Long time properties of infinite energy Navier-Stokes flows

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Abstract. The weak solutions to the unforced 3D Navier-Stokes equations constructed in Leray’s seminal work have non-increasing energy and eventually regularize. These properties are consequences of the global energy inequality. For initial data with infinite energy, the global energy inequality fails and it is generally unclear if solutions are quantitatively connected to the initial data for large times (in analogy with the energy inequality) and, if so, whether or not they eventually regularize. In this talk, a weighted, centered function space will be introduced which, for certain scalings, yields a quantitative relationship between the flow at large times and the data as well as eventual regularity. This space includes functions which are non-decaying in some directions as well as all locally square integrable self-similar data. Related work for the surface quasi-geostrophic equations will also be discussed. These results are drawn from joint works with Tai-Peng Tsai, Igor Kukavica, Wojciech Ozanski and Dallas Albritton.