Contribution ID: 85

Solar activity parameters do not follow each other: What happens in the solar atmosphere?

Wednesday 18 September 2024 11:50 (20 minutes)

The Sun experienced a period of unprecedented activity during solar cycle 19 in 1950s and 1960s, now called the Modern Maximum (MM). The decay of the MM has changed the Sun, the heliosphere and the planetary environments in many ways. However, this decay may not have proceeded synchronously in all solar parameters. One of the related key issues is if the relation between the two long parameters of solar activity, sunspot number and the solar 10.7cm radio flux, has remained the same during this decay.

Here we use the 10.7cm radio flux, sunspot numbers and several other, independent measures of solar activity in order to study their mutual relations during the decay of MM. We find that, during this overall decay, the 10.7cm radio flux increases relative to sunspot numbers. This is supported by found other radio fluxes measured independently in Japan. All five radio fluxes depict an increasing trend with respect to the sunspot number from 1970s to 2010s. This excludes the possibility for an inhomogeneity in the 10.7cm flux.

Interestingly, the fluxes of longer radio waves increased with respect to the shorter waves, which implies a long-term change in the solar spectrum at radio frequencies. We also find that solar UV irradiance, and the number of active regions also increased with respect to the sunspot number, indicating a difference in the long-term evolution in chromospheric and photospheric parameters.

These results give evidence for important structural changes in solar magnetic fields and solar atmosphere during the decay of the MM when solar activity weakened considerably. We show that these changes are related to the centennial Gleissberg cycle and opposite changes are already ongoing with the increasing solar activity from cycle 25 onwards.

Solicited or Contributed

Contributed

Presenting author

Kalevi Mursula

Author list and affiliations

Primary author: MURSULA, Kalevi

Co-authors: PEVTSOV, Alexei; TÄHTINEN, Ismo (University of Oulu); ASIKAINEN, Timo (University of Oulu)

Presenter: MURSULA, Kalevi

Session Classification: Solar Irradiance and Particle Variability

Track Classification: Solar Irradiance and Particle Variability