Mantle heterogenity and crustal processes at ultraslow-spreading ridges: Constraints from plagioclase ultraphyric basalts from the Mt. Jourdanne (~64°E), Southwest Indian Ridge

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Plagioclase ultraphyric basalts (PUBs) with up to 40% millimeter-sized plagioclase crystals, were sampled on the summit of Mt. Jourdanne volcano (~64°E) from the ultraslow-spreading Southwest Indian Ridge. The geochemistry of the matrix glass, the glassy melt inclusions and their hosting plagioclase megracrysts (An_{67-70}) are used to reveal the mantle heterogeneity and to discuss the origin of Mt. Jourdanne PUBs. The melt inclusions trapped in these low-An plagioclases display low MgO and high SiO_2 contents, with typical E-MORB type REE patterns. Together with their positive Sr and Eu anomalies, it indicates that they are derived from an enriched mantle source (e.g., pyroxenites or eclogites). The lack of negative Eu anomalies in matrix glasses precludes large amounts of plagioclase crystallization from their parental magma. Instead, both petrographic and geochemical evidence suggest that these plagioclase megracrysts originate from plagioclase-rich mush within the lower crust. The density contrasts allow the effective segregation of plagioclase prior their incorporation in the hosting magma. We propose that these plagioclase megracrysts were picked up when a new batch of magma passing through this mush, which triggers the PUBs formation. The PUBs eruption, however, requires that the hosting magma ascends with a velocity greater than the settling rate of the plagioclase, precluding a long residence time for the magma in the crust. We infer that the eruption of PUBs is preceding the enhanced magma supply, which gives rise to the growth of Mt. Jourdanne volcanic massif.