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Features of the evolution of polar and non-polar coronal holes over the past 11 years

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This paper presents the results of the analysis of the dynamics of coronal holes on the Sun during the period May 13, 2010- May 13, 2021. In our study used images in the extreme ultraviolet in the Fe XII, XXIV line (193 Å) obtained with the Atmospheric Imager Assembly of the Solar Dynamics Observatory (AIA/SDO). To localize coronal holes and determine their areas, we used the Heliophysics Event Knowledgebase (HEK), which is available at http://www.lmsal.com/hek/hek_isolsearch.html. Information on coronal holes was extracted with the Spatial Possibilistic Clustering Algorithm (SPoCA). The separation of all coronal holes of the considered period into polar and non-polar ones showed that the daily total area of polar coronal holes increases at the minima of solar activity and decreases at the maximum of the cycle. This is consistent with the general concept of polar coronal holes as the main source of the solar dipole magnetic field. There is an asymmetry in the areas of polar coronal holes in the northern and southern hemispheres. It is shown that the areas of nonpolar coronal holes vary quasi-synchronous with the sunspot activity of the Sun, which suggests the existence of a physical connection between these two phenomena. Apparently, the nature of the magnetic fields of polar and non-polar coronal holes is different. Non-polar coronal holes are possibly very high loops that close through the corona in other regions of the Sun, while polar coronal holes extend far into the heliosphere.

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