Session 32: Solar Physics Division Special Session 0930–1200 (Plaza Ballroom)

32.01 PROSPECTS FOR THE SOLAR-STELLAR CONNECTION OUTSIDE THE OPTICAL RAINBOW: A MATTER OF RESOLUTION. T.R. Ayres, Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder.

The past several decades have witnessed the explosive development of astronomical observations outside the domain of classical optical astronomy, often utilizing rather unorthodox techniques. Neutrinos emitted from the heart of the Sun have been captured in vats of cleaning fluid, gamma-ray bursts have been detected from the direction of the Magellanic Clouds by satellites designed to monitor atmospheric nuclear weapons tests, and gravity waves from distant stellar cataclysms have been sought with giant sapphire crystals cooled to within a few degrees of absolute zero. Furthermore, radio arrays and X-ray observatories built to probe the most remote and ancient reaches of known space, have recorded microwave flares from nearby solar-type dwarfs and extended our knowledge of multimillion degree coronae from a single aspect of the solar-stellar connection--the magnetic metallization of late-type stars--and address the prospects for, and problems facing, future progress in that area. I will demonstrate that fundamental questions concerning the generation of stellar magnetic fields and impose spatial organization on the emerging flux cannot be answered without significant advances in our ability to study surface features on stars other than the Sun. Furthermore, direct imaging or pseudo-imaging techniques must be coupled with high-resolution spectroscopy in order to diagnose macroscopic motions in stellar magnetic active regions or in analogs of solar coronal holes. The influence of flows on the plasma energetics of the stellar outer atmosphere is an inescapable conclusion of recent solar spectroscopy that is only just beginning to be appreciated by those of us who study the chromospheres and coronae of other stars. The coarse spatial resolution that will be technically feasible in the next decade for examining the magnetic structures of nearby stars will be strongly complement the very detailed studies of the solar surface that will be obtained near the end of this decade by the Solar Optical Telescope. Nevertheless, the most important kind of resolution for the solar-stellar connection is the resolve that we astronomers must instill in our elected officials to strongly support efforts to understand the intricate workings of our Sun in the broader context of the late-type stars.

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32.03 Future Prospects for the Theory of Corona and Flares. JAMES A. IONSON, Lab. for Astronomy and Solar Physics, NASA/GSFC - One of the most exciting observational discoveries of this decade has been that tenuous x-ray emitting plasmas are surprisingly common, found in association with a variety of mechanically and/or radiatively active astrophysical systems ranging from the solar-coronal complex, early and late-type stars to accretion disks and active galactic nuclei. The logical supposition that will be adopted here is that the site of mechanical activity (differential rotation and convection) and/or radiative activity (bolometric luminosity) couples to and energetically maintains a spatially distinct yet contiguous site of x-ray activity (corona).

This presentation focuses upon the theory of quasi-steady energization and impulsive flaring of stellar corona. Specifically, I will first define the problem of stellar-coronal coupling in a manner that allows efficient interaction between observers and theoreticians. Secondly, I will identify different investigative strategies available to the theoretist and conclude with a discussion of how these studies provide an important foundation for an understanding of astrophysical coronae in general.

32.04 Future Prospects for the Theory of Solar-Stellar Winds. K. B. MACGREGOR, HAO/NCAR.

In this paper, the prospects for advances in the theory of mass loss from late-type stars are assessed by delineating several outstanding problems which must be solved if significant progress is to be made. We note that when the observational inferred properties of winds from stars in the cool portion of the HR diagram are compared against the predictions of existing theoretical models, a number of discrepancies become apparent. For example, in the case of the sun, thermally-driven solar wind models cannot satisfactorily account for the observed velocities and mass fluxes of high-speed streams--an indication of the necessity of energy addition to the flow by physical processes which are currently poorly understood. Likewise, most of the proposed acceleration mechanisms for the winds of cool giants and supergiants give rise to outflows having terminal velocities substantially in excess of the surface gravitational escape speed, in contradiction to observational results. These