

Plate Tectonics Assumed but not Applied in Research or Teaching? A Dual Perspective from the Classroom and Research Realm

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The Plate Tectonic paradigm has been the foundation of geosciences teaching and research since the so-called “Plate Tectonic Revolution” some fifty years ago. Although plate tectonic processes from sea-floor spreading to subduction guide research and are part of basic science education to non geoscientists, many basic principles of plate tectonics are still seldom applied or ignored in the majority of so-called tectonic research, so it is little wonder that teaching suffers accordingly as well. Convergent (subducting) plate margin processes and their rock record afford prime examples of this. The majority of map figures in journal articles divide geologic units associated with old convergent plate margins on the basis of age, as if the rocks of such region represent an ordered stratigraphy that is merely disrupted by a few faults. Formation age has little useful, however, in such a setting where individual units may have formed at one time, but arrived at a subduction zone much later. Many studies report deformational and metamorphic events for an entire paleo-convergent plate margin rock assemblage, as if the formation of such an assemblage was from a pre-assembled stratigraphic stack of rocks that then had a series of deformational and/or metamorphic events superimposed on it. In detail such assemblages have different parts arrive at different times, so that each component has deformational and metamorphic events unique to them. Some studies attempt to figure subduction slip based on restoring offsets of faults within a subduction assemblage but this neglects the fact that there is no correlative point/line on the subducting plate (it has subducted into the mantle). Similarly many studies insist on speculating about the “basement” of a subduction-formed assemblage implying a basal depositional contact on some older rocks. In contrast, the true “base” or “basement” of a subduction assemblage does not exist, for it is a fault that was the last position of the subduction megathrust before termination of subduction. Returning to the realm of basic education, the common explanation of the so-called rock cycle also assumes a pre-plate tectonic fixist framework. In that model the sediment is buried in a giant basin until deep enough to melt, a truly unrealistic geologic model, in contrast to burial of sediment sufficient to form it to rock, then exhumation in the solid state by a transition in local tectonics. These are but a few examples that show that the “Plate Tectonic Revolution” was never completed.