

How Himalayan collision stems from subduction

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The mechanisms and processes active during the transition from continental subduction to continental collision at the plate interface are largely unknown. Rock records of this transition are scarce, either not exposed or obliterated during subsequent events. We examine the tectono-metamorphic history of Barrovian metamorphic rocks from the western Himalayan orogenic wedge. In this study, we demonstrate that these rocks were buried to amphibolite-facies conditions from ≤ 47 Ma to 39 ± 1 Ma, synchronously with the formation (46 Ma) and partial exhumation (45–40 Ma) of the ultrahigh-pressure eclogites. This association indicates that convergence during continental subduction was accommodated via development of a deep orogenic wedge built through successive underplating of continental material, including the partially exhumed eclogites, likely in response to an increase in interplate coupling. This process resulted in the heating of the subduction interface (from ~ 7 to ~ 20 °C/km) through advective and/or conductive heat transfer. Rapid cooling of the wedge from 38 Ma, coeval with the formation of a foreland basin, are interpreted to result from indentation of a promontory of thick Indian crust.

Keywords: Continental subduction; Collision initiation; Himalaya; Barrovian metamorphism; Petrochronology.