Mercury's dynamic magnetic tail

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The Mariner 10 and MESSENGER flybys of Mercury have revealed a magnetosphere that is likely the most responsive to upstream interplanetary conditions of any in the solar system. The source of the great dynamic variability observed during these brief passages is due to Mercury's proximity to the Sun and the inverse proportionality between reconnection rate and solar wind Alfven Mach number. However, this planet's lack of an ionosphere and its small physical dimensions also contribute to Mercury's very brief Dungey cycle, ~ 2 min, which governs the time scale for internal plasma circulation. Current observations and understanding of the structure and dynamics of Mercury's magnetotail are summarized and discussed. Special emphasis will be placed upon such questions as: 1) How much access does the solar wind have to this small magnetosphere as a function of upstream conditions? 2) What roles do heavy planetary ions play? 3) Do Earth-like substorms take place at Mercury? 4) How does Mercury's tail respond to extreme solar wind events such coronal mass ejections? Prospects for progress due to advances in the global magnetohydrodynamic and hybrid simulation modeling and the measurements to be taken by MESSENGER after it enters Mercury orbit on March 18, 2011 will be discussed.