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Slab tearing of the Nazca plate in the Central Andes and its interaction with the overriding plate

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Slab tearing in subducting plates is widely implicated in terms of the factors that control the evolution of the structural geology of the over-riding crust, here illustrated by interactions between the subducting Nazca plate and the overlying overthrust western continental margin of South America. We examine the different ways that structures above the bounding megathrusts are linked to the ripping and tearing of the subducting plate beneath, in particular focussed on the Andean orogeny at the Arica bend during the formation of the Bolivian orocline. We can create models for slab tearing by integrating seismotectonic analysis, seismic tomography, and morphotectonics. There are many features in the UU-P07 tomographic model that we cannot yet relate to the evolution of surface structure, for example, the gaps and tears beneath the Bolivian Orocline, or the separation of the detached slab we interpret as a paleo-segment of the Nazca plate, illustrating traces of an ancient subduction system. However, we can link the evolution of some surface structures to the growth of the giant kink of the Nazca slab that connects to the surface near the Arica bend. This may have driven strike-slip faulting with opposing sense-of-shear, northern south of the Bolivian Orocline. Megathrust rupture segments may be related to the polygonal kinked trace of the orogen, which is not at all a continuously curved arc. In this contribution, we relate the growth and accentuation of the Arica Bend to the evolution of the giant kink in the Nazca plate using a 4-D tectonic reconstruction.