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Accretionary complexes: Recorders on Earth and possibly Mars

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Accretionary complexes occur in parts of the world, highlighted in Japan, North America, Europe, and Greenland. They are comprehensive data recorders with information compiled while the oceanic crust is en route from the mid-oceanic ridge to the subduction zone, spanning hundreds of millions of years. At the zone, the oceanic crustal materials are stacked along thrust faults and/or subducted to be eventually recycled into the mantle. The surviving accretionary-complex materials include Ocean Plate Stratigraphy (OPS). The ideal succession of the OPS (from oldest to youngest) is mid-ocean ridge basalt (MORB), pelagic sediment including radiolarian chert, hemipelagic sediment including siliceous shale, and trench turbidite deposits. Therefore, accretionary complexes often record diverse environmental conditions from deep- to shallow-marine environments, including those perturbed by endogenic (e.g., magmatic) and exogenic (e.g., impacts and Snowball-Earth) events. During an ancient and dynamic phase of its evolution (~>3.9 Ga), Mars had Earth-like conditions, including an interacting ocean, landmass, and atmosphere, referred to as Habitable-Trinity, as well as plate tectonism through geologic investigation of Earth. A possible accretionary complex and nearby outcrop of steeply dipping beds comprising olistostrome-like blocks, nearby and in the Claritas rise, respectively, southwest margin of the Tharsis superplume, are key evidence of major crustal shortening related to plate tectonism. Future investigation of the ancient Martian basement, which includes geochemical analyses for OPS sequences (an important candidate test), will be the new phase of the geologic investigation of Mars. Such features could contain far-reaching records dating back more than 4.0 Ga.

Biography

James M Dohm has investigated the terrestrial planets with major focus on Mars. He has contributed to the publication of USGS I-maps, including the new global geologic map of Mars (2014), peer-reviewed journal articles, and book publications.

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