

Stochastic Properties in North-South Asymmetry of Sunspot Area

Heon-Young Chang

Department of Astronomy and Atmospheric Sciences, Kyungpook National University¹

We examine the observed sunspot area data exploring stochastic properties of the North-South asymmetry of the sunspot area by comparing results of the observational data with those derived from a simplified mathematical model, in which the asymmetry of the sunspot area is characterized by random noise superposed on a slowly varying sinusoidal background. From power spectrum analysis of the North-South asymmetry of solar activity 9 to 12-year periodicities have been revealed. Nonetheless, the cause of the North-South asymmetry of solar activity remains unsettled so far. We statistically analyze the sunspot area during the period from 1874 to 2007, by which a physical model can be constrained with reported periodicities. We find with the scatter plots that (i) the phase difference between the sunspot area in both hemispheres should be smaller than \sim a couple years, (ii) the exponentially distributed noise agrees with the observed sunspot area data more closely than the uniformly distributed noise, and (iii) the shape of the underlying sinusoidal function in both hemispheres should be similar. We conclude by pointing out that interpretation of a study on the periodicity of the North-South asymmetry should be derived with due care.