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Mercury's plasma belt under different Interplanetary Magnetic Field: hybrid simulations results compared to in-situ measurements

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The presence of plasma belt and trapped charged particles region in the Mercury's inner magnetosphere has been questionable due to small dimensions of the magnetosphere of Mercury compared to Earth, where these regions are formed. However, early and recent numerical simulations of the solar wind interaction with Mercury's magnetic field suggested that a similar structure, consisting rather of quasi-trapped charged particles could be found also in the vicinity of Mercury. These simulated results have been recently confirmed by MESSENGER in-situ observations. We present a detailed analysis of the plasma belt structure of quasi-trapped plasma near the Mercury's surface and its characteristics and behaviour under different orientations of the interplanetary magnetic field. The plasma belt region is constantly supplied with solar wind protons via magnetospheric flanks and tail current sheet region. Protons inside the plasma belt region are quasi-trapped in the magnetic field of Mercury and perform westward drift along the planet. This region is well separated by a magnetic shell and has higher average temperatures and lower bulk proton current densities than surrounding area. On the day side the population exhibits loss cone distribution function matching the theoretical loss cone angle. Simulations results are also compared to in-situ measurements acquired by MESSENGER MAG and FIPS instruments.