Solar wind interaction with Earth's magnetosphere under radial IMF geometry

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Solar wind coupling with the magnetosphere starts at the foreshock, the region upstream of the quasi-parallel bow shock. The ion foreshock is a dynamic region dominated by linear and nonlinear plasma processes, where a variety of ULF waves, cavity structures and ion distributions coexist. We use global hybrid (kinetic ions, fluid electrons) simulations to study the solar wind interaction with the magnetosphere for a radial (θ_{vB}=0) IMF geometry. Global hybrid simulations provide a collective picture of processes taking place in the foreshock, bow shock and magnetosheath. Because ions are treated as particles, these codes also give information on ion-scale microphysics. Under radial IMF geometry the foreshock forms in front of the dayside magnetosphere, and the plasma convecting downstream is very perturbed. We study the origin and evolution of foreshock waves and density cavities, as well as their associated ion distributions. We investigate what happens to waves and cavities as they are transmitted through the shock into the magnetosheath and how they influence the magnetosphere. Due to reconnection and field draping large structures form in front of the magnetopause. These structures are characterized by density enhancements, and depressions of magnetic field magnitude. In some of them the temperature is lower than in the surrounding plasma. We investigate how these structures modify the magnetosheath and influence magnetosphere dynamics. Finally, simulation results are compared with observations.