

Modelling Stratospheric Ozone Variability with the MOnTe CARlo Spectral Solar Irradiance Model (MOCASSIM)

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I will briefly introduce the MOnTe CARlo Spectral Solar Irradiance Model (MOCASSIM), a model developed at the Université de Montréal for spectral irradiance modeling in near- and mid-ultraviolet. Its reconstructions cover the spectral range between 150 and 400 nm, and the temporal range between 1610 up to present, on a daily basis. The model includes four components: sunspot darkening, facular brightening, a stochastic contribution from the network, and a slowly varying quiet Sun component. I will discuss a recent comparison study showing that our reconstructions agree within 5-10% with four other extant reconstruction models. I will then present a reconstructed spectrum averaged over the year 1680, during the Maunder minimum, and another spectrum averaged over March 2009, during the minimum between cycle 23 and 24. A comparison between the two shows that, according to our model, the ultraviolet irradiance was slightly higher during the last minimum than during the Maunder Minimum, because of remaining magnetic structures such as faculae. These spectra have been used in a simple stratospheric photochemistry model to evaluate the difference in chemical abundances in the stratosphere between these two levels of activity. I will discuss the simulations we performed using different reconstructed and observed solar spectra in order to compare the resulting variability in stratospheric ozone concentration. These calculations were made for different periods of time, including the ascending phase of cycle 22, descending phase of cycle 23, and the difference between the year 1680 and March 2009, as previously mentioned.