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This is the home of the Solar EUV Irradiance Working Group

The aim of the Working Group is to produce an absolutely calibrated measure of the solar EUV irradiance, and to provide a long-term record of the solar EUV irradiance and its variability.

This is accomplished by validating the EUV irradiance products from various instruments, understanding their calibration and degradation.

What we mean by Calibration

Understanding and correcting for the time/exposure dependant Instrument Response Function and quantifying the uncertainties in each step of the process.

Background

The solar **E**xtreme **U**ltra**v**iolet (EUV) radiation is totally absorbed in the Earth's atmosphere and drives the photo-chemistry of the Earth's (and other planets) upper atmosphere. Even though the EUV is only a small fraction of the total solar irradiance, it is highly variable on many time scales from minutes (solar flares), hours (flares and active region evolution), days (solar rotation modulation) and years (the 22 year magnetic cycle). The amount of variability depends on the wavelength (and hence temperature) we are looking at. The Total Solar Irradiance variation over an 11 year cycle is ~0.1%. In the mid-UV (200 – 300 nm) the variability is ~1.5% , at Lyman- (121.6 nm) it is almost a factor of 2, and at the shorter EUV wavelengths the solar cycle variability is a factor of 10 – 100. We do not know yet if there are longer-term trends, i.e. is a quiet-Sun spectral irradiance a constant. This is something we hope to help understand with this work.

The Solar radiation below 200 nm consists of emission lines superimposed on a rapidly declining continuum. These emission lines arise in higher temperature layers of the outer solar atmosphere and are strongly related to the magnetic activity of the Sun. Understanding this relationship between magnetic morphology and EUV spectral irradiance is one of the overarching goals of this work.

As this radiation is absorbed in the atmosphere it drives the temperature structure and ionization state of the upper atmosphere. In a modern technological world this has impacts on things such as GPS accuracy, high-frequency communications (used by aircraft) and satellite orbits. These types of effects are know as Space Weather, and understanding these effects is becoming increasingly important.

The Problem

Due partly to the importance of space weather, we now are in the fortunate position to have several instruments measuring the solar EUV irradiance at the same time. The problem is that the irradiances reported by the various instruments do not always agree within the uncertainties claimed by the instrument teams. This is very similar to the discrepancies found in the total solar irradiance community, though we are not even starting to approach the 100 ppm quoted accuracies of those measurements.

Measurements in the EUV are very difficult. The high-energy photons tend to degrade anything they hit, making material choices and instrument / spacecraft cleanliness imperative. even so, filters and detectors degrade with time, and understanding the degradation is an important goal of the present work.

There are few facilities that can provide absolute calibration of the instruments (the NIST SURF, BESSY and NSLS synchrotron sources being the ones most often used)

Members

The working group currently comprises members from most of the current and past EUV Instruments, and various standards organizations.

If you would like access to data and analysis programs please e-mail me:

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Navigate space