

LOW-FLUX SPATIAL STRUCTURES OF MEV PROTONS DURING QUIET PERIODS

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Time variations of 1-10 MeV/nucleon quiet-time populations of energetic protons and He nuclei between 1 AU and 10 AU are studied during the ascending part of solar cycle 21 as well as during quiet periods of SC 22 and 23. A comparison of the intensity profiles obtained by the IMP-8 satellite, Ulysses and Voyagers 1, 2, Pioneer 11 spacecraft are in reasonable agreement. The analysis of large decreases of the low-energy proton intensity observed in turn at Earth and various spacecraft reveals the existence of extensive empty spatial structures ("hollows") containing low fluxes. It should be noted that the value of magnetic field strength is also very low inside them. It is pointed out that these "hollows" are bounded by Archimedean spiral field lines and have a radial spread of at least 10 AU and about 60 degrees in ecliptic longitude. Four empty structures observed in 1978-81, and three in 1989 and 1999 are discussed. Based on these empty structures we attempt to obtain true energy spectra and to estimate the radial gradient of the low-energy particle background at distances 1-10 AU.