PROGRESS IN MHD WAVE RESEARCH OF THE SOLAR ATMOSPHERE

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There is now a wealth of evidence of waves and oscillations observed in a wide range of parameters in the solar atmosphere. Our views have been considerably changed in light of the currently emerged high spatial and time resolution observations made available by ground-based (e.g. ROSA, IBIS) and space-based (e.g. SOHO, TRACE, STEREO, Hinode, etc.) instrumentations allowing us to perform magneto-seismology of MHD waveguides in the solar atmosphere (e.g. open and closed magnetic structures). We will review the recent progress made and the current status of these wave observations with particular focus on the most recently detected and extensively debated Alfvén waves.

Next, we will given an account of the latest theoretical challenges and interpretations of the observed wave and oscillatory phenomena within the framework of MHD. What is the origin of these periodic phenomena? Are solar global oscillations penetrating into the chromosphere, transition region or even into the corona? What is the role of the magnetic field in the wave and oscillatory coupling between the solar interior and atmosphere? What is the role of MHD waves in small-scale dynamics (e.g., spicule formation)? We will discuss aspects of the magnetic coupling in terms of waves and oscillations and review our current theoretical understanding about solar MHD waveguides. We will summarise how solar magneto-seismology evolved and how new data can be implemented for more accurate solar atmospheric diagnostics, including topics such us determining the geometry, fine structure and even the heating mechanism(s) of coronal loops.