Reconstructing Greater India

Paleogeographic, kinematic, and geodynamic perspectives

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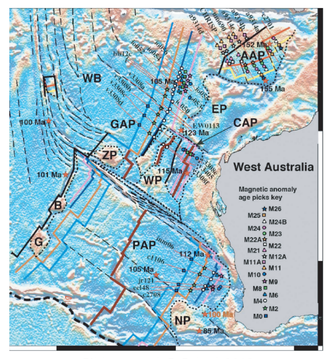
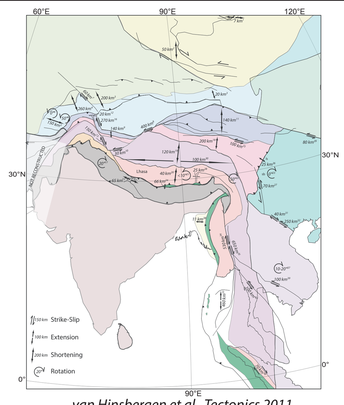
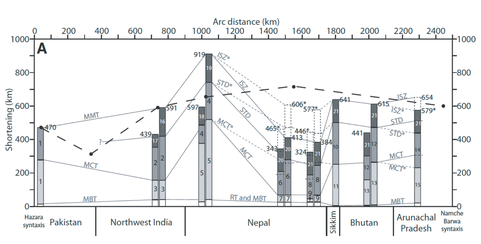
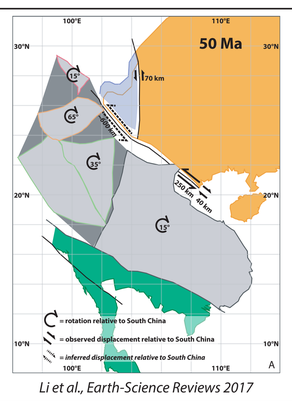
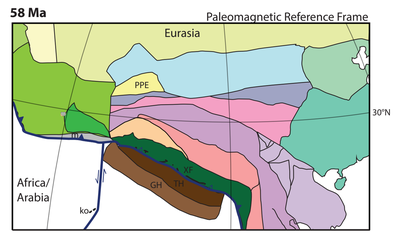
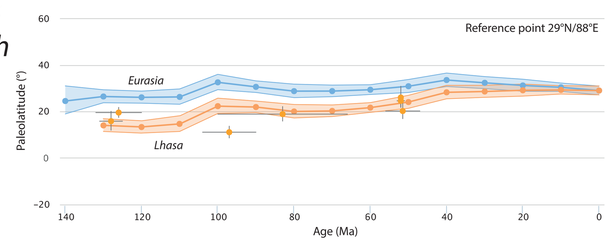
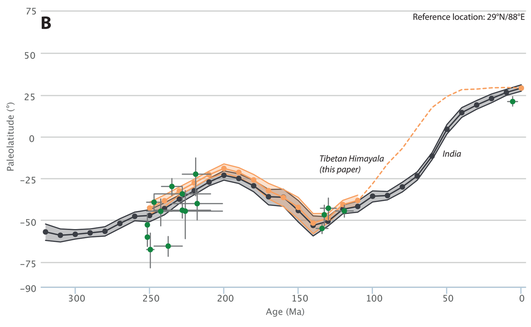
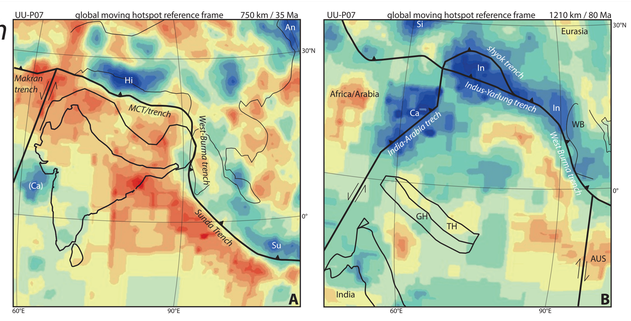
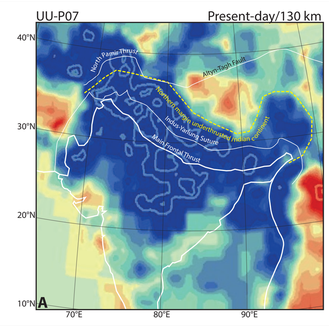
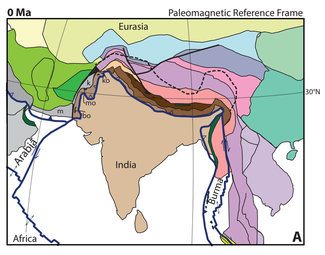
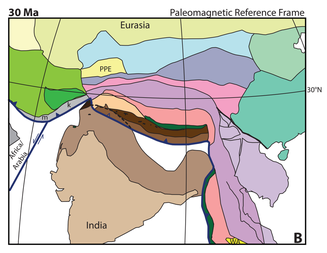
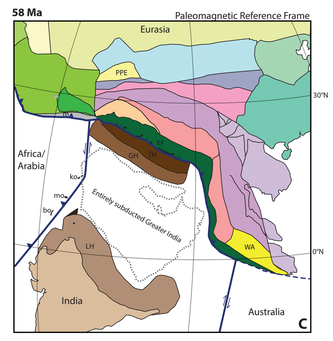
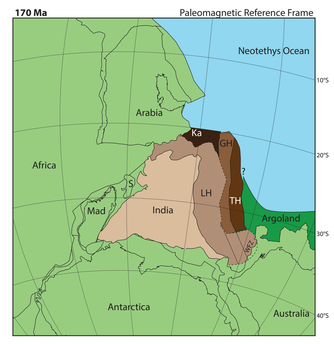
Kinematic reconstruction following a systematic protocol

