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On the use of Fourier analysis power spectra to identify temporal connections between total ozone gain and solar UV radiation increase

S. Dikty (1), J.A. Pagaran (1), M. Weber (1), J.P. Burrows (1)
(1) Institute for Environmental Physics, University of Bremen

Being the ultimate source of energy, the sun influences the thermal structure, dynamics and the chemistry of the Earth's middle atmosphere. UV solar radiation is considerably absorbed by stratospheric ozone. If the UV radiation levels alter it is likely that stratospheric and mesospheric ozone and other trace gases formed by photolysis are altered as well (direct radiation effect). However, it is difficult to make out a definite physical and temporal connection between the ozone production and a variation of ozone due to a dynamical response of the solar variability to the trace gas contribution (indirect effect).

With recent advances in global observations of atmospheric composition and solar output from different satellite platforms, a better understanding of interactions between solar activity and ozone chemistry may be achieved. Two instruments, GOME (Global Ozone Monitoring Experiment) aboard ERS-2 and SCIAMACHY (Scanning Imaging Absorption Spectrometer for Atmospheric Cartography) aboard ENVISAT, have been launched in 1995 and 2002, respectively. To detect the spatial and temporal extent of connections between an increase in solar UV radiation and ozone production, we perform a textbook Fourier analysis to time series of total ozone from GOME (1996-2002) and height resolved SCIAMACHY limb ozone data to detect a solar signal in short-term variations (27-day solar period and diurnal variations).