Using Ground-Based Ca II K Images as a Proxy for Shorter UV

Angela M. Cookson *[angela.cookson@csun.edu] and Gary A. Chapman, San Fernando Observatory, California State University, Northridge.*

Solar irradiance impacts Earth's atmosphere and climate, but the effects of its variability are less-well understood. This is especially true of short wavelength ultraviolet (UV) radiation, the effects of which appear to be more significant than those of radiation at longer wavelengths. Understanding the underlying mechanisms and their effects begins with knowledge of the source and extent of this variability. To that end, we examine full-disk Ca II K images from San Fernando Observatory (SFO). Previous variability studies show that active region data obtained from these images, combined with data from the red continuum images, correlates well with satellite Total Solar Irradiance, especially SORCE/TIM (r^2=0.95). In addition, SFO's Ca II K correlates well with the Mg II index used as a proxy for UV radiation.

Here, we consider whether ground-based Ca K data can be used as a proxy for shorter UV wavelengths, with application to climate modeling.

Our approach examines spectral irradiance from UARS/SUSIM and SORCE/SOLSTICE combined with SFO Ca K data. Several studies use the 100+ year Mt. Wilson Ca II K index to infer spectral information at shorter UV wavelengths. This data set is invaluable, but ends in 1985; further study, using a more recent data set, will be instructive. The SFO K indices begin in 1988, continue to the present day, and include the most unusual solar cycle of the last 100 years and, certainly, since space-based measurements began in 1978.

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