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HARNESSING HPC TO UNDERSTAND TURBULENCE: CAPTURING THE FINE-GRAIN STRUCTURE OF GEOPHYSICAL FLOWS

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Abstract. In the realm of atmospheric dynamics, the emergence of large-scale structures from small-scale turbulent convective motions stands as one of the most striking phenomena in nature. This process, which impacts climate modeling, small-scale collisions of particles and droplets in clouds, and has implications for industrial flows, is difficult to capture in traditional turbulence models. This presentation will delve into insights from single- and multi-phase numerical simulations of unprecedented sizes, resolving atmospheric flows with spatial resolutions down to 30 meters. Turbulence in these simulations develops intricate structures seen in nature, as well as large-scale self-organized patterns. I will also discuss the code development and parallelization methods we use to leverage the power of recent high-performance computing systems. Finally, I will discuss prospects for HPC in Argentina in light of the recent acquisition of a system in the TOP500.

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