PARKER SOLAR PROBE VENUS FLYBY CAMPAIGN: LATEST RESULTS.

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Introduction: In order for the NASA’s Flagship Parker Solar Probe (PSP) mission, to study the solar corona, it will fly closer to the sun than any spacecraft ever has by performing seven gravity assists at Venus [Figure 1]. These gravity assists provide a rare opportunity to study the induced magnetosphere and solar-wind interaction at Venus using the instrumentation aboard PSP. These gravity assists provide a rare opportunity to study the current induced magnetosphere and solar-wind interaction at Venus using the instrumentation aboard PSP. Venus’s upper atmosphere hosts several atomic species such as hydrogen, helium, oxygen, carbon, and argon, some of which are energized in the upper atmosphere to escape energies or ionized and carried away from the planet. What is special about Venus, as opposed to Mars, is that virtually all significant present-day atmospheric escape of heavy constituents is in the form of ions.

Results: Using the Fields experiment (FIELDS) and Solar Wind Electrons Alphas and Protons Investigation (SWEAP), we will present recent observations from the first 3 PSP Venus gravity assists, including the first high resolution in-situ electric field observations to ever have been measured at Venus. We will use the observed solar wind moments as upstream boundary inputs into a magnetohydrodynamic (MHD) model and present a global picture of the induced Venusian magnetosphere and the subsequent ion acceleration, as well as the magnetic topology throughout the first three flybys. For the third flyby, the Wide-field Imager for Parker Solar PRobe (WISPR) instrument observed the Venusian cloud deck, which we will discuss in context with Akatsuki as well as the ground campaign at Apache Point and Keck Observatories. We will also compare the PSP Venus flyby during the deep minimum of solar cycle 24 to previous observations downtail with VEX and PVO. Finally, we will also discuss the ongoing collaborations with BepiColombo and Solar Orbiter with respect to their Venus gravity assists.

Figure 1: An equatorial view of the Parker solar Probe Venus gravity assists. Top: Venus encountering the solar wind proton velocity; bottom: Venus encountering the interplanetary magnetic field (IMF). [Curry et al. 2020]
References:

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