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Dynamics and nucleosynthesis of neutron star mergers and collapsars

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The merger of two neutron stars and the collapses of rotating massive stars can form a system composed of a central object (either a neutron star or black hole) and a centrifugally supported disk. Inside the disk, a turbulent state is generated by magnetorotational instability and then induces an effective viscosity. The viscous angular momentum transport and heating can evolve the system and trigger mass ejection from the disk. In the case of the merger, the post-merger mass ejection contributes to the total ejecta in addition to the violent merger phase and to shaping the abundance pattern of heavy nuclei produced via the r-process. In the case of the collapsar, the disk outflow can contribute to the explosion of the collapsed star with a higher energy than the normal supernova. It can also provide a significant amount of radioactive nickel, which would power the luminosity of the supernova. In this talk, I will present the results of my numerical simulations of such systems and their implications.

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