Project Details

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Project Title:
Solar EUV Variability Modeling with CHIANTI

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Summary:
A principal component of NASA's LWS program is to understand the mechanisms of solar EUV variability and its effect on the Earth. NASA recently selected the EVE investigation to observe and model solar variability within the SDO program. The EVE investigation makes use of the NRLEUV physics-based model for solar EUV variability studies. This model is in turn largely based on the CHIANTI database for astrophysical spectroscopy. CHIANTI currently incorporates essentially all publicly available excitation and radiative rates for modeling the necessary solar EUV optically-thin emission lines. However, the ability to model the solar spectrum accurately is limited by at least two factors that we will attempt to correct with the work proposed here. First, atomic data for a number of strong lines, particularly at X-ray wavelengths, need to be incorporated into CHIANTI. Second, the differential emission measures derived from lines of different iso-electronic sequences often do not agree to within unexpectedly large factors. This can almost certainly be traced to errors in the ionization equilibria used to model solar spectral line intensities. We will review the available ionization and recombination rates, including the latest calculations and measurements. Of particular importance is the inclusion of the density sensitivity of dielectronic recombination which is not included in recent calculations of ionization balance. These rates can be reduced by a factor of about 10 at coronal densities as compared with the low electron density rates commonly used. We will calculate new ionization equilibria based on the best currently available atomic data and determine their ability to improve solar EUV variability modeling.

Publication References:

Summary: ''

Reference: Dere, Ken NRL - Solar EUV Variability Modeling with CHIANTI

Summary: no summary

Reference: Landi, E.; Dere, K. P.; Young, P. R.; del Zanna, G.; Mason, H. E.; Landini, M.; (2005), Recent developments of the CHIANTI database in the X-ray wavelength range, X-RAY DIAGNOSTICS OF ASTROPHYSICAL PLASMAS: Theory, Experiment, and Observation. AIP Conference Proceedings, Volume 774, pp. 409-414 (2005), doi: 10.1063/1.1960962