Solar Activity observed by means of OH*-Temperature Fluctuations utilising the Differential Rotation of the Sun

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Nocturnal temperatures are almost continuously derived from OH* (3-1) near infrared emissions in the upper mesosphere (around 87 km) above a midlatitude station in Europe (Wuppertal 51°N, 7°E) from ground based measurements. The time series analysed covers the time interval from 1987 until 2005 and consists of more than 4000 well documented night mean temperature data. Seasonal and longer term trends are removed from the data and OH*-temperature fluctuations on temporal scales of about 3-50 days are derived. Various spectral analysis techniques (harmonic analysis, maximum entropy method and the wavelet transform) are applied.

Due to the Sun's rotation the irregular pattern of sunspots on the solar disc leads to OH*-temperature fluctuations. Besides components around the well-known 27 day signatures pronounced spectral signals around 35-40 days are frequently observed. They seem to occur predominantly around spring and autumn, respectively. We tentatively attribute these signatures to the differential rotation of the Sun: Sun's equatorial regions rotate faster (taking only about 27 days) than the polar regions (about 35 days). Tracking the intensity of the 35-40 day component therefore allows to directly monitor the solar sunspot cycle.