Computation of Vortex and Tendex Lines in Numerical Simulations, and Their Behaviors in a Head-on Collision of Spinning Black Holes[1] KEITH D. MATTHEWS, Caltech — In this talk, I will describe the frame-drag vortex lines and tidal tendex lines (see previous abstracts) in the context of numerical relativity. Specifically, I will discuss how these lines can be computed in numerical-relativity simulations in general, and I will then explore their behaviors in a specific simulation (performed using the SpEC code): the head-on merger of two identical black holes with oppositely directed, transverse spins. As the holes merge, their merged horizon acquires four vortexes, two with each sign of vorticity. The closest vortex lines, those which connect to the horizon, simply wrap around the hole connecting horizon vortexes of like sign. As the hole settles down to Schwarzschild, the horizon vortexes slosh (their vorticities oscillate in sign). With each oscillation, they eject a self-contained packet of vortex lines that becomes a gravitational wave as it travels into the wave zone.

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