What controls the rate of seafloor subsidence?

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The seafloor subsides as it moves away from mid-ocean ridges, and the rate of subsidence can largely be explained by thermal isostasy. There exists, however, an important difference between theoretical predictions and the observed rate for normal seafloor, even if we restrict ourselves to relatively young seafloor with ages less than 70 Ma. Two hypotheses have been put forward to explain this discrepancy, one with the incomplete thermal contraction due to the strongly temperature-dependent viscosity of oceanic lithosphere, and the other with dynamic topography originating in radioactive heating in the convecting mantle. These two mechanisms are not mutually exclusive. As the degree of incomplete thermal contraction can be bounded by theoretical consideration, we may be able to use the observed discrepancy to infer the amount of radioactive heating in the convecting mantle. We will present a unified theoretical model that can treat these two effects simultaneously and quantify how the rate of seafloor subsidence is controlled by different processes.

