

Revisiting the Gnevyshev-Waldmeier rule for solar cycles 21-24

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Abstract:

In this work we revisit the Gnevyshev-Waldmeier rule analyzing sunspot data from the SOON (Solar Observing Optical Network). This empirical relationship describes the linear correlation between the maximum area and the lifetime of sunspot groups. However, due to the solar rotation it is not always possible to have a complete coverage of the sunspot groups relying solely on observations from Earth. This makes the proper determination of these two parameters, the lifetimes and the maximum areas, difficult. We use the Kaplan-Meier product-limit estimator, which allows us to describe the distribution function of a sample when a portion of the data or observations is not detected (i.e. censored data), as in this case. Here we present the first results obtained by analyzing the data provided by the different observatories of SOON that covers the period from 1982 to 2016, i.e. solar cycles 21-24.

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References:

Feigelson E.D., Nelson P.I., 1985, ApJ, 293, 192

Henwood R., Chapman S.C., Willis D.M., 2010, Solar Phys., 262, 299

Ringnes T.S., 1964, Astrophysica Norvegica, 9, 95

Nagovitsyn Y. A., Ivanov, V.G., Skorbezh, N.N., 2019, Astronomy Letters, 396-401

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