

Abstract Submitted  
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**A variational approach to study plasma coupling with gravitational waves**<sup>1</sup> DEEPEN GARG, Princeton University, ILYA DODIN, Princeton Plasma Physics Laboratory — Existing theories of gravitational-wave (GW)-plasma coupling are not directly applicable to the GWs of interest that are inhomogeneous in space and have more general polarization than in vacuum. We propose an alternative, variational formulation of this problem, which also leads to the prediction of the nonlinear ponderomotive force that a GW pulse exerts on massive particles. This force is calculated explicitly for the first time. Developing on our variational method, we also propose a geometrical-optics theory for collective matter oscillations in self-consistent metric with general polarization. Electromagnetic interactions can be added similarly, which, in the future, will lead to a generalized theory of plasma waves in astrophysical context.

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