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Heliolatitude structure of the solar wind proton speed and density at 1 AU for heliospheric modeling

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The heliolatitudinal structure of solar wind proton speed and density varies with solar activity. A model of its variation with time is needed for heliospheric studies and modeling. It is important for the global heliospheric structure, allows for an assessment of ionization rates of neutral species in the heliosphere and interpretation of observations of the energetic neutral atoms and neutral interstellar atoms. Sokół et al. 2013 presented a model of the heliolatitudinal and time variations of solar wind structure based on results of the computer assisted tomography analysis of the solar wind speed enabled by remote-sensing observations of interplanetary scintillations, in-situ measurements from Ulysses, and in-ecliptic measurements from various missions gathered in the OMNI2 database. They determined the 3D structure of solar wind on a yearly time grid from 1990 to 2011. Now we increase the time resolution of the grid used in the model. Because of the weather conditions in Japan, where the interplanetary scintillation observations are carried out, the solar wind data sets contain systematic gaps. For the purposes of the increase of the time resolution of the model for heliospheric studies the method of filling of these gap is needed. We present a comparison of various methods of gap filling. We present results of the investigation of the procedures of reconstruction of the solar wind density with the use of the solar wind invariants published in the literature. Additionally we study various algorithms of extrapolation of the heliolatitudinal time series of the solar wind proton speed and number density in time.