Solar Activity and Responses Observed in Balmer Lines

Sergey Marchenko [sergey.marchenko@ssaihq.com]¹,², Serena Criscuoli ³, Matthew DeLand ¹,², Debi Prasad Choudhary⁴, and Greg Kopp ⁵

¹ Space Science Systems and Applications, Inc. (SSAI), Lanham, MD, USA
² NASA Goddard Space Flight Center (GSFC), Greenbelt, MD, USA
³ National Solar Observatory, Boulder, CO, USA
⁴ San Fernando Observatory, California State University – Northridge, CA, USA
⁵ University of Colorado / LASP, Boulder, CO, USA

The ~daily solar irradiance measurements made by the Aura/OMI and Sentinel-5P/TROPOMI instruments are capable of observing subtle variations in solar absorption features such as hydrogen Balmer lines, using the core-to-wing ratio method that provides stable measurements despite possible instrument degradation, as previously developed for the Mg II and Ca II features. Analysis of these data shows that, on 27-day solar-rotational timescales, the upper-Balmer series lines closely follow changes in the total solar irradiance, thus diverging from the behavior observed in other chromospheric-sensitive transitions. This behavior persists through both active- and quiet-Sun epochs.