Uplift of the Colorado Plateau

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Introduction to the Colorado Plateau: [2]
The Colorado Plateau is a relatively coherent uplifted crustal block surrounded on three sides by the extensional block-faulted regime of the Basin and Range Province and the Rio Grande rift. It has experienced no major crustal deformation since (at the latest) the end of the Laramide orogeny (40 Mya). It is stuffed full of monoclines and has a present mean elevation ~ 2 km.

Description of uplift: [3]
Prior to the Laramide orogeny, the Colorado Plateau was a shelf area. It then became a basin/trough surrounded by newly formed mountains during the Laramide orogeny but was still close to sea level (marine Mancos shale). Prior to 24 Mya, it was still topographically low with internal drainage. It reached an elevation of at least 1 km by 18 Mya (downcutting in Peach Springs Canyon) and became higher than the adjacent Basin and Range province by 10 Mya. It experienced a final 1 km of uplift during the last 5.5 My (Colorado River deposits). Two (or more) stage uplift, with a very recent last stage.

Theories about uplift: [3]
Constraints are: the Colorado Plateau is close to isostatic equilibrium, has a thick (45 km) crust 10 – 15 km thicker than neighbouring provinces, and has an unexceptional heat flow of 60 mW m^{-2} but high upper mantle temperatures.

Possible causes of the uplift include: thermal expansion, crustal thickening, and phase changes. Possible sources of heating include: subduction of a mid-oceanic ridge, presence of a plume/hot spot, and cessation of subduction followed by thermal equilibriation of cold, subducted slab. Crustal thickening could be achieved by horizontal transfer of mass in the lower crust or by very shallow angle subduction. Phase (and density) changes could be caused by hydration or by partial melting followed by expansion.

Tharsis uplift: [4]
The Tharsis bulge is an elevated region on Mars associated with a number of large volcanoes. There are many theories about how it was uplifted and how it stays uplifted.

References:
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