MONITORING SOLAR ACTIVITY VARIATIONS USING HIGH-RESOLUTION SUN-AS-A-STAR SPECTROSCOPIC OBSERVATIONS WITH PEPSI

Ekaterina Dineva\textsuperscript{1,2}, Carsten Denker\textsuperscript{1}, Klaus G. Strassmeier\textsuperscript{1}, Ilya Ilyin\textsuperscript{1}, Alexei Pevtsov\textsuperscript{3}

\textsuperscript{1}Leibniz Institute for Astrophysics (AIP), An der Sternwarte 16, 14482 Potsdam, Germany
\textsuperscript{2}Institute for Physics and Astronomy, University of Potsdam, Karl-Liebknecht-Str. 24/25, 14476 Potsdam-Golm, Germany
\textsuperscript{3}National Solar Observatory, 3665 Discovery Drive, Boulder, CO 80303, USA

The Potsdam Echelle Polarimetric and Spectroscopic Instrument (PEPSI) is a state-of-the-art, thermally stabilized, fiber-fed, high-resolution spectrograph for the Large Binocular Telescope (LBT) at Mt. Graham, Arizona. Typically the LBT with its large light-gathering power feeds starlight to PEPSI. However, the spectrograph can also be fed with sunlight from the Solar Disk-Integrated (SDI) telescope. Synoptic solar observations with PEPSI/SDI produce daily spectra with high signal-to-noise ratio, providing access to unprecedented, quasi-continuous, long-term, disk-integrated spectra of the Sun with high spectral and temporal resolution. The observed spectra contain a multitude of photospheric and chromospheric spectral lines in the wavelength range of 380–910 nm. We develop tools to monitor and study solar activity on different time-scales ranging from daily changes, over periods related to solar rotation, to annual and decadal trends. Strong chromospheric absorption lines, like the Ca II K & H lines, are powerful diagnostic tools for solar activity studies, since they trace the variations of the solar magnetic field. Currently, we are developing a data pipeline for extraction, calibration, and analysis of the PEPSI/SDI data. Derivation of activity indices from these and other chromospheric spectral lines allows us to trace and evaluate the chromospheric magnetic field and its variability. Obtained time series will be compared to solar cycle models and activity tracers such as International Sunspot Number (SSN) and radio F10.7cm radio flux. The well established relation between solar calcium indices and UV flux variations motivates us to compare our results with total solar (spectral) irradiance data. Thus, enabling us to study solar activity trends manifested in the solar atmosphere and its contribution to Space Weather and its impact on Earth and the near-Earth environment. We present results for the Ca II K & H lines, including details of the wavelength and flux calibration. First results from the Ca II K line activity index are discussed in the context of synoptic full-disk images and magnetograms.