

TOTAL SOLAR ECLIPSE OBSERVATIONS: FILLING A CRITICAL SCIENCE GAP FOR IDENTIFYING THE SOURCES OF THE SOLAR WIND

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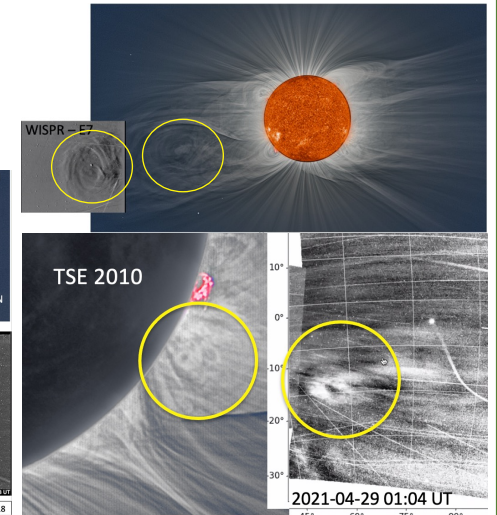
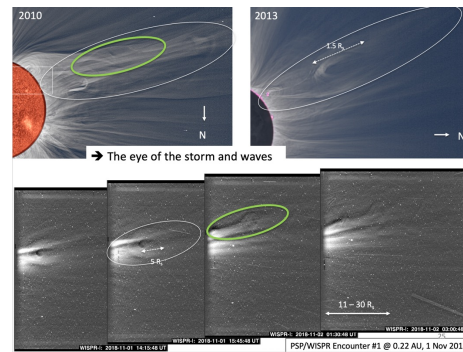
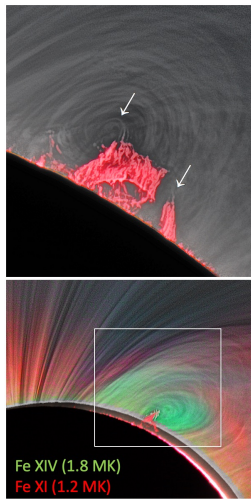
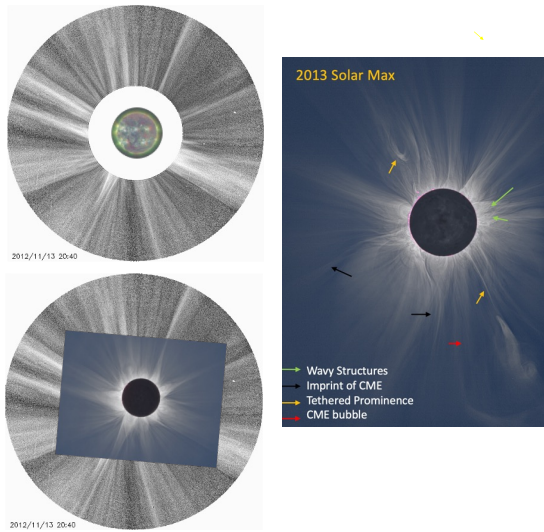
LINKS IN THE CRITICAL SCIENCE GAP

PREPONDERANCE OF TURBULENCE, WAVES AND INSTABILITIES IN THE LOW CORONA, INVARIABLY PRESENT IN THE IMMEDIATE ENVIRONMENT OF PROMINENCES, MANIFESTED IN-SITU AS WAVES, TURBULENT STRUCTURES, LOW IONIZED IONS & NEUTRALS

Prominence-corona connectivity

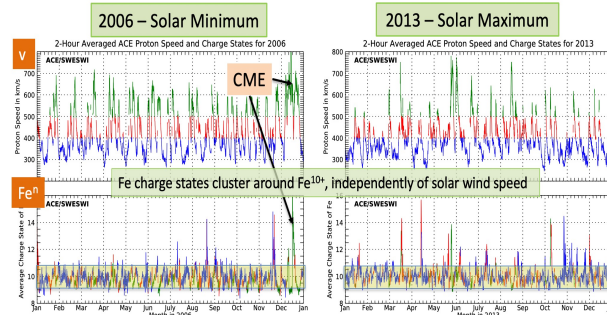
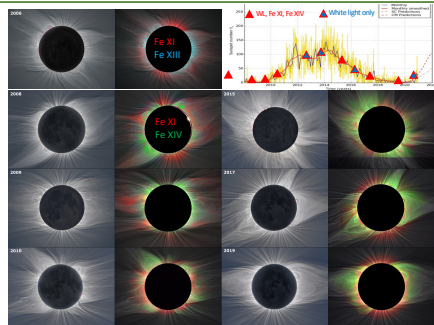
Hot prominence shroud

Complexity of CMEs, and origin of waves & turbulent structures in-situ (comparison w/ WISPR)



MULTI-WAVELENGTH ECLIPSE OBSERVATIONS OF Fe XI (Fe^{10+}) & Fe XIV (Fe^{13+}) COMBINED WITH Fe^{10+} , Fe^{13+} IN SITU CHARGE STATES, STRADDLING 2 SOLAR CYCLES: 2006 – 2020

SUMMARY: INSIGHTS FROM TOTAL SOLAR ECLIPSE OBSERVATIONS



THE DYNAMIC/TURBULENT WIND AND OUTWARD PROPAGATING WAVES ARE DRIVEN BY PROMINENCE ERUPTIONS AND CMEs
THIS WIND IS CHARACTERIZED BY THE SPORADIC APPEARANCE OF HIGH FE CHARGE STATES OF DIFFERENT SPEEDS, AND NEUTRALS AND LOW IONIZED ATOMS, DRIVEN BY PROMINENCE DYNAMICS AT THE SUN

THE STEADY SOLAR WIND BOTH FAST AND SLOW IS CHARACTERIZED BY A CONSTANT T_e AT THE SUN, ORIGINATING FROM ALL LATITUDES NOT LIMITED TO CORONAL HOLES, LEADING TO Fe^{10+} DOMINANCE IN-SITU

- Ubiquitous Fe XI (Fe^{10+}) emission at 1.2 MK from open field lines not limited to CHs & independent of phase within a solar cycle
- T_e at the source of open field lines constrained to 1.2 MK

- Fe^{10+} freezes-in around $1.4 R_s$
- Fe^{10+} ions (= Fe XI coronal emission in the corona) are the dominant charge state in the steady solar wind independently of wind speed
- High charge states associated with CMEs

REFS: Habbal + ApJL 911 (2021), Alzate +, ApJ 848 (2017), Druckmuller + ApJ 785 (2014)