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Melange genesis in the construction of the Anatolian subcontinent

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Melanges can be defined as chaotically deformed blocks with, or without, a matrix and may be of tectonic, or sedimentary origin, or both. Classic examples throughout Anatolia have mainly Carboniferous (Konya-Teke Dere-Karaburun), Late Triassic (Karakaya), Late Cretaceous (e.g. Ankara), Eocene (Pontides) and Oligo-Miocene (Misis-Andırın) ages of formation. All of the major melanges reflect contractional processes and delineate convergent plate margins or suture zones. The Carboniferous melanges record southward (?) subduction of "older Palaeotethys" beneath the N margin of Gondwana. The U. Triassic melanges reflect late-stage northward subduction of "younger Palaeotethys" beneath Eurasia. The U. Cretaceous melanges record northward subduction of Mesozoic oceanic crust; i.e. Ankara-Izmir-Erzincan ocean in the N (e.g. Domuzdağ Melange, central Pontides; Ankara Melange) and S Neotethys in the south (e.g. Berit Melange). The Eocene melanges in the Pontides reflect final closure of the Izmir-Ankara-Erzincan ocean. The Oligocene-Lower Miocene melanges in SE Turkey (e.g. Killan Melange) document later-stage subduction/closure of the S Neotethys. The melanges typically reflect the interaction of both tectonic and sedimentary processes. Tectonic processes include frontal accretion, forearc subcretion, subduction channel mixing, high pressure/low temperature metamorphism/deformation (e.g. Anatolide melanges), exhumation; also, re-imbrication to maintain a critical taper. Sedimentary processes include collapse of seamounts/continental margins into subduction trenches (e.g. Carboniferous mélanges), reworking as debris flows in trench/forearc basin settings (e.g. U. Cretaceous Anatolide melanges), also genesis of large-scale collision-related mega-debris flows, e.g. driven by seamount-trench collision (e.g. U. Triassic Karakaya melange), trench-passive margin collision (e.g. U. Cretaceous Tauride melanges), or continent-continent collision (e.g. Eocene Pontide melanges and Oligo-Miocene S Neotethyan melanges). Important controls of the melange genesis include: 1. Subduction setting, either continental margin or oceanic, with e.g. Carboniferous melanges representing near continental margin subduction with high terrigenous input, compared to e.g. some U. Cretaceous melanges that formed in sediment-starved more oceanic settings. 2. Age of subducting oceanic lithosphere: older ocean (e.g. Carboniferous melanges), was more easily subducted than young, buoyant, ocean (e.g. some U. Cretaceous melanges); 3. SSZ-type oceanic lithosphere: where present dismembered ophiolites including mantle rocks were accreted preferentially (e.g. U. Cretaceous Ankara Melange); 4. Igneous seamounts or continental fragments; where present (e.g. U Triassic Karakaya melange; U. Cretaceous Ankara melange) large volumes of ocean-island-type volcanics, cover sediments and flank facies were accreted. 5. Large-scale plate dynamics; slab roll-back favoured accretion but slab roll-forward subduction erosion. In the absence of situations favouring crustal accretion the normal condition was non-accretion such that melange genesis was skewed to exceptional geological settings (e.g. collision of plume-type seamounts or SSZ-type oceanic lithosphere with subduction trenches). Melanges generally lack incorporated oceanic lithosphere in cases where the subduction décollement was located at a high structural level in the subduction trench, well above oceanic basement (e.g. for the Carboniferous melanges). None of the major Anatolian mélanges formed by mainly sedimentary processes as "olistostromes" or in rift settings (either continental, or backarc), although relatively small-scale debris flow deposits characterise several extension-related settings (e.g. Triassic rifting of Antalya Complex; Eocene back-arc Maden Formation). Finally, the varied Anatolian melanges can be used as a model to infer modes of melange formation elsewhere (e.g. some Iapetus-related melanges).