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Investigating the relation between the measured solar wind speed and the extrapolated magnetic field configuration in the solar corona

Our understanding of the physics behind the origin and the evolution of the solar wind in the low/middle corona depends on our capability of gathering information on the characteristics of the solar wind and on its interaction with the magnetic field within this region. Despite the possibility of acquiring in situ measurements closer to the Sun provided by the Parker Solar Probe and the Solar Orbiter missions, the region below 10 solar radii remains still impenetrable. Our knowledge of this portion of the solar corona relies on the acquisition of remote sensing instruments and on models. This work aims at deriving new insights on the relationship between the configuration of the coronal magnetic field and the measured solar wind speed. We combined solar wind speed measurements obtained by exploiting the Doppler dimming technique using SOHO/UVCS and SOHO/LASCO-C2 data, with the configuration of the magnetic field lines derived by using the Wang-Sheeley-Arge (WSA) model starting from photospheric magnetic field measured. This statistical analysis has been done for different Carrington Rotations. In this work, we provide a detailed description of the used method and of the obtained results explaining how the same technique can be used on data acquired by other remote sensing instruments capable of measuring the outflow speed of the solar wind in corona such as Metis on-board Solar Orbiter and CODEX.

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