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How to make a triple junction – new evidence for the assemblage of Gondwana along the Kaoko-Damara Belts, Namibia

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Triple junctions between mobile belts are common in present-day continents, and are usually formed as a results of the Wilson cycle, where older mobile belts between cratonic blocks are truncated, and partly replaced by the collision of a third craton. Less common are mobile belts where the branches of a triple junction are of approximately the same age. This kind of junction seems to occur in the assemblage of Gondwana. What is so far unclear, is why and how this kind of junctions can form. A particularly well exposed example in NW Namibia has been studied to answer this question.
The junction of the Kaoko, Damara and Gariep Belts formed by collision of the Congo-Angola, Rio de la Plata and Kalahari cratons. The precise sequence of events and extension of affected areas and how amalgamation of differently shaped cratons could proceed without gaps or overlaps is still a matter of debate. Detailed structural analysis in Neoproterozoic metaturbidites along the junction of the Kaoko and Damara belts has shed new light on this matter.

Early N-S stretching lineations and gently south dipping foliations, axial planar to north verging folds, with top-to-the-north shear sense indicators are found exclusively in the Damara belt, east of the line Vrede-Doros-Brandberg. These structures are of late Neoproterozoic age (~590 Ma) and formed in response to initial convergence of the Congo-Angola and Kalahari cratons. Subsequently, open to tight D2 folds and an associated steep foliation develop throughout the Kaoko and western Damara belts, overprinting the thrust-related D1 structures and forming the first foliation in the westernmost Damara and southern Kaoko belts. The D2 folds and foliations are mostly N-S trending, but wrap around the SW corner of the Kamanjab inlier. The kinematic signature of D2 structures indicates that they formed by approach of the Congo-Angola craton and coastal terranes NW of the studied area in the latest Neoproterozoic (570-545 Ma). In a third and newly discovered phase that we labelled D2a, NW-SE shortening graded into sinistral transpression with development of major N-S sinistral strike slip shear zones in the Kaoko and Dom Feliciano belts. This Cambrian phase was dated as 540-520 Ma. Massive intrusion of granite and syenite plutons, possibly triggered by the strike slip motion, accompanied this event that probably also reflects the main collision of the Congo-Angola and Kalahari cratons. All earlier D2 structures were reoriented and overprinted by a sinistral strike slip signature, while a new S2a NE-SW cleavage developed in the western Damara belt. Apparently, the present shape of the triple junction was formed at this stage through southward displacement of the coastal terrane and Rio de la Plata craton, closing or truncating the Damara belt to the west. Finally, low-grade NE-SW trending D3 folds

and kink bands, formed in the final consolidation of the triple junction after 520 Ma. The reconstructed sequence of events shows an alternation of N-S, E-W and strike-slip constrictional motion between the three cratons involved, creating up to five overprinting foliations in some outcrops. Our reconstruction of the development of this triple junction was only made possible by detailed field analyses of deformation structures in metapelites. Similar scenarios, involving a strike slip phase, may be responsible for the formation of other similar equal-age triple junctions in Gondwana and elsewhere.