Issues in building a coherent climate model for terrestrial planets

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Given the conceptual similarity in many aspects of terrestrial planet climatology, including the radiative transfer, atmospheric dynamics, interactive atmospheric composition (including water, ice, vapour, dust, sulphates, methane), convection, atmospheric chemistry etc., there may be some advantages to building a coherent climate modeling framework to cover the full range of observed planetary climates. Climate models for the Earth's climate system have now reached a new level of sophistication, incorporating multiple external drivers, interactive aerosol and atmospheric chemistry modules, broad-band radiative transfer that is well match to line-by-line models, and new grids that don't include polar singularities (such as the Cubed Sphere). They are also becoming far more modular and standardized in many aspects. Given the escalating costs of maintaining independent codes – particularly in terms of taking advantage of upgrades in computational capacity (compilers, multiple processers, etc.) and the existing investment in dynamic cores , tracers and radiative transfer, a new model framework that covered Earth, Mars and Venus (at first) might allow for a big leap in simulation technology. I will discuss what issues will undoubtedly arise, and whether the costs will be less than the benefits – not just for the existing planets, but more generally for conceivable exoplanets.