*Saad S. B. Haq*

*EAS Department - Purdue University*

**Investigating the Role of Rheology in Localizing Margin Parallel Shear in Oblique Wedges: Insights Using Deformation Analysis in Analog Models**

Oblique plate motion is the rule rather than the exception, and is understood to be a primary factor at many convergent margins in determining the style and location of deformation. Oblique margins are often characterized by a dominant strike-slip fault parallel to the margin that accommodates the margin-parallel component of motion, adjacent to partitioned near margin-normal thrusting. There have been numerous studies in which such settings have been simulated using frictional analog models. While these models typically do partition deformation, only at the largest obliquities do they create a strike-slip fault like that seen in nature. At moderate obliquities, common in nature, frictional models typically produce en echelon Riedel shears rather than a single long-lived fault. I have simulated the evolution of oblique double wedges with frictional and layered (frictional over viscous) rheologies to understand how this discrepancy with nature might be related to variations in rheology with depth. In these experiments I have quantified the deformation field using image analysis and remote sensing techniques. In the the experiments the relative obliquity is large, 60º, so significant partitioning of deformation was expected in both wedges, regardless of the rheology. The pure frictional wedge is characterized by numerous discrete thrust faults in the pro-wedge and a zone of shear between the pro-wedge and the retro-wedges. The highest rate of contractional deformation is at the thrust front, while the highest rate of shear is isolated in a narrow zone of sub-parallel and near-vertical faults at the back of the pro-wedge. The layered model has a single discrete fault structure on which strain is accommodated but the relative width of the actively deforming zone is wider than that for the frictional wedge. Because the layered wedge is better able isolate shear behind the pro-wedge it can better partition strain into dip-slip thrusting normal to the margin. The introduction of viscous rheology at depth in the layered wedge also allowed for some margin-normal oriented normal faulting when topography became large and after convergence ceased.