The second half of plate tectonics: finding the last ~200 Ma of subducted lithosphere and incorporating it into plate reconstruction

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Precise plate-tectonic reconstruction of the Earth has been constrained largely by the seafloor magnetic-anomaly record of the present oceans formed during the dispersal of the last supercontinent since ~200 Ma. The corresponding world that was lost to subduction, which accounts for ~100% of the surface area of the Earth, has been only sketchily known. We have developed methodologies to map in 3D these subducted slabs of lithosphere in seismic tomography and to unfold them to the Earth surface, using them to constrain plate tectonic reconstructions. Slab edges are commonly formed at times of plate reorganization (for example bottom edges typically record initiation of subduction) such that unfolded slabs fit together in picture-puzzle fashion at times of reorganization, analogous to the fitting together of Africa and South America. Mapping to date suggests that a relatively complete and decipherable record of lithosphere subducted over the last ~200 Ma exists in the mantle today, providing a storehouse for new discoveries.

Figure 1. Tomographic section of East Asia showing subducted lithospheric slabs under East Asia

References