## Unexpected Frequency of Horizontal Oscillations of Magnetic Structures in the Solar Photosphere

Magnetic elements are well-known to cover the entire lower layer of the Sun's atmosphere, the photosphere. These magnetic structures and their associated dynamics can potentially explain long debated questions in solar physics, such as coronal heating and the acceleration of solar wind. The aim of this work is to study the coherent transverse oscillations observed in magnetic concentrations within the lower solar atmosphere with unprecedented statistical accuracy. Exploiting unmatched high-stability and temporal coverage of magnetograms acquired by the Helioseismic and Magnetic Imager (HMI) onboard of NASA's Solar Dynamics Observatory, we investigate the dynamics of small scale elements on the photosphere over the whole operational lifetime of the instruments, currently amounting to more than 10 years. More than 1 million magnetic elements are tracked in HMI magnetograms, at disk center, for an entire solar cycle to investigate the power spectra of their horizontal velocity perturbations. This frequency peak at  $\approx$ 5 mHz is found in the power spectra of horizontal velocity perturbations. Since magnetic elements are passively advected by the photospheric plasma, we suggest that the  $\approx$ 5 mHz dominant frequency may come from the cooperative interaction between different granules that apply forces to the magnetic elements.

Primary author: BERRETTI, M. (Università di Trento / Università degli Studi di Roma "Tor Vergata")

**Co-authors:** STANGALINI, M. (Italian Space Agency); VERTH, G. (Plasma Dynamics Group, School of Mathematics and Statistics, University of Sheffield); JAFARZADEH, S. (Max Planck Institute for Solar System Research / Niels Bohr International Academy,); JESS, D. B. (Astrophysics Research Centre, School of Mathematics and Physics, Queen's University Belfast/ Department of Physics and Astronomy, California State University Northridge); BERRILLI, F. (Università degli Studi di Roma "Tor Vergata"); GRANT, S. D. T. (Astrophysics Research Centre, School of Mathematics and Physics, Queen's University Belfast); DUCKENFIELD, T. (Astrophysics Research Centre, School of Mathematics and Physics, Queen's University Belfast); FEDUN, V. (Plasma Dynamics Group, Department of Automatic Control and Systems Engineering, The University of Sheffield)