Abstract Submitted
for the APR18 Meeting of
The American Physical Society

The Illusion of the Ubiquity of Chaos[1] ALEJANDRO CARDENAS-AVENDANO, Montana State University - Fundacion Universitaria Konrad Lorenz, ANDRES GUTIERREZ, LEONARDO PACHON, Universidad de Antioquia, NICOLAS YUNES, Montana State University — The recent gravitational wave observations by the LIGO/Virgo collaboration have allowed the first tests of General Relativity (GR) in the extreme gravity regime, when comparable-mass black holes and neutron stars collide. In addition, future space-based detectors, such as LISA, will allow tests of GR with gravitational waves emitted when a small black hole falls into a supermassive one in an extreme mass-ratio inspiral (EMRI). One particular test that cannot be carried out cleanly with ground-based instruments is the search for chaos, which is expected to be absent in two-body encounters described by GR. In this talk, I will discuss whether chaos is present in parity-violating modified theories of gravity, focusing in particular on dynamical Chern-Simons gravity. Given the fact that for such modified theories, exact solutions for isolated, spinning black holes are not yet available, I will show how the use of approximate solutions may lead one to believe that chaos is present, when in reality such chaotic behavior is an artifact of the truncation of the solution. I will present a method that allows us to identify whether numerical signatures of chaos are real or not. The studies presented here begin to lay the foundations for chaotic tests of GR with LISA observations of EMRIs.

[1]A.C.-A. and N.Y acknowledge financial support through NSF CAREER grant PHY-1250636 and NASA grants NNX16AB98G and 80NSSC17M0041.

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Date submitted: 16 Dec 2017 Electronic form version 1.4