Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Multiscale Processes Energizing Plasmas during Reconnection: 3D Simulations in preparation for the MMS mission[1] GIOVANNI LAPENTA, KU Leuven, MARTIN GOLDMAN, DAVID NEWMAN, University of Colorado — Magnetic reconnection is a mechanism to convert magnetic energy to particle energy in the form of heat and directed flows. We study here where reconnection and particle energization are found in full 3D models of a reconnecting plasma sheet. Three regions emerge as the primary loci of energy conversion: the separatrices [1], the dipolarization fronts [2] and the electron diffusion region near x-points[3]. We consider two scenarios: one where the exhaust from multiple x-lines forms a plasmoid (a flux rope in 3D) and one where the exhaust encounters pristine unreconnected plasma and forms a pile-up front. A key process intrinsically 3D, not present in 2D, is the development of an instability in the outflow leading to the formation of secondary reconnection sites [2] that further enhance energy conversion. The MMS mission of NASA was launched on March 12 of this year with the stated goal of finding these regions. We will soon know if we are right in predicting these additional regions of dissipation in the reconnection outflow. [1] Lapenta, G, et al. J. Plasma Phys 81.01 (2015): 325810109. [2] Lapenta, G. et al., Nature Physics, 20 July, 2015. [3] Goldman, M. V., et al., Space Sci Rev (2015): 1-38.

[1]Work supported by the NASA MMS Program and by the BOF funds of the KU Leuven. Simulations conducted on NASA Computing facilities, PRACE Tier-0 computing and at NERSC (DOE Office of Science User Contract No. DE-AC02-05CH11231).

Giovanni Lapenta
KU Leuven

Date submitted: 17 Jul 2015 Electronic form version 1.4