Importance of an Expanded Definition of Ocean Plate Stratigraphy For Evaluating Tectonic versus Sedimentary Mélanges

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The transfer of materials from a subducting oceanic plate to a subduction-accretionary complex has resulted in rock assemblages that record the history of the subducted oceanic plate from creation to arrival at the trench. These rock assemblages, which comprise the uppermost igneous part of the oceanic crust (commonly basalt) overlain by pelagic sedimentary rocks (chert and/or limestone) overlain by clastic sedimentary rocks (mostly sandstone, shale/mudstone), have been called Ocean Plate Stratigraphy (OPS). The original definition of OPS as a basalt-chert (with or without limestone)-clastic triad, was based on early recognized examples in ancient subduction complexes and the prevailing model for oceanic crust. Growing recognition of the variability of oceanic crust, including examples of serpentinite exposed on the sea floor, as well as observations of lithologic variability of oceanic imbricates in subduction complexes, suggests the need to expand the OPS definition. For example, at a structurally intermediate level in the Sierra City mélange of the Shoo Fly Complex of California, oceanic lithologies include zones of serpentinite, gabbro, diabase, basalt and chert up to 200 m thick, with internal structural style ranging from imbricate slabs to block-in-matrix with serpentinite, gabbro, and basalt locally forming matrix. Serpentinite-dominated OPS may also include slices of continental crust affinity where the subducted crust was apparently a hyper-extended continental margin. Examples of this type of OPS have been recently identified in high-pressure metamorphic rocks of the Western European Alps. The definition of OPS is important in interpreting “native” blocks, derived by progressive deformation from OPS, versus “exotic” blocks (may be introduced by sedimentary means) in mélanges. Prior to the defining of OPS, chert and basalt blocks in a clastic matrix were commonly considered exotic; a wider range of native lithologies needs to be considered and this requires corresponding care in evaluation of tectonic versus sedimentary origin of blocks-in-mélanges.

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