

there is a continuous fractionation or partial melting sequence from essentially anhydrous olivine tholeiite (20–30% melting) to olivine nephelinite (2–5% water, <5% melting) at 50–70 km depth and from tholeiitic picrite, through olivine-rich basanite to olivine-melilite nephelinite (<5% melting) at 70–100 km depth. The hydrous olivine nephelinite, olivine-rich basanite, and olivine melilite nephelinite magmas form at temperatures of 100–250 °C below the dry pyrolite solidus – this has the effect of bringing partial melting into the garnet pyrolite stability field so that early formed liquids at 30 kb, the olivine melilite nephelinites, are in equilibrium with residual olivine, orthopyroxene and garnet. The presence of 0.1–0.2% H₂O (and possibly similar or larger CO₂ contents) would play an essential role in producing small amounts of very undersaturated liquids at temperatures well below the anhydrous pyrolite solidus and at depths near the low velocity zone.

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