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Abstracts

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Using modern data to understand historical solar observations

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Solar irradiance is one of the key external forcing agents of Earth's climate. To quantify the effect of its variability on climate, knowledge of past irradiance changes over as long periods of time as possible is required. As direct measurements are only available for less than a half-a-century, this necessitates reconstructions of irradiance with the help of models. The main driver of irradiance changes on climate-relevant timescales is the solar surface magnetism, and thus proxies of past solar magnetic activity are crucial for such reconstructions. One such proxy is the brightness of the Sun in the Ca II K spectral line. Images of the Sun in Ca II K have been taken since 1892 at different sites around the globe, with data from individual observatories covering different time intervals. Combining these data has the potential to give insight into changes in solar surface magnetism and thus irradiance over more than a century. However, such a combination requires accounting for differences in instruments and observational settings. One crucial issue is varying passbands among and across the various observational archives. To study the effect of different passbands on the Ca II K observations, we make use of the recent state-of-the-art data provided by the balloon-borne observatory Sunrise 3. Using high spectral-resolution Sunrise 3 data, we simulate different passbands used in historical archives and study the relationships between Ca II K intensity as would be observed with such filters. These results will allow a cross-calibration of various historical observations.

Peculiarities of the height and surface inhomogeneity of the magnetic field in the solar flare of November 5, 2004, observed in the H-alpha and FeI 6569 lines

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We investigate the solar flare of November 5, 2004 of medium power (M-class), using the chromospheric H-alpha line and the photospheric Fe I 6569.2 A line. The observational material was obtained at the AO KNU and is an Echelle Zeeman spectrogram, which was recorded on the WP3 ORWO photographic plate. One of the spectrograms of this flare was scanned by an Epson Perfection V 550 scanner and digitized taking into account the nonlinearity of both the photomaterial and

the scanner itself. It was found that the pattern of splitting of the photospheric line corresponds well to the weak field approximation (WFA), while significant deviations from WFA were found in the H-alpha line. This is most evident from the shape of the bisectors of the I $\pm$ V profiles and also from the fact that in the core of the line and its wings the magnitude of the specified splitting is different in magnitude. The inhomogeneity of the magnetic field is also evidenced by the fact that the ratio of the longitudinal component of B_LOS in the specified lines, more precisely B_LOS (H-alpha)/ B_LOS (Fe), was found to be within 0.35-0.7 outside the flare, but within 1.0-2.3 in the flare itself. This indicates a local enhancement of the magnetic field at the chromospheric level and is in good agreement with similar results obtained by other researchers.