M24a **On optimized relation functions of solar wind plasma used in the IPS-MHD tomography and their long-term evolution**

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The IPS(Interplanetary Scintillation)-MHD(magnetohydrodynamics) tomography is a method we developed to determine three-dimensional MHD solution of the solar wind best matching the line-of-sight IPS solar-wind speed data (Hayashi et al., 2003). In each iteration step of this method, synthetic IPS observations are simulated in MHD steady-state solution, and the boundary map at 50 solar radii is then modified in a way such that differences between the computed and actual line-of-sight plasma speed will be reduced. In this iterative MHD method, the plasma density and temperature of solar wind are determined with empirical functions of solar-wind speed, $N(V_r)$ and $T(V_r)$, that were derived from data of Helios in-situ measurements within 0.5 AU in 1970s. The functions work reasonably well for numerically reproducing state of solar-wind plasma in earlier solar cycles, and the obtained solutions well agree with in-situ measurements at Earth and by Ulysses space probe. However, for recent years, specifically after 2006, these functions yield higher densities and lower temperatures than in-situ measurements indicate. To assess the background dynamics in acceleration and heating processes in the solar corona and characterize the differences between the simulated and actual solar wind plasma, we first optimize the empirical relation functions for each Carrington Rotation period. In this presentation, we will show the methodology for optimizing the relation functions and discuss their variations over three and a half solar cycles, from early 1970s.