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Comparative Climate Models of Terrestrial Planets and Outer Satellites

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For about forty years, many institutions and scientific teams around theworld have been develelopping Earth atmosphere numerical weather predictionmodels (designed to predict the weather a few days in advance) and GlobalClimate models (design to fully simulate the climate system and its longterm evolution). Such models are now used for a countless numbers ofapplications, including tracer transport, coupling with the oceans or thegeological CO2 cycles, photochemistry, data assimilation to build dataderived climate database, etc. . . Because these models are almost entirely built on physical equations(rather than empiric parameters), several teams have been able tosuccesfully adapt such models to the other terrestrial planet orsatellites that have a solid surface and a thick enough atmosphere. In oursolar system, that includes Mars, Venus, Titan, and Triton. On Mars, following the pionneer work of Leovy and Mintz (1969) and Pollacket al. (1981, 1990), in the past ten years, several teams around the worldhave develloped general circulation model of the martian atmosphere andapply these models to various projects. The first application of MarsGCMs has been the prediction of the thermal structure and atmosphericcirculation. As on Earth, because the martian atmosphere is also veryactive and highly variable, they have become essential to analyse andinterpret the meteorological observations. Just like on Earth as well, GCMs are now becoming Global Climate model able to simulate the dustcycle, CO2 cycle and water cycle. They are also used as platforms to studythe photochemistry of the atmosphere, couple the atmosphere with thethermosphere or the subs-surface, etc. . . On this basis, GCMs can now beused to predict the climate that could have existed on Mars when theorbital parameters were different (