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Paradigms of Complexity in Modelling of Fluid and Kinetic Processes P.H. DIAMOND, University of California, San Diego, CASS 0424, La Jolla, CA 92093-0424 USA — The need to discuss and compare a wide variety of models of fluid and kinetic processes is motivated by the astonishing wide variety of complex physical phenomena which occur in plasmas in nature. Such phenomena include, but are not limited to: turbulence, turbulent transport and mixing, reconnection and structure formation. In this talk, I will review how various fluid and kinetic models come to grips with the essential physics of these phenomena. For example, I will discuss how the idea of a turbulent cascade and the concept of an “eddy” are realized quite differently in fluid and Vlasov models. Attention will be placed primarily on physical processes, the physics content of various models, and the consequences of choices in model construction, rather than on the intrinsic mathematical structure of the theories. Examples will be chosen from fusion, laboratory, space and astrophysical plasmas.

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