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Deterministic large-eddy simulation ROBERT RUBINSTEIN, NASA Langley Research Center, TIMOTHY CLARK, Northrop-Grumman Information Technology — By 'deterministic large-eddy simulation' we mean the abridgment of a spectral closure theory by replacing small scales of motion by a simplified subgrid model. As in standard LES, this abridgment reduces the number of resolved scales; the important question is how well the subgrid model preserves the dynamics of the resolved scales. This question will be addressed for the transient development of a Kolmogorov spectrum under steady forcing in a fluid initially at rest. This problem poses a simple yet severe test of the physical ideas behind subgrid models. Deterministic analogs of the classical Smagorinsky, dynamic Smagorinsky, and Yoshizawa-Horiuti one-equation subgrid models will be considered. The classical Smagorinsky model does not reproduce the transient dynamics well. Both the dynamic model and the one-equation model are considerably better. Perhaps surprisingly, the best results are obtained with a dynamic procedure that expresses everything in terms of the resolved scales alone.

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