Climate sensitivity from the greenhouse to the icehouse

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Projections of future climate depend critically on refined estimates of climate sensitivity, which remains poorly constrained for the modern climate. Improved proxy reconstructions of past altered climates hold great promise in placing tighter constraints on the climate sensitivity parameter relevant to future climate change. Here, I will review recent progress in estimating paleoclimate sensitivity using data and modelling approaches for both early Cenozoic greenhouse and late Cenozoic icehouse climates. Two fundamental problems are encountered in both periods. One is the difficulty in accurately estimating the magnitude of and response to different climate forcing agents. Another is the issue of "state dependent" sensitivity—the fact that the climate response to a given forcing may be different in different climate states. I will examine the way in which these interrelated problems play out in both greenhouse and icehouse climates, and outline possible strategies for future progress.