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Abstract for an Invited Paper
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Nonlinear Whistler Wave Generation in Space Plasmas*

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In this talk, I'll present recent results on whistler wave generation by nonlinear induced scattering. Nonlinear induced scattering is a process that allows transfer of energy from one unstable mode ω_1 into another stable mode ω_2 and the particles that can satisfy the resonant condition. In our particular example, the nonlinear induced scattering of the whistler waves is achieved via lower-hybrid (LH) beat-wave coupling with thermal electrons. The LH waves are generated first by a cold but energetic ring ion distribution that is unstable to these waves [1]. Thus, this process acts as a saturation mechanism for the linearly unstable LH modes. This fundamental and interesting nonlinear mechanism is at the heart of the upcoming SMART experiment where LH modes will be converted to whistler modes via weak turbulence [2]. We present 2D PIC simulations with parameters close to those found in plasmas of the Earth's ionosphere at ˜500 km of altitude (where the SMART experiment will be performed). However, nonlinear induced scattering is a universal phenomenon in turbulent plasmas. We'll also discuss the linear instability of multiple ion rings leading to various beam and LH waves.

1. Soto, A. Rualdo, et al., *Phys Plasmas,* **27**, 122112, (2020). https://doi.org/10.1063/5.0025379

2. Ganguli, G., et al. (2019). *JGR: Space Physics*, *124*. https://doi.org/10.1029/ 2019JA027372. Crabtree, C., et al. (2012). *PoP* 19, https://doi.org/10.1063/1.3692092.

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