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Statistical study of the solar wind properties using the magnetic connectivity from in-situ measurements of Solar Orbiter extrapolated sunward the Solar Corona.

Jean-Baptiste Dakeyo[1,2], Alexis Rouillard[1], Milan Maksimovic[2], Victor Réville[1], Philippe Louarn[1], and Pascal Démoulin[2,3]

[1]IRAP, Observatoire Midi-Pyrénées, Université Toulouse III - Paul Sabatier, CNRS, Toulouse, France
[2]LESIA, Observatoire de Paris, Université PSL, CNRS, Sorbonne Université, France
[3]Laboratoire Cogitamus, 75005 Paris, France

Using the magnetic field properties in the interplanetary medium and near the Sun allows to trace back the trajectory of an in-situ observed parcel of solar wind. This kind of study has already shown around 1 AU an anti-correlation between the speed of the wind, and both the expansion factor of the flux tube and the magnetic field magnitude of the source (Wang & Sheeley 1990). In this study we apply the magnetic connectivity to the Solar Orbiter measurements from 0.3 AU to 1 AU, to trace back their source at the solar surface using ADAPT magnetograms. The nominal mission phase data are used (from the beginning of 2021). To better approximate the departure time of the plasma at the Sun and the location of its source, we constrain the trajectory of the solar wind using iso-poly modeling (Dakeyo et al. 2022) from the probe location until the source surface Rss. In addition, we aim to follow the classification of Maksimovic et al. 2020 and Dakeyo et al. 2022, to extrapolate sunward the magnetic condition of the different wind speed populations observed by Solar Orbiter. This statistical analysis shows that the correlation already observed at 1 AU mentioned above (bulk speed, flux tube expansion and magnitude of the magnetic field) are globally conserved getting closer the Sun between 0.3 AU and 1 AU. Depending the speed of the wind we are also able to estimate typical values of expansion factor, magnitude of the coronal magnetic field, the state of charge for each wind speed populations.