**The geometry of underplated accreted “packets” in subduction zones; examples from the Eastern Belt of the Franciscan in California and the Torlesse Terrane in New Zealand**

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Accretion is a complex process, the details of which cannot be resolved seismically. Well-exposed ancient examples offer a better opportunity. This study focuses on two areas with nearly 100% exposure: glaciated exposures of the Torlesse near Arthur’s Pass, New Zealand and stream-cut exposures of the Franciscan Eastern Belt in Grindstone and Thomes Creeks, California. Rocks are mainly turbidites of prehnite-pumpellyite to lower blueschist grade, described as “broken formation” with no melange or exotic blocks present.

The dominant structural features are steeply dipping beds cut by thrust faults oriented at a modest angle to bedding. Fault spacing ranges from ~100 to 600 meters with the angle between bedding and faults usually ranging from 0° to 35°. Between faults, bedding continuity, though locally disrupted, is generally well-preserved. Deformation associated with the faults is variable. In some cases, fault contacts are sharp and show little deformation of adjacent beds. In other cases, small folds, boudinage, and intense fracturing and veining define fault zones. Intensity of deformation varies along the fault plane and is commonly more intense on one side than the other. Of note are two additional faults present in the Thomes Creek area; they are out-of-sequence thrusts (OOST’s) that cross-cut the other faults at high angles and are associated with a greater degree of deformation. Aside from these OOST’s, deformation associated with the faults is roughly an order of magnitude less than that described in the literature for “megathrusts.”

The faults described above (excluding the OOST’s) represent primary surfaces along which “packets” of relatively intact rocks were accreted.  This study and others show that these fault-bounded packets can be traced along strike for a few km to at least 10 km or more where not cut by OOST’s or younger faults. The faults appear to form after a period of diffuse, largely extensional shear in semi-consolidated sediments; as rigidity increases, shear becomes localized along fault surfaces. It is inferred that this process is driven by a plate boundary megathrust located some distance structurally below the accreted packets. Such megathrusts may be rarely preserved as they have not been observed in the areas studied.