

MULTI-HEIGHT MEASUREMENTS OF THE SOLAR VECTOR MAGNETIC FIELD. Luca Bertello¹, Alexander Pevtsov¹, and Alexei A. Pevtsov¹, ¹National Solar Observatory, 3665 Discovery Drive, 3rd Floor, Boulder, CO 80303, USA, lbertello@nso.edu, aapevtsov@nso.edu, apevtsov@nso.edu.

Introduction: Over the last decade, significant advances in computational power combined with the development of more sophisticated numerical models of the heliosphere have made measurements of the solar vector magnetic field extremely relevant. These measurements are necessary for understanding the role of the solar magnetic field in nonpotential processes inherent to solar activity, such as solar flares. These measurements can also be combined into synoptic charts to be used as the main drivers for the most advanced 3-D coronal and heliospheric models. For almost 20 years the Integrated Synoptic Program at the National Solar Observatory has provided to the solar community, through its SOLIS/VSM instrument, unique full-Stokes measurements of the full-disk photospheric magnetic field and more recently full-Stokes chromospheric measurements as well. This achievement is expected to be greatly enhanced by a newly proposed ngGONG (next generation GONG) project, a ground-based global network of highly capable solar observations to study the Sun and its consequences on Earth. Once operational, ngGONG will provide measurements of the processes that drive the activity from the solar interior, the atmosphere, and throughout the heliosphere.

Newly developed magnetohydrodynamic (MHD) coronal models are now beginning to demand full disk vector magnetic field data with enhanced sensitivity to the transverse magnetic fields. In the future, routine well-calibrated vector magnetic fields in both the photosphere and the chromosphere will be required for space weather modeling, both research and in support of operational forecast. This improved performance is particularly important for the polar regions, where all current instruments fail to provide good sensitivity. This requirement is driven by the force-free condition adopted by some widely used models for extrapolating magnetic fields into the corona, and the need for a robust approach to the 180-degree ambiguity resolution for the direction of the transverse field. ngGONG will be designed to provide these required vector magnetic field data.

Specific techniques to construct reliable synoptic maps of the solar vector magnetic field will be discussed, with particular emphasis on the treatment of the polar regions and the possible use of combining vector and longitudinal measurements to improve the sensitivity in the quiet regions.