Hinode-3: 3rd Hinode Science Meeting
Hitotsubashi Memorial Hall, Tokyo
1–4 December, 2009

Solar irradiance variations related to intensity and magnetic flux of solar features

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Abstract. Solar total and spectral irradiance have been measured since late 1978. These measurements have demonstrated that solar irradiance changes from minutes to the 11-year solar cycle. Considering the astrophysical and climate importance of irradiance variations, considerable efforts have been put forward to develop irradiance models to explain the origin of irradiance variations and have information for those time intervals when measurements don't exist. However, most of the current models are simple empirical models, using the Photometric Sunspot Index to describe the darkening effect of sunspots and either the CaK index or the Mg II h & k core-to-wing ratio to describe the facular excess flux. While these models can explain reasonably well the short-term variations, long-term variations over years to the cycle are not well-accounted. Since the SOHO era we have combined the MDI intensity images and magnetograms to account for the effect and the role of active region evolution to irradiance variations. Similar studies have been done routinely at the San Fernando Observatory, California State University. More recently we have used the SPM data from NSO Kitt Peak to deduct various activity components, and new efforts at UCLA are in progress to develop a sophisticated method to identify various features. Using observations by HINODE we can have further insight into active region evolution, especially during this deep and long solar minimum when sunspots appear individually and we can easily calculate their contribution to irradiance changes. In this paper we compare data derived from various images and compare them to irradiance variations. One of the main goals is to identifiy weak magnetic fields and estimate their contribution to irradiance

changes. We will study cycle 23 in detail, and will discuss how the used methods and techniques can be applied to the HINODE observations and HMI on SDO.