



Wednesday
November 13, 2019
3:30 pm
Room 1005 EECS

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Substorms, Dipolarization, and Particle Acceleration in the Magnetosphere

Magnetosphere plasma dynamics continue to challenge our understanding of energy release in the near-earth environment. Magneto-hydrodynamics (MHD), particle-in-Cell (PIC), and test particle simulations are used to describe the dynamic evolution of the magnetotail, associated with substorms (energy releases from the magneto-tail) and other dipolarization events. Simulations show the formation of thin current sheets embedded in the wider plasma sheet due to solar wind interactions. PIC then demonstrates the onset of tearing instabilities and magnetic reconnection, causing fast plasma flows and dipolarization. These phenomena are then followed by MHD simulations which form the basis of test particle simulations, which provide details on acceleration mechanisms, and phase space distributions. Results compare favorably with THEMIS and MMS observations.

About the Speaker: Joachim Birn received his PhD. in 1973 at the Technical Univ. Berlin studying the Stability of the Planetary System. From 1973-82 he was at Ruhr-University Bochum working on equilibrium modeling and magnetohydrodynamic (MHD) simulations of the Earth's magnetotail. In 1980 he was a visitor at Los Alamos National Lab. (LANL), where he extended his 2D MHD code to 3D, simulating substorm dynamics of the magnetotail. From 1982 to 2012 he was at LANL continuing his simulation work, working on satellite data interpretation and studying acceleration of ions and electrons in magnetospheric substorms. Since 2012 he is a Senior Research Scientist at the Space Science Institute in Boulder. Birn's research experience includes 3D equilibrium theory, development of 3D MHD codes with applications to magnetotail and solar corona dynamics; and MHD stability theory on which he has published 260 refereed papers. Birn is a Fellow of the American Geophysical Union and LANL Fellow.