Abstract Submitted
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Using generative adversarial networks for subfilter modeling of turbulent flows MATHIS BODE, RWTH Aachen University — Accurately modeling turbulence is still one of the main challenges in many industrial flows and, therefore, the development of universally applicable turbulence closures is essential. One approach is to employ data-driven methods, which has become very popular in many fields over the last years as large, often extensively labeled, datasets became available and the usage of GPUs speeded up the training of large neural networks tremendously. However, the successful application of deep neural networks in fluid dynamics, for example for subfilter modeling in the context of large-eddy simulations (LESs), is still challenging. For example, the high requirements with respect to accuracy, error robustness, and physical plausibility demand tailored methods and also the generalization is an open question. This work focuses on generative adversarial networks (GANs) with physics-informed loss function. In particular, physics-informed enhanced super-resolution GANs (PIESRGANs) are discussed, and their application to turbulent reactive flows and multiphase flows is shown. The superior performance of PIESRGAN-based subfilter models to classical subfilter models is demonstrated. Aspects, such as a two-step learning approach and the adversarial part of the loss function, are emphasized.

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