

Supercomputing of large earthquakes

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Earth modeling is extraordinarily complex - and when the earth quakes, it's no different. Earthquakes are highly non-linear and multiscale processes fracturing the Earth's crust and emanating potentially destructive seismic waves. While computational seismology has been a pioneering field for high-performance computing, the multitude of scales and multi-physics character of earthquake source processes remain difficult to model.

Earthquake science is increasingly data-rich, which opens up new pathways to synergistically integrate seismological, geodetic, tectonic and experimental analysis in multi-physics forward modeling. Using a physics-based description of earthquakes, interdisciplinary earthquake observations, modern numerical methods and hardware specific optimisation shed light on the dynamics, severity and cascading hazards of earthquake behaviour. An unparalleled degree of realism is enabled by exploiting high-performance computing.

In this talk, I will cover data-integrated, parsimonial scenarios of recent powerful multi-fault earthquake cascades and 3D fully-coupled Earth and ocean models of tsunami generated during using petascale supercomputers and the potential of exascale computing infrastructure.