



Multiple-point modeling the Parker spiral configuration of the solar wind magnetic field at solar maximum

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The interplanetary magnetic field (IMF) and the outflowing solar wind plasma are "frozen-in". Due to the Sun's rotation, the solar magnetic field lines are distorted into a configuration of so called "Parker spiral". Theoretically, the Parker spiral interplanetary magnetic field line can be simplified as Archimedes spiral. We statistically surveyed the long-period solar magnetic field configuration near Mercury, Venus and the Earth using Messenger, Venus Express (VEX) and Advanced Composition Explorer (ACE) observations during different solar activity phases of Solar Cycles 24. We found that the parker spiral angle is increasing from Mercury to the Earth and also correlated to solar activities. Our results can provide empirical coefficients of Archimedes and Parker spiral equation that depend on the solar wind velocity and the position from which the solar wind speed almost remain unchanged with distance. We found that there are some differences of solar wind magnetic field configuration during different years. By taking into account of four different points in the interplanetary space, we model the IMF line as Parker spiral configuration and a proximate Archimedes spiral configuration. However, there are some differences between Archimedes spiral configuration and Parker spiral configuration less than or equal to 1 au.