Some recent studies have pointed out to a possible correlation between foreshock topography and seismic properties on megathrust (Song and Simons, 2005, Wells et al., 2005). This correlation suggests that the morpho-tectonic zones could reveal spatial variations in frictional properties of megathrusts. One possible cause would be that the effective friction along megathrust depends on the mode of slip: it would be lower in seismic areas due to dynamic weakening during seismic rupture, and larger in non-seismic areas dominated by rate-strengthening friction. In order to assess this correlation, a systematic study of a number of subduction margins has been conducted. The objective is to highlight common features associated to seismic vs. non-seismic areas and weakly or strongly coupled areas and to establish if they can be linked to frictional properties. Forearc topography and slab geometries are studied based on the critical taper model and on the limit analysis theory. This theory, which is based on the mechanical equilibrium and the theory of maximum rank-stress, allows predicting forearc deformation based on the megathrust geometry, forearc topography and frictional properties. More general than the critical taper model, it can be used to refine the effective friction on the megathrust, and its eventual variation in space from the localization of active faults.

**SUMATRA**

Location of the onset of the critical mechanical state and comparison with seismic properties and coupling

**MELILLONES Peninsula**

How can we explain the normal faults?

**ARAUCA Peninsula**

A rate-strengthening barrier?

**Dip angle change of the slab, correlation with forearc basins?**

**Some perspectives**

Study of slab break-down processes in order to determine the patterns and compare mechanical states.

Study of coupled forearcs to check if they are over critical.

Other peninsulas considered as barriers (Ilo) also at mechanical critical state with very high basal friction?

Normal faults in forearc basins associated to transition of frictional state or extensional critical state?

Forearc basins always associated to break-in-slope?