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Persistent gravitational wave observables in nonlinear plane wave spacetimes ALEXANDER GRANT, EANNA FLANAGAN, Cornell University, ABRAHAM HARTE, Dublin City University, DAVID NICHOLS, University of Virginia — Persistent gravitational wave observables are generalizations of the gravitational wave memory effect that are nonlocal in time and nonzero in the presence of gravitational radiation. A natural class of spacetimes in which to discuss these observables is that of nonlinear plane waves, which are exact, radiative solutions to Einstein's equations. In this talk, we discuss a particular observable in these spacetimes: a holonomy involving a closed curve, which is known to contain information about the usual gravitational wave memory. For linearized plane waves, this observable is determined by just one, two, and three integrals of the Riemann tensor along a central worldline. At nonlinear order, we show that a similar result holds: this observable can be written in terms of two functions, which we call the transverse Jacobi propagators, and their first derivatives. These functions are related to the usual gravitational wave memory.

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