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Structural evolution of the outer Indo-Burma Wedge: Insights from field observations and laboratory experiments

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The outer wedge of the Indo-Burma wedge (IBW) has resulted due to oblique subduction of the Indian Plate below the Burma. In this study, we will use the analysis of outcrop-scale structures from Tripura-Mizoram fold belt (TMFB) to evaluate the structural evolution of the outer wedge of IBW. TMFB belongs to the widest section of the outer wedge that stretches from east to west for around 270 km (along 23.5° N latitude). The first order structure of the outer wedge is characterized by a series of north-south trending anticlines-and-synclines of varying tightness. Analysis of our field observations provide a detailed understanding on the evolution of the first-order structure of the outer wedge of IBW. We show that the style of folding progressively becomes complex towards the hinterland direction of the wedge. The complexity of the fold structure is defined by the development of different geometries of folds, including refolding of earlier structures. Interestingly, different geometries of folds towards the hinterland share a uniform orientation of folds axes, implying pure shear deformation. Our field observations allow us to infer that the outer wedge sediments of IBW have deformed in a ductile manner over a shallow decollement, lying beneath the Neogene sediments of the outer wedge. We attribute the ductile behaviour of the outer wedge sediments to the dominance of weak shale horizons and high pore fluid pressure in the entire Neogene sequence of the outer wedge. To gain a complete understanding on the style of the strain distribution within TMFB, we performed scaled laboratory modelling under oblique convergence. We used Polydimethyl Siloxane (PDMS) to simulate the viscous rheology of the Neogene sediments. Model results show strong consistency not only with the existence of across-strike variations in the tightness of fold patterns from east to west but also provides a strong basis for explaining the occurrence of along-strike variations of deformation intensity in the outer wedge of IBW, which gradually increases southward with narrowing the width of the wedge.