVOLUTION OF THE NORTH AMERICAN EXTENSIONAL PROVINCES

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Abstract: North American extensional provinces run ~3500 km from Canada to Mexico and are up to ~800 km wide. Early extension was focused in metamorphic core complexes (MCCs) that formed in a back-arc setting in SW Canada and NW US in Eocene time, and migrated south into east-central Nevada by Oligocene. In the south, extension began similarly in a belt of back-arc MCCs from NW Mexico to Arizona in latest Oligocene or early Miocene time, but brittle faulting of similar age, locally accommodating large-magnitude extension, began over a much wider area over much of central Mexico and the Rio Grande Rift. In general, extension and magmatism overlapped spatially, with magmatism beginning a few m.y. before extension in most regions, and evolving to include large-volume caldera-forming eruptions.

At ~ 29 Ma the East Pacific Rise first contacted North America and the dextral San Andreas fault system began to evolve: it grew fairly smoothly northward but lengthened episodically southward by death of stretches of the East Pacific Rise. By ~20-17 Ma, this new tectonic regime affected much of the active extensional province, and much of the Basin and Range began to extend in a wide-rift mode. Magmatism generally became more bimodal and alkalic, although arc-type magmatism continued in western areas, generally shutting off in a northward sweep that has arrived at the southern active stratovolcanoes of California. The last ridge abandonment occurred at ~12 Ma west of the southern ~2/3 of Baja California.

From ~15 Ma to now, fastest extensional strain shifted west into the present Gulf of California extensional province and Walker Lane, where regional NW-SE extension is accommodated by complex strain partitioning among normal and strike-slip faults, vertical-axis rotations and, in the Gulf of California-Salton Trough, by formation of new crust. Locally, MCCs and low-angle normal faults continued to form in this regime, commonly at extensional stepovers between dextral faults. In the Gulf, the continent had necked sufficiently to allow marine incursion by ~7-5.5 Ma, and new crust probably began to form within 1-2 m.y. In the southern Gulf, the new crust is typical magnetically lineated oceanic crust but in the northern Gulf and Salton Trough the new crust is ~18 km thick and composed of juvenile mafic lower crust overlain by intruded metasedmentary rocks that grade upward into sedimentary strata. Crustal necking, marine incursion, and

formation of new crust probably occurred in response to basal drag under the continental margin by Pacific-realm microplates that took on Pacific-North America motion as the East Pacific Rise died along their western margins. This, in turn, caused the San Andreas fault to jump east into the Salton Trough and for the dextral-shear component of Pacific North America motion to be concentrated in the Gulf of California.