

Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

There Is No Smagorinsky Constant DANIEL ISRAEL, Los Alamos National Laboratory — There is significant discussion in the literature regarding the “correct” value for the Smagorinsky coefficient, C_S , which appears in the classical Smagorinsky subgrid model as a multiplier for the characteristic grid length scale. Careful consideration of the equations, however, shows that C_S is not a physical quantity at all, and certainly is not a constant, even for a specific flow and flow solver. Rather, the coefficient includes both numerical and physical effects in that its value controls the trade-off between the numerical resolution and the range of turbulent scales which are explicitly resolved. Consequently, as the numerical resolution is improved the model should become insensitive to the particular value of the coefficient. In the current work, a simple model is developed which shows the qualitative behavior of the total simulation error as C_S and the numerical resolution are varied. Simulations are presented to support this model. This has important ramifications for both model development and validation. It is further argued that the current results generalize to any model which includes a coefficient multiplying an implicit filter length scale.

Daniel Israel
Los Alamos National Laboratory

Date submitted: 04 Aug 2006

Electronic form version 1.4