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 Gnm and Hnm, where n = 0 – 90, and m = 0 – n, are calculated. G10 corresponds to the magnetic dipole, and Gnm and Hnm are called as magnetic multipoles. The motion picture of the long term variations of Gnm is constructed during three solar activity cycles by these 457 Gnm. It is found, from this motion picture, that (1) the magnetic dipole component, G10 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 variation of Gnm.

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