Abstract Submitted
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An Experimental Concept for Probing Nonlinear Radiation Belt Physics[1] BILL AMATUCCI, GURU GANGULI, CHRIS CRABTREE, MANISH MITHAIWALA, CARL SIEFRING, ERIK TEJERO, Plasma Physics Division, Naval Research Laboratory — The SMART sounding rocket is designed to probe the nonlinear response of a known ionospheric stimulus. High-speed neutral barium atoms generated by a shaped charge explosion perpendicular to the magnetic field in the ionosphere form a ring velocity distribution of photo-ionized Ba+ that will generate lower hybrid waves. Induced nonlinear scattering of lower hybrid waves into whistler/magnetosonic waves has been theoretically predicted, confirmed by simulations, and observed in the lab. The effects of nonlinear scattering on wave evolution and whistler escape to the radiation belts have been studied and observable signatures quantified. The fraction of the neutral atom kinetic energy converted into waves is estimated at 10-12%. SMART will carry a Ba release module and an instrumented daughter section with vector wave magnetic and electric field sensors, Langmuir probes and energetic particle detectors to determine wave spectra in the source region and detect precipitated particles. The Van Allen Probes can detect the propagation of the scattered whistlers and their effects in the radiation belts. By measuring the radiation belt whistler energy density, SMART will confirm the nonlinear scattering process and the connection to weak turbulence.

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