Nikbakhsh, Shabnam; Tanskanen, Eija; Hackman, Thomas; Käpylä, Maarit

Study of Magnetic Complexity of Solar Active Regions from 1996 to 2017

Published: 01/01/2018

Document Version
Publisher's PDF, also known as Version of record

Please cite the original version:
Nikbakhsh, S., Tanskanen, E., Hackman, T., & Käpylä, M. (2018). Study of Magnetic Complexity of Solar Active Regions from 1996 to 2017. Abstract from European Geosciences Union General Assembly, Vienna, Austria.

Geophysical Research Abstracts
Vol. 20, EGU2018-16625, 2018
EGU General Assembly 2018

Study of Magnetic Complexity of Solar Active Regions from 1996 to 2017

Shabnam Nikbakhsh (1), Eija Tanskanen (1), Thomas Hackman (2), and Maarit Käpylä (3)

(1) Aalto University, Electrical Engineering, Espoo, Finland (shabnam.nikbakhsh@aalto.fi), (2) University of Helsinki, Department of Physics, Helsinki, Finland, (3) Max Planck Institute for Solar System Research, Germany

Solar Active Regions (ARs) are areas on the photosphere where the sun's magnetic field is especially strong. Major manifestations of the solar magnetic activity, such as flares and Coronal Mass Ejections (CMEs), are associated with ARs. The Mount Wilson Classification groups ARs according to their magnetic structures from the less complex, Alpha class, to the more complex one, Beta-Gamma-Delta class.

In this study, we investigated the Mount Wilson magnetic classification and latitude data of 4760 ARs from January 1996 to December 2017. We showed that the abundance of Simple ARs (SARs) follows very closely the sunspot number. In addition, we found that in both cycle 23 and 24, the abundance of SARs peaks during the sunspot maximum. On the other hand, the abundance of Complex ARs (CARs) reaches its maximum value two years after solar maximum in both cycles.

We also studied the latitudinal distributions of the different magnetic complexity classes, and found out that, independent of the complexity type, the northern and southern distributions are the same. Furthermore, we investigated the earlier claim of the time lag in between SARs and CARs being due to the butterfly wing widths getting narrower as the cycle progresses, forcing the rising flux tubes to get more packed and the resulting active regions more complex. The maximum of CARs, however, was clearly seen to occur before the linear decrease of the wing widths took place, making this scenario unlikely.