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Dynamical features of the near-Hermean environment under different solar wind conditions

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The interaction between the interplanetary medium and planetary environments gives rise to different phenomena on several temporal and spatial scales. Here we use the Hilbert-Huang Transform (HHT) to characterize both local and global properties of Mercury's environment as seen during two MESSENGER flybys with different upstream solar wind conditions. Hence, we may infer that the near-Mercury environment presents some different local features with respect to the ambient solar wind, due to both interaction processes and intrinsic structures of the Hermean environment. Our findings support the ion kinetic nature of the Hermean plasma structures, with the magnetosheath being characterized by inhomogeneous ion-kinetic intermittent fluctuations, superimposed to both MHD fluctuations and large-scale field structure. We show that the HHT analysis allow to capture and reproduce some interesting features of the Hermean environment as flux transfer events, Kelvin-Helmholtz vortices, and ULF wave activity, thus providing a suitable method for characterizing physical processes of different nature. Our approach demonstrate to be very promising for the characterization of the structure and dynamics of planetary magnetic field at different scales, for the identification of boundaries, and for discriminating the different scale-dependent features of global and local source processes that can be used for modelling purposes.