Error analysis of the long term Mg II index from SCIAMACHY, GOME and GOME-2

Abstract:

The Mg II index is a (core to wing) ratio of the chromspheric emission core at 280 nm to the wing absorption of photospheric radiation [Viereck et al., 2004]. The Mg II index is a common proxy, reason being that it is just one number and simple to measure. It also correlates extremely well with spectral solar irradiance at many UV wavelengths. This proxy composed of many satellite data-sets has a long record reaching back to the late 1970s. Furthermore it is not possible to have similarly long record of the solar spectrum available at all wavelengths. In this work errors are determined for the daily Mg II indices. So far none of the Mg II indices have an error associated to it. This is the first attempt to provide an error estimation of the Mg II indices from SCanning Imaging Absorption spectroMeter for Atmospheric CHartograpHY "SCIAMACHY", Global Ozone Monitoring Experiment "GOME" and Global Ozone Monitoring Experiment-2 "GOME-2". We provide the error analysis taking into account the optical degradation of the instrument over time. Such errors enable us to estimate the uncertainties caused by the degradation of the satellite exposed to harmful radiation in space. Error propagation is the technique used to derive a simple error calculation model. This is applied on GOME [1995-2011], SCIAMACHY [2002-2012] and GOME-2 [2007-until today] data sets. Calculated errors for all the three satellites are not constant but vary over time (magnitude of the errors increase as sensor ages). These results have enabled us to estimate the long term stability of the Mg II index time series.