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Blurred garnet zoning reveals short-term duration of heating during subduction initiation

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Mafic granulites from the metamorphic sole relicts in the South Tianshan Accretionary Complex exhibit Ca-Mg-Fe diffusion zoning within garnet crystals. Ilmenite inclusions in garnet are formed under oxygen fugacity of ΔFMQ ~+1.18 by rutile-ilmenite oxygen barometer. Ti-in Zircon thermometry provides a mean temperature of 822 ± 43 °C. Diffusion modeling on the garnet Ca-Mg-Fe profiles identifies a short-term diffusive timescale of ~1.0 ky. We interpret this period to represent the heating duration of high-temperature metamorphism during subduction initiation. This transient event could reflect the short-lived accretion of metamorphic sole slices attaching on the hot mantle wedge.