



Re-examining classical climate models: A state of the art radiative-convective model

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Even among simple 1D radiative-convective models, estimates of climate sensitivity vary greatly. For a doubling of CO₂, Manabe and Wetherald (1967) found temperature increases of 2.4 K and 2.9 K for cloudy and clear profiles respectively, Hunt and Wells (1979) found a 1.8 K increase, and Hummel and Kuhn (1981) found climate sensitivity values as low as 0.79 K depending on their treatment of clouds and convection. With the advances in our understanding of atmospheric radiative processes and increases in computational resources, we can treat radiation properly. This will enable us to make more accurate estimates of the climate sensitivity under specific assumptions. Moreover, we will be able to test some of those assumptions, eg. the water vapour distribution and our treatment of convection, by studying the effects of varying these parameters on the surface temperature and on the climate sensitivity. In addition, 1D models could help to improve our understanding of the structure of the tropical tropopause layer. Again, we will be able to test the effects of different assumptions on this region, and 1D models also have the advantage of a much higher possible vertical resolution than in global models. Here, we present a discussion of our model set-up and our first results, as well as our plans for future studies.