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Advanced cyberinfrastructure for research in Geodynamics

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Today's scientists need access to new information technology capabilities, able to perform high-resolution complex computing simulations in a reasonable time frame. Sophisticated simulation tools allow us to study phenomena that can never be observed or replicated by standard laboratory experiments. Modeling complex natural processes in general, and numerical computation in particular, represents today an essential need of research, and all modern research centers benefit from a computing center of one form or another. The combined power of hardware and sophisticated software, visualization tools, and scientific applications produced and used by interdisciplinary research teams make possible nowadays to advance the frontiers of science and to pose new key scientific questions. Cyberinfrastructure integrates hardware for high speed computing, a collection of highly specialized software and tools, and a powerful visualization tool. A new interdisciplinary research domain is emerging at the interface of geosciences and computing with essential inputs from geology and geophysics.
In this study we show how to rapidly deploy a low-cost high-performance computing cluster (HPCC) and a 3D visualization system that can be used both in teaching and research in geosciences. Also, we present several geodynamic simulations performed with such systems.