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Particle-In-Cell PIC 3D and MHD simulations of the Earth's Bow show.

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Particles-In-Cell (PIC) and magnetohydrodynamics (MHD) 3D models are used to simulate Earth's magnetosphere under similar solar wind (SW) and north interplanetary magnetic field (IMF) conditions. The bow shock's position is found by both codes at a distance of $\sim$14.8 R_E along the Sun-Earth line, and $\sim$29 R_E on the dusk side, consistent with past *in situ* observations. Based on our comparison, running PIC and MHD models under similar input SW parameters elucidates the strengths and drawbacks of these approaches and demonstrates the use of both models in a complementary, rather than competitive, manner for a better understanding of magnetospheres.