Title: Long term trends of the Mg II, Ca II K, and UV color indices

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Abstract:

Solar UV variability is a critical input to models of Earth's climate. By understanding solar UV variability we can apply this concept to Sun-like stars to better characterize habitable zones and model climates of their exoplanets. Lovric et. al (2017) used data from SOLSTICE (the Solar Stellar Comparison Experiment) on board the SORCE (Solar Radiation and Climate Experiment) satellite to define a UV color index that describes the UV radiation that affects the photochemistry of planets' atmospheres. The authors found that the UV color index shows a strong linear relation with the Mg II index, an indicator of solar activity. In order to investigate whether and to what extent, such linearity holds for previous solar cycles, when direct measurements of solar irradiance were not available, we compare UV color index and MgII index as obtained with different reconstruction techniques: the Naval Research Laboratory Solar Spectral Irradiance (NRLSSI) model, the Spectral And Total Irradiance Reconstructions (SATIRE), and the Empirical Irradiance Reconstruction (EMPIRE) model. These models are also compared to the UV composite by Deland et. al (2008). We found that all data sets show a linear correlation, although the slopes show differences, with a small deviation from linearity for the strongest cycles. Based on this finding, we also investigated the relationship between the UV color index and the Ca II K index, another proxy of solar activity for which measurements extend to longer temporal scales than the MgII index. As expected, there is also a linear relationship between the UV color index and the Ca II K index. However, the linearity of this relationship is much more scattered than that of the Mg II index.