Black Hole Mergers, Gravitational Waves, and Multi-Messenger Astronomy

Joan Centrella

The final merger of two black holes is expected to be the strongest source of gravitational waves for both ground-based detectors such as LIGO and VIRGO, as well as the space-based LISA. Since the merger takes place in the regime of strong dynamical gravity, computing the resulting gravitational waveforms requires solving the full Einstein equations of general relativity on a computer. Although numerical codes designed to simulate black hole mergers were plagued for many years by a host of instabilities, recent breakthroughs have conquered these problems and opened up this field dramatically.

This talk will focus on the resulting gold rush of new results that is revealing the dynamics and waveforms of binary black hole mergers, and their applications in gravitational wave detection, astrophysics, and testing general relativity.