

Panels (P)

International Space Weather Missions and Coordination: Current and Planned Missions (PSW.9)

TOWARDS AN INTERNATIONAL GEOSPACE SYSTEMS PROGRAM (IGSP)

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The Earth's magnetosphere acts as a "System of Systems". Each magnetospheric system – the magnetotail, inner magnetosphere (itself a system of systems with plasmasphere, ring current, and radiation belts), magnetopause, magnetosheath, and ionosphere-thermosphere-mesosphere (another system of systems) – has its own dynamics and characteristics that can be, and have been, studied separately. The science of these studies has also provided valuable input into the operational applied science of Space weather. However, there is a clear need to examine how these systems interact with each other – how magnetotail dynamics are connected to ring current enhancements; how ionospheric outflow modifies magnetospheric response; how meso- and macro-scale reconnection and boundary waves regulates the transfer of energy from the solar wind and foreshock into the magnetosphere. This cross-scale, system science currently relies on ad-hoc and chance alignments of largely uncoordinated missions. Such fortuitous conjunctions are not sufficient to address how these mesoscale dynamics (1-3 RE in scale), that are both ubiquitous and central to magnetospheric dynamics, are driven and evolve. This would at the same time provide a highly valuable space weather constellation. Our ability to predict, quantitatively, how one part of the system-of-systems will respond to external drivers has unnecessary roadblocks because our space missions currently focus on one system at a time. A breakthrough in prediction and forecasting requires new observations of how the systems in the magnetosphere couple and interact. To address this "messenger scale" or "missing middle" of the mesoscales would involve multiple constellations of spacecraft in key regions, combined with remote imaging measurements, ground-based measurements, and advanced numerical modeling, all coordinated and working in concert to study Geospace holistically. This goes far beyond single instrument/observatory/mission or agency platforms, requiring broad international collaboration and coordination. To enable this vision, we have created a new COSPAR Task Group on establishing an International Geospace Systems Program (IGSP), the output of which will be a COSPAR scientific roadmap. In this talk we will summarize the science questions that are motivating our desire to create such a program, and outline our approach (and challenges) towards building community support and stakeholder engagement. How this can benefit the space weather community will also be presented.