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Partition of Heating During Magnetic Reconnection: Role of Exhaust Velocity MICHAEL SHAY, COLBY HAGGERTY, University of Delaware, JAMES DRAKE, University of Maryland, TAI PHAN, University of California Berkeley, RUNGPLOYPHAN KIEOKAEW, University of Exeter, KITTIPAT MALAKIT, Thammasat University, Thailand — Understanding how magnetic reconnection heats the plasma and how the energy is partitioned between electrons and ions is an important problem that has recently become under intense scrutiny in both space and laboratory studies of reconnection. In the strong magnetic shear limit of magnetic reconnection (low guide field), the production of counter-streaming beams due to magnetic field line contraction plays an important role in heating the plasma. The contraction velocity or outflow velocity controls both the magnitude of the heating and partition of the heating between electrons and ions. However, although it is known that often the outflow velocity is less than the upstream Alfven speed, an understanding of why this is so is lacking. We show that the outflow velocity in reconnection is reduced by the ion exhaust temperature and derive a scaling relationship for this effect. Both kinetic PIC simulations and satellite observations are used to test this scaling prediction. The reduction in outflow speed is shown to be due to the firehose instability, which is suppressed for large guide field cases where the outflow speed matches the inflowing Alfven speed. This scaling for the outflow is then applied to a general theory for plasma heating during magnetic reconnection.

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