RECONSTRUCTING 3D SOLAR WIND STRUCTURES IN THE INNER HELIOSPHERE FROM STEREO DUAL VIEWS

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Heliosphere or interplanetary space is filled with various types of solar wind structures, which may significantly influence the space environment near the Earth and cause severe space weather. Traditionally, solar wind is learned and monitored through in-situ measurements of spacecraft at a limited number of locations, e.g., the Wind and ACE spacecraft at L1 point near the Earth, the STEREO twin spacecraft in the Earth orbit at 1 AU and the Ulysses spacecraft in the large elliptical orbit around 5 AU. This way can only obtain the in-situ solar wind properties rather than the overall distribution of solar wind in the heliosphere. Alternatively, large-scale solar wind structures in 3D may be reconstructed by using interplanetary scintillations (IPS) technique. However the spatial resolution and cadence of the reconstructed solar wind maps are quite low. In this work, we show a newly developed method to reconstruct 3D solar wind in the inner heliosphere by using imaging data from dual views. This method is established on the correlation analysis and model-free. By applying this method to real observations from STEREO twin spacecraft, which keep taking pictures with a cadence of 40 minutes from two angles of views, we find that the periodic pattern hidden in the small-scale solar wind transients can be retrieved and the large-scale CME structures can also be clearly reconstructed though some limitations exist. This method demonstrates its merit and potential in reconstructing and monitoring 3D solar wind structures in the inner heliosphere.