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Flux-balance laws from an effective stress-energy tensor

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The trajectory of a point particle can be represented by a series of geodesics whose constants of motion slowly evolve over the inspiral. Flux-balance laws give the (averaged) evolution of these "conserved quantities" in terms of fluxes of conserved currents through the horizon and at null infinity. In the specific case of conserved quantities coming from spacetime isometries (for example, energy and axial angular momentum in Kerr), there is an intuitive picture for non-gravitational field theories, due to the conservation of the stress-energy tensor. This suggests that such flux-balance laws, for the gravitational self-force, could be derived from the "effective" stress-energy tensor that sources higher-order metric perturbations. In this talk, we discuss such a derivation, using the two-timescale formulation of the gravitational self-force, that applies at first and second order.

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