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Resolving Current Systems in Geospace

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Electric currents flowing through near-Earth space ($R \leq 12$ Re) can support a highly distorted magnetic field topology, changing particle drift paths and therefore having a nonlinear feedback on the currents themselves. A number of current systems exist in the magnetosphere, most notably the dayside magnetopause Chapman-Ferraro currents, high latitude "region 1" field-aligned Birkeland currents, lower-latitude "region 2" field-aligned currents connected to the partial ring current, magnetotail currents, and the symmetric ring current. In the near-Earth nightside, however, several of these current systems flow in close proximity to each other and it is very difficult to identify a local measurement as belonging to a specific system. Such identification is important, however, because how the current closes and how these loops change in space and time governs the magnetic topology of the magnetosphere and therefore controls the physical processes of geospace. An international team is meeting at ISSI in Switzerland this winter to discuss this issue and develop a robust definition of current systems in geospace, as viewed from a variety of observational and computational analysis techniques. The consensus of this deliberation will be presented and the initial implications of these results will be discussed.