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Validity of stationarity in solar wind flows

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Using single-point measurements in space physics makes possible the study of a phenomenon only as a function of time. This means that we cannot have a direct access to information about spatial variations of a measured quantity. However, the investigation of the properties of turbulence and of related phenomena in the solar wind widely makes use of an approximation frequently adopted in hydrodynamics under certain conditions, the so-called "Taylor's hypothesis"; indeed, the solar wind flow has a bulk velocity along the radial direction which is much higher than the velocity of a single turbulent eddy embedded in the main flow. This implies that the time of evolution of the turbulent features is longer than the transit time of the bulk flow trough the spacecraft position, so that the turbulent field can be considered frozen into the solar wind flow. This assumption allows to easily associate time variations to spatial variations and stationarity to homogeneity. Here we investigate, by using a weak stationarity approach, at which time scale and under which conditions the hypothesis of stationarity, and then of homogeneity, of turbulence in the solar wind is well justified. We discuss the validity of the stationarity assumption in different solar wind conditions and on different timescales.