An interactive atmospheric model for teaching and research

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Numerical models have become the most important tool in meteorology research. Their use in teaching has been, though, somewhat restricted by practical reasons associated with the time required to learn a given model, to use it as a demonstration tool and/or to analyze its results. However, the continuous evolution of personal computing platforms already allows for many simple atmospheric physics problems to be interactively tested in reasonable time intervals, if models are properly adjusted to make use of new technologies (including software and hardware). In this paper we develop a fully interactive version of the non-hydrostatic atmospheric model NH3D (Miranda and James, 1992), prepared to run in either Windows or Linux, with a simple Graphic User Interface (GUI) that allows for the customization of the experiments and for a quick analysis of the output. The interface was built with open source software using the QT libraries from Trolltech (Oslo, Norway) and the DISLIN graphics package by H. Michaels (Max Planck Institute for Solar System Research). Both NH3D and DISLIN are standard Fortran 90 codes, while QT is written in C++. The interactive model iNH3D is made of 3 independent executables that constitute separate threads that run in parallel. This leads to an efficient use of new multiprocessor systems and allows the user to change each of the open source codes while keeping the other executables unchanged. A number of data files, including relevant meteorology problems, have been prepared to show the model in action. All source files may be compiled with different compilers commercially available or freeware, and because they make full use of dynamical allocated memory, they can also be simply offered as ready made "black-box" applications. While the interface has been tailored to motivate the use of the models by students the model is fully functional and may be used for both teaching and research.