Solar wind turbulence during the solar cycle deduced from Galileo coronal radio-sounding experiments

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Seven coronal radio sounding campaigns were carried out during the active lifetime of the Galileo spacecraft in the years 1994-2002. The observational data analyzed in the present work are S-band frequency fluctuation measurements recorded during the solar conjunctions at different phases of solar activity cycle 23, specifically: periods near solar maximum (3 conjunctions), near solar minimum (3 conjunctions), and during the ascending phase (1 conjunction). These data are all applicable to low heliocentric latitudes, i.e. to the slow solar wind. The mean frequency fluctuation and power-law index of the frequency fluctuation temporal spectra are determined as a function of heliocentric distance. The turbulence power spectrum tends to be flatter inside ca. 20 solar radii during all phases of the solar cycle. This coincides with a transition in the flow from the inner acceleration region to the outer region of constant velocity. The radial falloff rate of the mean frequency fluctuation is also invariant over the solar cycle, but the absolute level is typically higher at solar maximum compared with that at the minimum phase.