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Joint remote sensing-in situ measurements of solar wind plasma during the first Solar Orbiter-Parker Solar Probe quadrature

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On January 18, 2021, Solar Orbiter (SolO) and Parker Solar Probe (PSP) were for the first time in a special orbital configuration, that is, in quadrature. At this time when traveling along its orbit very close to the Sun, PSP has been crossing the atmosphere of the Sun at a distance just above $20 R_{\odot}$. Because of the continuous expansion of the solar corona, the plasma crossed by PSP, which is moving outward at a speed above $100-200 \text{ km s}^{-1}$ on the solar equatorial plane, is the same plasma observed with the Metis coronagraph just a few hours earlier at a distance of $3-7 R_{\odot}$ from the solar limb. It is, thus, the first time that the expanding coronal plasma - that is, the solar wind - fully characterized by observations remotely performed with Metis, encounters almost immediately in its way outward a suite of in-situ instruments that can directly measure its physical properties. This work deals with the joint SolO-PSP observations to study the transition of the solar wind plasma from the sub-Alfvénic solar corona to a region just above the Alfvén radius, thus aiming to investigate the evolution of the pristine solar wind not yet reprocessed by nonlinear interactions.

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