

Modeling the Spectral and Total Irradiance from Solar Atmospheric Structures

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Currently, several research groups model the solar irradiance through the identification of typical structures found on the solar surface. These methods construct the solar irradiance spectrum and the TSI by assembling the contributions depending on the characteristics of the structures associated with each pixel. The link between dynamo theory and solar irradiance is currently hampered by the lack of physical understanding of the origin and evolution of the magnetic field structuring and of how this affects the temperature and density distribution in the solar atmospheric structures that contribute to the irradiance spectrum.

Modeling of solar atmospheric structures physical properties allows the linking of spatially resolved observations of the solar spectrum with measurements of the solar spectral and total irradiance. However, an important missing link is the understanding of how the magnetic field physically determines or is determined by these structures. The answer to this question will be found when high spectral, spatial and temporal resolution observations are combined with realistic MHD and plasma simulations that allow for quantitatively interpreting such complex data. Currently, Hinode observations and magneto-convection simulations are making progress in that direction, but there is still much progress to be done.