GROUND-BASED MONITORING OF THE VARIABILITY OF VISIBLE SOLAR SPECTRAL LINES FOR IMPROVED UNDERSTANDING OF SOLAR AND STELLAR MAGNETISM AND DYNAMICS.

S. Criscuoli[1], L. Bertello[1], D. P. Choudhary[2], M. DeLand[3,4], G. Kopp[5], A. Kowalski[1,5], S. Marchenko3,4, K. Reardon[1], [1]National Solar Observatory, 3665 Discovery Drive, Boulder, CO, USA - scriscuo@nso.edu; [2]San Fernando Observatory, California State University, Northridge, CA, USA; [3] Science Systems and Applications, Inc., Lanham, MD, USA; [4]Goddard Space Flight Center, Greenbelt, MD, USA; [5] Univ. of Colorado/LASP , 3665 Discovery Drive, Boulder, CO, USA.

Introduction: Long-term, high-cadence, measurements of stellar spectral variability are fundamental to better understand a wide variety of phenomena including stellar atmospheres properties and dynamos, evolution of the magnetic fields in stellar photospheres, convective motions, rotational periods and eruptive phenomena. These, in turn, are fundamental for the detectability of exoplanets, the characterization of their atmospheres and habitability, as well as understanding stellar magnetospheres and winds. The Sun, viewed as a star via disk-integrated observations, offers a means of exploring such measurements while also offering the spatially resolved observations that are necessary to discern the causes of observed spectral variations.

Solar spectral variations have been observed consistently over decades using space-based instrumentation, but these measurements typically encompass large spectral regions at coarse spectral resolution (not better than ~0.1 nm).

A few ground-based telescopes with the capability of monitoring the solar visible spectrum at high spectral resolution (R~100000) have been deployed in the last few years (e.g. PEPSI, HARPS, NEID). However, the main scientific goals of most of these instruments is to study stars and exoplanets, and solar observations are acquired mainly as a reference. Consequently, their technical requirements (instrumental and operational) are not necessarily ideal to monitor solar variations, especially over the solar-cycle temporal scales, with high photometric stability.

The goal of this white paper is to illustrate the scientific return and explore the technical requirements of a network of instruments devoted to monitoring disk-integrated, solar spectral variability at high spectral resolution and high photometric accuracy, in addition to disk-resolved observations in selected spectral lines, to complement stellar variability studies.

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