Tracking the subduction-collision transition in the Philippine-Taiwan region: new perspectives from modern kinematic reconstructions

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Résumé

Plate convergence ends up with subduction-collision processes involving former structural elements of passive margins. These features may be difficult to recognise once the collision has occurred, leading to their underestimation in palaeogeographic reconstructions. Such studies are traditionally based on geodesic, palaeoenvironmental or palaeomagnetic tools, but modern software enables to incorporate all available datasets to propose more robust kinematic models.

In the frame of the research project COLLISEA (ANR-22-CE49-0015), we reconstruct the palaeogeography of thrusted units shaping the Philippine Mobile Belt along the Philippine-Taiwan region since the Late Cretaceous. To do so, we define block motions that replicate the oblique subduction of the Philippine Sea Plate below Eurasia and the ongoing subduction-collision processes. However, the detailed origin, geometry and motion of such blocks are rather hypothetical due to the lack of regional onshore/offshore geological correlations, implying to redefine them accurately in many places. To do so, we have gathered a comprehensive geodetic, geological and geophysical dataset that enable us to implement pre-accretionary structures in a structural map. The overall is then converted to a block map, to which kinematic tools are applied to progressively unfold the Philippine Mobile Belt over time. Thus,

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GPS data are tentatively extrapolated to reconstruct tectonic motion for the last available tectonic pulse (if unknown up to 2 Myrs, Pleistocene). Beyond 2Myrs, reconstructions use detailed geological mapping. Thus, we unravel the complex piling-up of structural units until 15-20 Myrs (Early Miocene).
This methodology allows us to pinpoint processes that have been underestimated such as large, crustal-scale, ramp-and-fold systems, sliced-off continental basements and diachronism of shear partitioning along the plate boundary. Thus, this study enables to reconstruct the nature and the position of elements that are nowadays digested in the Philippine Mobile Belt and to discuss the variations of velocity and deformation styles during the subduction-collision transition.

Mots-Clés: kinematic reconstructions, subduction, collision processes, SE Asia