Title: SUVI Thematic Maps: A New Tool for Space Weather Forecasting

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Abstract:
The new Solar Ultraviolet Imager (SUVI) instruments aboard NOAA's GOES-R series satellites collect continuous, high-quality imagery of the Sun in six wavelengths. SUVI imagers produce at least one image every 10 seconds, or 8,640 images per day, considerably more data than observers can digest in real time. Over the projected 20-year lifetime of the four GOES-R series spacecraft, SUVI will provide critical imagery for space weather forecasters and produce an extensive but unwieldy archive. In order to condense the database into a dynamic and searchable form we have developed solar thematic maps, maps of the Sun with key features, such as coronal holes, flares, bright regions, quiet corona, and filaments, identified. Thematic maps will be used in NOAA's Space Weather Prediction Center to improve forecaster response time to solar events and generate several derivative products. Likewise, scientists use thematic maps to find observations of interest more easily.

Using an expert-trained, naive Bayesian classifier to label each pixel, we create thematic maps in real-time. We created software to collect expert classifications of solar features based on SUVI images. Using this software, we compiled a database of expert classifications, from which we could characterize the distribution of pixels associated with each theme. Given new images, the classifier assigns each pixel the most appropriate label according to the trained distribution. Here we describe the software to collect expert training and the successes and limitations of the classifier. The algorithm excellently identifies coronal holes but fails to consistently detect filaments and prominences. We compare the Bayesian classifier to an artificial neural network, one of our attempts to overcome the aforementioned limitations. These results are very promising and encourage future research into an ensemble classification approach.