

Spherical Harmonic Expansion of Solar Wind Speed

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The Institute for Space-Earth Environmental Research, Nagoya University has observed solar wind speed (SWS) by the interplanetary scintillation (IPS) method. Drs. Tokumaru and Fujiki have been constructing synoptic charts of SWS by the technique of Computerized Axial Tomography (CAT). SWS synoptic charts show the distribution of solar wind speed on the spherical surface surrounding the sun named "source surface"; the ordinate shows solar latitude and the abscissa shows Carrington longitude in the chart. We can get one synoptic chart during every one solar rotation called Carrington rotation. The spatial resolution of this chart is one degree for both in longitude and in latitude. We frequently found wide region of data gap in the chart, especially in high latitudes. In this paper, in the first, (1) we try to expand the SWS on the synoptic chart into spherical harmonic series ($N=0\text{--}90$, $M = 0\text{--}N$) and to calculate about (90×90) coefficients (A_{nm} and B_{nm}) of expansion series. And next, (2) we try to estimate continuously the SWS in both the direction of longitude and the one of latitude in the synoptic chart. It is found that this technique can estimate well the SWS, especially in low latitudes of chart.

Keywords: Solar Wind Speed, Source Surface, Spherical Harmonic Function