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A study of solar-cycle variation of coronal rotation using the *SDO*/AIA 211 Å observations

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Abstract: We present the results of variation in the rotational profile of solar corona for the period from 2012 to 2017, covering the peak and descending phases of the Solar Cycle 24. There is a clear evidence of North-South asymmetry in the solar coronal rotation. For this work, we used flux modulation method analysis for the solar full disk images (SFD) obtained at 211 Å by the Atmospheric Imaging Assembly (AIA) telescope on board *Solar Dynamics Observatory (SDO)* space mission. The SDO has three scientific instruments namely, the Extreme Ultraviolet Variability Experiment (EVE), the Helioseismic and Magnetic Imager (HMI) and the Atmospheric Imaging Assembly (AIA). *SDO* mission was launched by NASA on 11 February 2010 aimed to study the dynamics of Sun's surface and its atmosphere. AIA filters cover 10 different wavelength bands, chosen to reveal key aspects of solar activity at different heights in the solar atmosphere. Solar full disc (SFD) images obtained at the extreme ultraviolet wavelength (EUV) 211 Å by AIA are available in different sizes: 512 × 512, 1024 × 1024 and others with a very less data gap.

In the present work, we used AIA 211Å images for the period from 2012 to 2017 with size of 512 × 512 pixels. To create a time series of averaged daily flux/intensity at all latitudes, we have considered pixel strips at the interval of 5 degree on both the hemispheres on SFD images. For this purpose, daily images for the aforementioned period at nearly fixed time are selected. All the data sets are subdivided into one year segments starting from the year 2012. The width of each rectangular strip is just two pixels while the length includes entire pixels on SFD at different latitudes. The strips on both the hemispheres at equal interval of 5 degree are selected to extract a time series of EUV intensity to estimate the autocorrelation coefficient. The peak of Gaussian fit to first secondary maxima in the autocorrelogram gives synodic rotation period. Our analysis indicates temporal variability of equatorial rotation as well as North-South asymmetry of the solar coronal rotation. Here, we will discuss the solar-cycle induced variations in these solar rotational profiles and their implications.