Properties and origin of Sun-as-a-star magnetic field

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The line-of-sight component of Sun-as-a-Star Magnetic Field (SSMF) exhibits a prominent periodicity of 27 days with its amplitude as low as ± 0.1 gauss during solar minimum period to ± 2.5 gauss during solar maximum period. This dependency of amplitude on solar cycle may imply that the observed non-zero SSMF represent the magnetic flux imbalance associated with the sunspot activity across the visible disk of the Sun. While this may be true of the larger amplitude variation, what contributes to the persistent non-zero SSMF, though with the reduced amplitude, observed during solar cycle minimum is still an open question. Closer look at the SSMF variation shows that the smaller amplitude variation is present even during solar maximum period. This may suggest the presence of a constant magnetic structure whose magnitude (the LOS component) is modulated by the solar rotation and hence contributing to the persistently observed low amplitude SSMF variation. In this context we present the analysis of the synoptic (Carrington) magnetic field maps of SOHO/MDI and SDO/HMI, particularly during the minima periods between solar cycles 23-24 and 24-25. The magnetic fields are averaged over a selected range of Carrington latitudes and compared them with the observed SSMF towards the goal of identifying the region contributing the SSMF. The time history of thus identified region in Carrington maps will help in addressing the above stated enigma. In addition to presenting this analysis, we will give a brief description about the instrument and laboratory characterization of a sun-as-a-star vector magnetometer.