



Determination of filling factors of Active Regions, Coronal Holes and Quiet Sun for the EIT archive 1997-2011

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In previous work, we have proposed a multi-channel unsupervised spatially-constrained multichannel fuzzy clustering algorithm (SPoCA) that automatically segments EUV solar images into Active Regions (AR), Coronal Holes (CH), and Quiet Sun (QS). This algorithm has been running in near real time on AIA data as part of the SDO Feature Finding Team Project since 2010, populating the Heliophysics Events Knowledgebase (HEK) with Active Region and Coronal Hole events.

After having corrected for the limb brightening effect, SPoCA computes an optimal clustering with respect to the regions of interest using fuzzy segmentation. The process is fast and automatic. Morphological dilation is employed to assemble neighboring bright AR cores into individual AR regions. Combining SPoCA's detection of AR, and CH on subsequent images allows automatic tracking and naming of any region of interest. We applied SPoCA on SOHO-EIT, SECCHI-EUVI, PROBA2-SWAP, and SDO-AIA, and show in particular the filling factors of AR/QS/CH as well as AR and CH mean intensity time series obtained from the full dataset of synoptic SOHO/EIT images taken between 1997 and 2011.

Such segmentation can be used for several applications. Filling factors of AR, QS, and CH can be included into (semi-) empirical models of the solar atmosphere, which can in turn feed models of solar EUV irradiance. Another application is the investigation of active longitudes as well as long-term statistical studies of AR and CH parameters.