	Greater Asia	Greater India
1) Marine magnetic anomalies	*No ocean floor within Asia*	*-India restores against Antarctica, Australia, Madagascar at ~130 Ma* *-Pre-130 Ma continental break-up occurred N of Wallaby Fracture zone* *Wallaby fracture zone restores ~1000 km north of modern MFT*  *Gibbons et al, G-Cubed, 2012*
2) Structural geological constraints (extension, strike-slip, shortening)	*At least some 600-1000 km of Cenozoic shortening in Tibet*  *van Hinsbergen et al., Tectonics 2011*	*Himalaya contains upper crustal relics of a minimum 800-1000 km continental crust that once existed North of the modern Main Frontal Thrust.*  *Long et al, GSA Builletin 2011*
3) Paleomagnetic rotations	*Indochina extrusion for large part accommodated by rotations; increases shortening in eastern Tibet to ~1200 km*  *Li et al., Earth-Science Reviews 2017*	*Reconstructing oroclinal bending restores the Tibetan Himalaya to a WNW-ESE trend at collision time* 
4) Paleomagnetic paleolatitudes	*Paleolatitudes consistent with shortening* 	*Paleolatitudes from Tethyan Himalaya are consistent with position in Early Cretaceous and Triassic within 1000 km from MFT.* 
5) Seismic tomographic constraints on slab location and dimension	*Predicted trench locations in mantle frame consistent with locations of major slabs* 	*-Up to ~1000 km of Indian continental lithosphere horizontally underlies Tibet* *-Has a sharp kink around 90°E, zone is ~400 km narrower to the west.* 
6) Reconciling a 1000 km wide Greater India and a 1000 km wide Greater Asia with a 58 Ma collision requires ~3000 km extension between southern Lhasa and continental India.	   

Geodynamic interpretation

-Collision at 58 Ma had no effect on plate convergence rate

-Subduction of TH continental lithosphere occurred within 2 Myr, followed by renewed GIB (wholesale) subduction

-Arrival of TH lithosphere at 660 km cloggs upper mantle and leads to slab advance and overturning during

-Slab overturning causes flat slab subduction below Tibet, causing Andean-style orogenesis and plateau rise

-Flat slab and plateau rise enhance friction and combined with increasing slab curvature cause India-Asia slowdown starting at 50 Ma