M26a Comparison of Observed and Computer-Simulated Interplanetary Magnetic Fields During Solar Cycles 21 and 22

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For the purpose of examining the approximations and the numerical scheme of the computer simulation of the three-dimensional time dependent structure of the coronal and interplanetary magnetic field (IMF) as well as of the solar wind flows, we compared the data set of the observed IMF complied as the Near-Earth Heliospheric data set of the National Space Science Data Center (NSSDC) of NASA from various data sets observed by many space crafts, with the simulated IMF near the Earth at about 1 AU during the period of solar cycles 21 and 22. The computer simulation of the IMF was done up to 1.5 AU by using the photospheric solar magnetic field observed at the John M. Wilcox Solar Observatory of Stanford Observatory from April, 1976 to October, 1996 as the surface boundary condition. Comparison was done by creating stack plot diagrams of radial Sun-Earth direction component of the observed and simulated IMF near the Earth as a function of time and of the solar Carrington longitude. Direction and strength of the observed and simulated IMF agree well with each other for the whole time interval between the solar cycle 21 and 22 except in the minimum phase between the solar cycles 21 and 22. In the solar minimum phase between the solar cycles 21 and 22, structure of the simulated IMF is almost symmetric with respect to the solar equatorial plane and its longitude dependence is small while the observed IMF has longitude dependence which is stronger than the computed one. In other words, the neutral sheet in reality in the solar equatorial plane has wavelike structure which is more conspicuous than the computed one. Since overall structures of the observed and computed IFM agree well with each other except this small discrepancy, we conclude that the general features of the approximations of the numerical scheme are adequate enough for our further study of the structure of the solar wind flows and the magnetic field of the heliosphere.