Analysis of isotropic turbulence using a public database and the Web service model, and applications to study subgrid models[1] CHARLES MENEVEAU, Johns Hopkins University, YUNKE YANG, ERIC PERLMAN, MINPIN WAN, RANDAL BURNS, ALEX SZALAY, SHIYI CHEN, GREGORY EYINK, Johns Hopkins University — A public database system archiving a direct numerical simulation (DNS) data set of isotropic, forced turbulence is used for studying basic turbulence dynamics. The data set consists of the DNS output on 1024-cubed spatial points and 1024 time-samples spanning about one large-scale turn-over timescale. This complete space-time history of turbulence is accessible to users remotely through an interface that is based on the Web-services model (see http://turbulence.pha.jhu.edu). Users may write and execute analysis programs on their host computers, while the programs make subroutine-like calls that request desired parts of the data over the network. The architecture of the database is briefly explained, as are some of the new functions such as Lagrangian particle tracking and spatial box-filtering. These tools are used to evaluate and compare subgrid stresses and models.

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