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Automated identification of coronal hole from synoptic EUV maps

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Coronal holes (CH) are regions of open magnetic field lines in the solar corona and the source of fast solar wind. Understanding the evolution of coronal holes is critical for solar magnetism as well as for accurate space weather forecasts. We study here the extreme ultraviolet (EUV) synoptic maps at three wavelengths (195Å/193Å, 171Å and 304Å) measured by *Solar and Heliospheric Observatory/Extreme Ultraviolet Imaging Telescope* (SOHO/EIT) and *Solar Dynamics Observatory/Atmospheric Imaging Assembly* (SDO/AIA) instruments. The two datasets are first homogenized by scaling the SDO/AIA data to the SOHO/EIT level by means of histogram equalization. We then develop a novel automated method to identify CHs from these homogenized maps by determining the intensity threshold of CH regions separately for each synoptic map. This is done by identifying the best location and size of an image segment, which optimally contains portions of coronal holes and the surrounding quiet Sun allowing us to detect the momentary intensity threshold. Our method is thus able to adjust itself to the changing scale size of coronal holes and to temporally varying intensities. To make full use of the information in the three wavelengths we construct, a composite CH distribution, which is more robust than distributions based on one wavelength. Using the composite CH dataset we discuss the temporal evolution of CHs during the solar cycles 23 and 24.