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Long term variations of magnetic multipoles of the sun

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457 3-D maps of the coronal magnetic field are constructed by the Radial-Field Model devised by myself and synoptic charts of the photospheric magnetic field (PMF) observed at the NSO, Kitt Peak in the state of Arizona during 1645 Carrington rotation (Aug. 17, 1976) and 2101 Carrington rotation (Sep. 5, 2010). In this procedure the scalar magnetic potential of the PMF is expanded into spherical harmonic series. 457 coefficients of each G_{nm} and H_{nm} , where $n = 0 - 90$, and $m = 0 - n$, are calculated. G_{10} corresponds to the magnetic dipole, and G_{nm} and H_{nm} are called as magnetic multipoles. The motion picture of the long term variations of G_{nm} is constructed during three solar activity cycles by these 457 G_{nm} . It is found, from this motion picture, that (1) the magnetic dipole component, G_{10} is more or less steady after its polarity change. (2) some of the magnetic multipole components, $m = 0$ and $n = m$, grow up after the shrink of the dipole component. The motion picture is useful for the understanding of the temporal variaion of G_{nm} .

Keywords: solar magnetic field, magnetic dipole, magnetic multipole, long term variation