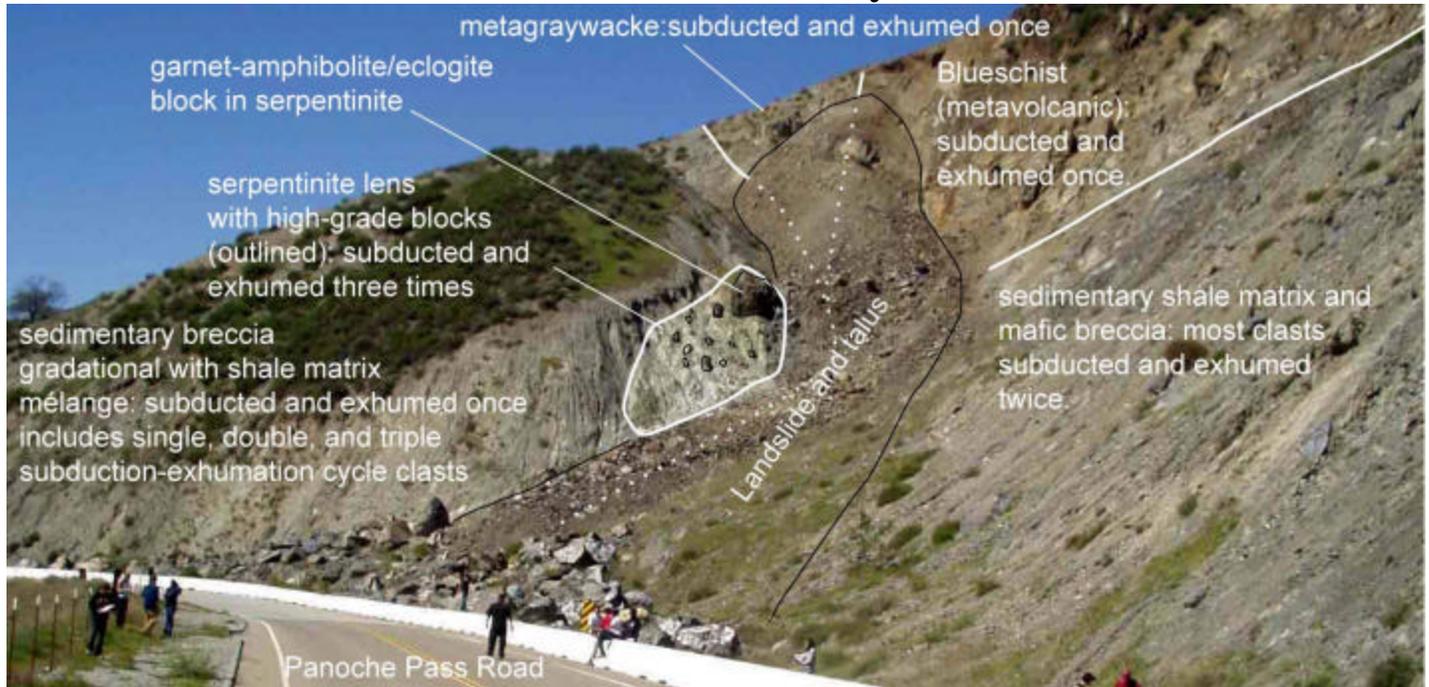


Franciscan Mélanges: Evidence for Sedimentary Origins, Multiple Subduction-Exhumation Cycles, Subduction Accretion, Subduction Erosion and Non Accretion

John Wakabayashi, Department of Earth and Environmental Sciences,
California State University Fresno



Abstract

Mélanges give insight into large-scale convergent plate margin processes. A field geologist may easily recognize the sedimentary origins of little-deformed mélanges, but mélanges within accretionary prisms have undergone significant deformation. Shale and serpentinite matrix mélanges of the Franciscan subduction complex of California have a foliated and seemingly intact matrix. Such exposures contrast sharply with the (generally) granular undeformed sedimentary serpentinite mélanges of the coeval Great Valley Group forearc basin deposits that depositionally overlie Coast Range Ophiolite (that structurally overlies the Franciscan). Nonetheless, Franciscan mélanges display evidence of sedimentary origins, including sedimentary breccias with exotic blocks that grade with increasing strain into shale matrix mélange, serpentinite sandstone and conglomerate. Huge displacement associated with past positions of the subduction megathrust appears accommodated on the upper contact of mélanges rather than within them as commonly proposed. Some mélanges record resubduction of earlier exhumed, high-pressure blueschist, amphibolite and eclogite, to blueschist facies depth, so they record at least two burial-exhumation cycles. One mélange/breccia in the Panoche Pass area may have components that record three cycles. Estimates of exhumation rates for the various cycles range from 2-10 mm/yr. The Tiburon Peninsula mélange represents the structurally highest horizon in the Franciscan of the San Francisco Bay area with an apparent depositional age of ~100 Ma. This suggests that 65 m.y. of subduction erosion/non accretion followed initiation of Franciscan subduction there, longer than the 40-45 m.y. non-accretion period proposed for the Franciscan of the northern Coast Ranges. Subduction erosion may have facilitated reworking of forearc sedimentary serpentinite deposits into the trench.

Biography: John Wakabayashi is a San Francisco Bay area native having lived there for 45 years before moving to Fresno to join the Earth and Environmental Sciences Department of Fresno State where he is now an associate professor of geology. He received his bachelor's degree in geology from UC Berkeley in 1980, and his undergraduate study culminated with a 10-week field camp that included a 3 week mapping project in mélanges in the central Sierra Nevada foothills. That field training stood him in good stead when he did his PhD research at UC Davis on Franciscan Complex rocks of the San Francisco Bay area under the advisorship of Eldridge Moores. That project which began with John introducing himself and telling Eldridge what he would do for his thesis (good shock factor) concluded with him receiving his PhD in 1989. However, nobody ever smitten by Franciscan geology can ever get enough of it. John worked in the engineering/environmental geology field for the next 16 years, including the last 13 as an independent consultant based in Hayward. In his non-billable time (lots of it during his independent years) he continued research on the Franciscan geology while branching into other avenues of research, including active tectonics, tectonic models for development of metamorphic PT paths, ophiolites and subduction initiation, evolution of strike-slip fault systems, and tectonic geomorphology of the Sierra Nevada. He looks back with some nostalgia at the "affiliation" on his AGU and GSA meeting badges of that era that read "Hayward Brewing Company" a statement of independence and his love of consuming and brewing beer. At Fresno State, he teaches introductory geology, geomorphology, structural geology, and an advanced field mapping course he claims is the most difficult field exercise taught in the USA (yes, the students have to map mélange). He supervises student research in the Coast Ranges and the Sierra Nevada, with projects ranging from Franciscan mélanges to northern Sierra Nevada ophiolites to Sierra Nevada landscape evolution. When not obsessing over geology or drinking beer, his other hobbies include high country trout fishing (has fished over 700 different wilderness lakes) and associated hiking (especially off trail hiking), writing fiction (excluding that which others no doubt call geologic fiction), cooking, fine wine, and trying not to injure himself playing with his kids. His current talk comes from what he considers his most exciting voyage of discovery in his 30 years as a researcher. This began with him finding key exposures while teaching his field class in March 2009 and (?)climaxed(?) perhaps not yet) with a series of field excursions from late December 2010 to late April 2011 where it seemed as if every trip resulted in a major change of his understanding.