The Spectral Irradiance Monitor (SIM) measures solar spectral variability in the 200-2400 nm range, accounting for about 97% of the total solar irradiance (TSI). This instrument monitored the descending phase of solar cycle 23 and is now continuing these observations in the rising phase of cycle 24. The SIM observations clearly show rotational modulation of spectral irradiance due to the evolution of dark sunspots and bright faculae that respectively deplete and enhance solar radiation. In addition to this well-known phenomenon, SIM observations indicate a slower evolutionary trend in solar spectral irradiance (SSI) over solar cycle time periods that are both in and out of phase with the TSI. Wavelengths where the brightness temperature is less than \( T_{\text{eff}} = 5770 \) K are in phase, and where the brightness temperature \( > T_{\text{eff}} \) in the visible and infrared the time series show an anti-solar cycle trend. To understand this observation, radiant output from solar structures such as sunspots and bright facular regions is calculated using the Solar Radiation Physical Modeling (SRPM) program. The Precision Solar Photometric Telescope (PSPT) provides the area of these features on the solar disk as function of time to generate a modeled SSI time series that is concurrent with the SIM observations. A comparison of the modeled and measured irradiance shows that the offsetting trends seen in SIM are reproduced in the current SRPM time series, but its magnitude is smaller than the observation suggesting that the solar cycle evolution of active regions alone cannot account for the trends observed in SIM.