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How do magnetic holes cross a bow shock? Results from the kinetic hybrid plasma model Menura

Pierre Henri[1,2], **Cyril Simon Wedlund**[3], Francesco Pucci[4], Etienne Behar[5,6], and Giulio Ballerini[7,8]

[1]Laboratoire Lagrange, Observatoire Côte d'Azur, Université Côte d'Azur, CNRS, Nice, France (pierre.henri@oca.eu)
[2]LPC2E, CNRS, Univ. Orléans, CNES, Orléans, France (pierre.henri@cnrs-orleans.fr)
[3]Cyril Simon Wedlund, Space Research Institute, Austrian Academy of Sciences, Graz, Austria (cyril.simon.wedlund@gmail.com)
[4]Institute for Plasma Science and Technology, ISTP-CNR, Bari, Italy (francesco.pucci@istp.cnr.it)
[5]Swedish Institute of Space Physics, Kiruna, Sweden (etienne.behar@oca.eu)
[6]Laboratoire Lagrange, Observatoire Côte d'Azur, Université Côte d'Azur, CNRS, Nice, France (etienne.behar@oca.eu)
[7]LPP, CNRS/Sorbonne Université/Université Paris-Saclay/Observatoire de Paris/Ecole Polytechnique Institut Polytechnique de Paris, Palaiseau, France (giulio.ballerini@lpp.polytechnique.fr)
[8]Dipartimento di Fisica, University of Pisa, Italy (giulio.ballerini@lpp.polytechnique.fr)

Linear magnetic holes (LMH) are magnetic field depressions in the solar wind found everywhere in the heliosphere and sometimes downstream of planetary bow shocks. LMH, with only very little rotation of the magnetic field **B** across the structure, are often considered as the evolutionary endpoint of mirror modes, thus retaining certain characteristics of their parent structure: embedded in a plasma with large temperature anisotropy, large plasma beta, anticorrelation between **B** and the plasma density. One question is how and under which conditions these large depressions may survive a shock crossing, as observations have recently shown that such a crossing is possible. In other words: what is the interaction between two nonlinear space plasma structures that both scale as the ion gyroradius? To answer this question, we present here the first hybrid simulations of the evolution of a LMH crossing the bow shock boundary of a medium-activity comet using the hybrid Particle-In-Cell (PIC) model Menura. We first create a LMH with mirror mode characteristics in the pristine solar wind and, then, convect it down toward a comet, through the shock, into the cometary magnetosheath. We study its morphology along its path, and how the magnetosheath is impacted locally and as a whole. This work also aims at preparing fundamental space plasma physics aspects of the upcoming multi-spacecraft Comet Interceptor mission.