Contribution ID: **418** Type: **Oral**

Impact of Cosmic Ray Transport on Galactic Winds

Wednesday 9 August 2017 14:30 (15 minutes)

The role of cosmic rays generated by supernovae and young stars has very recently begun to receive significant attention in studies of galaxy formation and evolution due to the realization that cosmic rays can efficiently accelerate galactic winds. Microscopic cosmic ray transport processes are fundamental for determining the efficiency of cosmic ray wind driving. Previous studies focused on modeling of cosmic ray transport either via a constant diffusion coefficient or via streaming proportional to the Alfven speed. However, in predominantly neutral gas, cosmic rays can propagate faster than in the ionized medium and the effective transport can be substantially larger; i.e., cosmic rays can decouple from the gas. We perform three-dimensional magnetohydrodynamical simulations of patches of galactic disks including the effects of cosmic rays. Our simulations include the decoupling of cosmic rays from the neutral interstellar medium. We find that, compared to the ordinary diffusive cosmic ray transport case, accounting for the decoupling leads to significantly different wind properties such as the gas density and temperature, significantly broader spatial distribution of cosmic rays, and larger wind speed. These results have implications for X-ray, gamma-ray and radio emission, and for the magnetization and pollution of the circumgalactic medium by cosmic rays.

Author: FARBER, Ryan (University of Michigan, Ann Arbor)

Co-authors: Prof. RUSZKOWSKI, Mateusz (University of Michigan, Ann Arbor); Dr YANG, Hsiang-Yi Karen (University of Maryland, College Park); Prof. ZWEIBEL, Ellen (University of Wisconsin-Madison)

Presenter: FARBER, Ryan (University of Michigan, Ann Arbor)

Session Classification: Cosmic rays

Track Classification: Cosmic rays