Measuring Coronal Density with the CoMP Instrument

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The Coronal Multi-channel Polarimeter (CoMP) combines a filter and polarimeter to measure polarization in two wavelengths simultaneously. The filter can be tuned to FeXIII lines at 1074.7 and 1079.8 nm, and HeI at 1083.0 nm, sampling many wavelengths for each line. This can provide intensity, LOS velocity, line width, POS linear polarization and LOS magnetic field in images of the entire corona from 1.05 to 1.4 Rsun with 4.5 arcsecond pixels. This poster focuses on measuring the coronal density.

The ratio of intensities of the FeXIII 1074.7 and 1079.8 nm lines is a density diagnostic. It is reasonably insensitive to temperature for this purpose.

Chevalier and Lambert (1969)
Flower and Pineau des Forets (1973)

The ratio is around 1.5 near the limb, when W is 0.3. At greater heights, as W goes toward 0.1, the ratio is around 3.0. From Flower and Pineau des Forets (1973), this range corresponds to $N_e$ of 10$^9$ to 5 x 10$^7$ cm$^{-3}$.

$W$ is the radiative transfer filling factor. $W$ of 0.5, 0.3, 0.1 correspond to heights of $R/R_{Sun}$ of 1.00, 1.09 and 1.65.

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CoMP has been permanently installed at the Mauna Loa Solar Observatory in Hawaii. The instrument scientist, Steve Tomczyk, is there now performing final adjustments and tests prior to commissioning the instrument for daily operations. CoMP is becoming an important part of the suite of instrumentation observing the Sun as part of the High Altitude Observatory's facility at MLSO.