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Recurrent global structure of the out-of-ecliptic solar wind

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We use the coronal expansion factor model of Wang and Sheeley and the solar wind speed observed from Ulysses to study the out-of-ecliptic solar wind. The wind speed is calculated from the rate of magnetic flux-tube expansion factor obtained from the observed photospheric field maps using a conversion function that is determined by least-squares fit of all currently available data from Ulysses. Using the best-fit conversion function we investigate the global solar wind at all latitudes, from 90º south to 90º north, covering a 36-year period from 1968 through 2003. The results complement and expand upon earlier studies conducted with IPS and other in situ spacecraft observations. The rotationally averaged wind speed is a function of two parameters: the heliolatitude and the phase of the solar cycle. The out-of-ecliptic solar wind has a recurrent stable structure, the average wind speed varies like a sine square of latitude profile spanning more than 5 years during the declining phase and solar minimum in each solar cycle. Near solar maximum the structure of the out-of-ecliptic solar wind is in a transient state lasting 2 to 3 years when the stable structure breaks down during the disappearance and reappearance of the polar coronal holes. We also report on the Ulysses observations of the stable and transient structure.