TECTONICS AND GEODYNAMICS OF THE EASTERN TETHYS AND NORTHERN GONDWANA SINCE THE JURASSIC

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The tectonic and geodynamic evolution of the eastern Tethys since the Jurassic drove the opening of important hydrocarbon-bearing basins and emplacement of ore deposits on the northern margins of Gondwana and the southern margins of Eurasia. However, the geological record of these events is obscured by multiple subduction and collision events in equatorial regions where weathering and inaccessible geography has led to poor data coverage. We synthesise constraints from the geology to create end-member global plate motion models with regional refinements for Southeast Asia and the New Guinea margin using the open-source community GPlates software. The plate reconstructions are applied as boundary conditions in forward numerical models of mantle convection using CitcomS, with present-day mantle structure predictions validated using P- and S-wave seismic tomography. This approach enables us to use the deep Earth as an additional constraint to help refine the chronology of major rifting, subduction and collisional episodes. Our results suggest that the Philippine Arc and the Sepik terrane rifted from the Gondwana margin through slab rollback and back-arc opening processes. The Sepik back-arc basin was consumed from the Late Cretaceous, with accretion of the Sepik composite terrane occurring sometime in the Eocene (~52 to 35 Ma). The sinking of the Tethyan and Sepik slabs beneath the northward-moving Australian continent also modulated the regional topography that results from convection in the mantle. This evolving dynamic topography forms an important input for surface process models that provide insights into the depositional history of basins in New Guinea and Australia.