Self-torque and frame nutation in binary black hole simulations[1]
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Texas at Austin — We investigate the precession of the spin of the smaller black
hole in binary black hole simulations. By considering a sequence of binaries at
higher mass ratios, we approach the limit of geodetic precession of a test spin.
This precession is corrected by the "self-torque" due to the smaller black hole's
own spacetime curvature. We find that the spins undergo spin nutations which are
not described in conventional descriptions of spin precession, an effect which has
been noticed previously in simulations. These nutations arise because the spins
are not measured in a frame where the smaller hole is stationary. We develop a
simple model for these frame nutations, extract the instantaneous spin precession
rate, and compare our results to PN and extreme-mass-ratio approximations for the
self-torque.

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