Abstract Submitted
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Kinetic-Scale Physics of Magnetic Reconnection in the MMS Era: Accomplishments and Future Challenges for Theoretical Research[1] PAUL CASSAK, West Virginia University, MICHAEL HESSE, University of Bergen, HAOMING LIANG, University of Alabama-Huntsville, HASAN BARBHUIYA, West Virginia University — The launch of NASAs Magnetospheric Multiscale (MMS) mission in 2015 transformed research into magnetic reconnection, the fundamental physics process during which the often abrupt change of magnetic topology leads to particle energization, plasma heating, and large-scale energy release from magnetic fields. This crucial process impacts a diverse set of phenomena on Earth and elsewhere in the universe, making major contributions to space weather, causing astrophysical eruptions, hampering magnetically confined fusion, and having potential applied uses in spacecraft thrusters. The veritable plasma physics laboratories embedded on the four identical MMS spacecraft have temporal resolution approximately 100 times faster than previous missions. This has ushered in a new era in which kinetic-scale physics, at and below the scale of the ion and electron gyroradius, is regularly measured during magnetic reconnection using Earths magnetosphere as a laboratory. In this presentation, numerous aspects of what has been learned in the MMS era about kinetic-scale physics of magnetic reconnection will be reviewed. Then, remaining theoretical challenges for understanding magnetic reconnection will be outlined and discussed.

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