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**Relations between the local structure of turbulence and the Smagorinsky coefficient**[1] MARCELO CHAMECKI, CHARLES MENEVEAU, Johns Hopkins University, MARC B. PARLANGE, Ecole Polytechnique Federal de Lausanne (EPFL) — The objective of this study is to uncover systematic dependencies of the Smagorinsky coefficient upon dimensionless parameters that characterize the local flow conditions in turbulence. The local flow can be characterized using invariants of the velocity gradient tensor that are related to some fundamental dynamic/ kinematic characteristics of turbulent flows, such as dissipation, enstrophy, vortex stretching, self-amplification of strain rate, etc. Such invariants are often used to classify local flow topology and they are expected to play an important role in scale-interactions of relevance to subgrid-scale modeling for Large Eddy Simulation. In this a-priori study we use the HATS field data obtained from 14 3D-sonic anemometers arranged in two horizontal arrays in the atmospheric surface layer. For comparison, DNS data of isotropic turbulence is used as well. We make use of conditional averages to investigate how the SGS dissipation and the Smagorinsky coefficient depend on local properties of the resolved field. Besides the invariants of the resolved velocity gradient tensor, for the HATS data the local gradient Richardson number is also used. We briefly discuss how this information can be used to improve dynamic SGS models.

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