Abstract Submitted
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Variational Symplectic Algorithm for Whistler Wave Ray Tracing in the Inner Magnetosphere[1] CHRIS CRABTREE, Naval Research Laboratory, LEONID RUDAKOV, Icarus Research Inc., GURUDAS GANGULI, MANISH MITHAIWALA, Naval Research Laboratory — Whistler wave ray tracing in the inner magnetosphere using the full cold plasma dispersion relation is prone to producing drifts in frequencies that lead to inaccurate ray dynamics especially in the presence of both field aligned density structures (such as ducts and plasmapause boundaries) and sharp radial gradients in multi-species plasmas (such as ionospheric layers). The computation of accurate and quick ray trajectories are especially important for developing solutions to the wave kinetic equation including nonlinear (NL) effects such as induced scattering [1] where a large number of rays need to be time advanced and energy redistributed among rays. To facilitate such a calculation we have transformed the usual canonical ray tracing equations to an extended phase space Lagrangian framework and extended the variational symplectic integrator (VSI) [2] used for guiding-center dynamics to the ray tracing equations. The VSI conserves exactly a discrete Lagrangian structure and most importantly leads to bounds in the frequency drift that can develop.

[1] C. Crabtree, L. Rudakov, G. Ganguli, M. Mithaiwala, V. Galinsky, V. Shevchenko, Phys. Plasmas 19, 032903, (2012).
[2] H. Qin and X. Guan, Phys. Rev. Lett. 100, 035006 (2008).

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