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Kinetic turbulence simulations for space and laboratory plasmas — •Daniel Told, Daniel Grošelj, Alejandro Bañón Navarro, and Frank Jenko — Max Planck Institute for Plasma Physics, Boltzmannstr. 2, D-85748 Garching, Germany

Many natural plasmas such as the interstellar medium, the solar wind, or hot accretion disks are known to exist in a strongly turbulent state. Key physical processes occurring in these systems such as particle acceleration, reconnection and turbulent heating can only be understood by means of kinetic modeling and careful validation against observations.

Computational modeling via fully kinetic simulations is very expensive, and despite routinely relying on the use of a reduced ion/electron mass ratio, 3-dimensional turbulence simulations have only become feasible very recently.

To alleviate this problem, various reduced models such as hybrid fluid/kinetic models as well as gyrokinetics and further reductions have been developed. We will discuss the key physics observed in fully and reduced-kinetic simulations, as well as the benefits and limitations of model reductions, along with directions for future work.

Beyond the purely computational work, it is crucial to demonstrate the reliability of any kind of model by validating its results against observations and/or laboratory measurements. Examples of successful validation exercises will be shown.