P-T-t paths of eclogite blocks reveal coeval fast and slow exhumation of early subducted oceanic crust along strike of the Caribbean subduction channel

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Bodies of serpentinite-matrix mélange containing m- to dm-sized blocks of epidote eclogite, garnet amphibolite, blueschist and antigoritite are associated with ophiolitic serpentinized peridotites in the Caribbean. These tectonic mélanges pertain to the Cretaceous-Tertiary Antillean orogeny triggered by convergence between the Caribbean and the North American plates that finally led to collision of the oceanic Caribbean volcanic arc and the Maya and the Bahamian passive margins. Age data from volcanic arc and ophiolite rocks, high-pressure subducted margins and synorogenic sediments indicate subduction initiation shortly before 135 Ma and arrest of subduction at 70-60 Ma, latter resumed in the eastern part of the belt. In central Cuba, the protoliths of eclogites are of MORB composition representing subducted Proto-Caribbean oceanic lithosphere. Peak mineral assemblage is composed of garnet, omphacite, Na-Ca amphibole, epidote, phengite and rutile that experienced variable extent of retrogression. In blocks with the strongest retrogression, the assemblages are made of relict garnet (with inclusions of omphacite) Na-Ca to Ca amphibole, albite, epidote, chlorite and titanite indicating epidote amphibolite to greenschist facies conditions and intense fluid-rock interaction in the subduction channel during exhumation, also indicated by chlorite±antigorite blackwalls with abundant apatite and titanite around the blocks in contact with the enclosing antigorite serpentinite. Thermobarometric calculations indicate clockwise paths with near-isothermal decompression that points to fast exhumation. Lu-Hf, U-Pb Grt and $^{40}Ar/^{39}Ar$ WM geochronological data indicate ca. 125 Ma and 119 Ma for peak eclogitic conditions and cooling below 350-400 °C, respectively, confirming fast exhumation during the early stage of oceanic subduction. These results are at odds with early products of subduction from serpentinite mélanges in eastern Cuba and Dominican Republic, which record much slower exhumation rate and longer residence time within the channel. The lack of evidence for subduction/collision of a buoyant lithospheric fragment that may have triggered local fast exhumation of the channel at this early stage in central Cuba indicates contrasting coeval dynamics of oceanic subduction along strike.