Characteristics of Low-latitude Coronal Holes near the Maximum of Solar Cycle 24 - DTU Orbit (29/12/2018)

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We investigate the statistics of 288 low-latitude coronal holes extracted from SDO/AIA-193 filtergrams over the time range of 2011 January 01–2013 December 31. We analyze the distribution of characteristic coronal hole properties, such as the areas, mean AIA-193 intensities, and mean magnetic field densities, the local distribution of the SDO/AIA-193 intensity and the magnetic field within the coronal holes, and the distribution of magnetic flux tubes in coronal holes. We find that the mean magnetic field density of all coronal holes under study is 3.0 ± 1.6 G, and the percentaged unbalanced magnetic flux is 49 ± 16%. The mean magnetic field density, the mean unsigned magnetic field density, and the percentaged unbalanced magnetic flux of coronal holes depend strongly pairwise on each other, with correlation coefficients $cc > 0.92$. Furthermore, we find that the unbalanced magnetic flux of the coronal holes is predominantly concentrated in magnetic flux tubes: 38% (81%) of the unbalanced magnetic flux of coronal holes arises from only 1% (10%) of the coronal hole area, clustered in magnetic flux tubes with field strengths >50 G (10 G). The average magnetic field density and the unbalanced magnetic flux derived from the magnetic flux tubes correlate with the mean magnetic field density and the unbalanced magnetic flux of the overall coronal hole ($cc > 0.93$). These findings give evidence that the overall magnetic characteristics of coronal holes are governed by the characteristics of the magnetic flux tubes.

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