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Landward vergence in accretionary prism, evidence for frontal propagation of earthquakes?

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Landward vergence in accretionary wedges is rare and have been described at very few places: along the Cascadia subduction zone and more recently along Sumatra where the 2004 Mw 9.1 Sumatra-Andaman event and the 2011 tsunami earthquake occurred. Recent studies have suggested a relation between landward thrust faults and frontal propagation of earthquakes for the Sumatra subduction zone. The Cascadia subduction zone is also known to have produced in 1700 a Mw9 earthquake with a large tsunami across the Pacific.
Based on mechanical analysis, we propose to investigate if specific frictional properties could lead to a landward sequence of thrusting. We show that landward thrust requires very low effective friction along the megathrust with a rather high internal effective friction. We also show that landward thrust appears close to the extensional critical limit. Along Cascadia and Sumatra, we show that to get landward vergence, the effective basal friction has to be lower than 0.08.
This very low effective friction is most likely due to high pore pressure. This high pore pressure could either be a long-term property or due to dynamic effects such as thermal pressurization. The fact that landward vergence appears far from the compressional critical limit favors a dynamic effect. Landward vergence would then highlight thermal pressurization due to occasional or systematic propagation of earthquakes to the trench. As a consequence, the vergence of thrusts in accretionary prism could be used to improve seismic and tsunamigenic risk assessment.