

## An Energy Balance Model of Paleoclimates

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The Earth's climate is a complicated system, but relatively simple models can provide insight. We present a new energy balance model (EBM), which, unlike previous EBMs, is region-specific (Arctic, Antarctic, tropics), and incorporates the effects of water vapour, ice-albedo feedback, and evapotranspiration in a temperature-dependent manner. The EBM also takes into account changes in the other major greenhouse gas, carbon dioxide. The model is applied to known Paleoclimate transitions. The primary conclusion drawn from the EBM is that the climate may possess multiple coexisting equilibrium states. Saddle-node bifurcations of these equilibria are mechanisms for rapid climate transitions associated with the *Pliocene Paradox*, the *Glaciation of Antarctica* and the so-called *warm, equable climate problem* of both the mid-Cretaceous Period and the Eocene Epoch. In all cases, the EBM is in qualitative agreement with the geological record.