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A Simple Climate Model Program for High School Education

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The future climate change projections of the IPCC AR4 are based on GCM simulations, which give a distinct global warming pattern, with an arctic winter amplification, an equilibrium land sea contrast and an inter-hemispheric warming gradient. While these simulations are the most important tool of the IPCC predictions, the conceptual understanding of these predicted structures of climate change are very difficult to reach if only based on these highly complex GCM simulations and they are not accessible for ordinary people.
In this study presented here we will introduce a very simple gridded globally resolved energy balance model based on strongly simplified physical processes, which is capable of simulating the main characteristics of global warming. The model shall give a bridge between the 1-dimensional energy balance models and the fully coupled 4-dimensional complex GCMs. It runs on standard PC computers computing globally resolved climate simulation with 2yrs per second or 100,000yrs per day. The program can compute typical global warming scenarios in a few minutes on a standard PC. The computer code is only 730 line long with very simple formulations that high school students should be able to understand.
The simple model's climate sensitivity and the spatial structure of the warming pattern is within the uncertainties of the IPCC AR4 models simulations. It is capable of simulating the arctic winter amplification, the equilibrium land sea contrast and the inter-hemispheric warming gradient with good agreement to the IPCC AR4 models in amplitude and structure. The program can be used to do sensitivity studies in which students can change something (e.g. reduce the solar radiation, take away the clouds or make snow black) and see how it effects the climate or the climate response to changes in greenhouse gases.
This program is available for every one and could be the basis for high school education. Partners for a high school project are wanted!