Calculation of solar rotation rate using the magnetic field observation, and its long-term variation

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Space environment around Earth have been influenced by solar wind that is plasma which is released from the Sun. The plasma is explosively released by phenomena such as solar flare and CMD, and that exerts a huge damage to our planet and artificial satellite. This is called solar storm. In addition, the entire change in the solar wind is called space weather that has been studied in a variety of fields. There is a study of solar activity mechanism in one of the Solar-Terrestrial Environment prediction research.
The Sun it is known that the magnitude of the activity varies 11 year cycle. When activity is strong, it is called the maximum. Opposite, when weak, it is called the minimum. Along with it also varies the strong of solar wind occur many solar storms during the maximum phases. In addition it is reported that magnitude of the activity is different in every cycle. It is known that there is a correlation in the intensity of pole magnetic field and the solar activity in the next cycle when solar minimum period. So, knowing the pole magnetic field of the current minimum period is useful to predict the next solar cycle.
In this study, determine the parameters from solar magnetic field observation by the solar observation satellite SDO/HMI. The parameters (such as differential rotation, meridional flow and turbulent diffusion coefficient) are important for surface flux transport model calculations. We have developed a module that calculates the parameters of the sun from observed data by two differential ways (Local Correlation Tracking (LCT), Magnetic Element Tracking (MET)), using the actual data analysis. Compare the results to be estimated by LCT and MET, discussing about the differences and characteristics obtained two ways. Further, by analyzing the data up to now from launched (about 6 years), we report the results of consideration for long-term variation of the three physical parameters in the sun.

Keywords: Sun, Magnetic field observation, Rotation rate, Meridional flow

