

Relationship between global seismicity and solar activities^{*}

GUI-QING ZHANG (张桂清)

Beijing Astronomical Observatory, Chinese Academy of Sciences, Beijing 100101, China

Abstract

The relations between sunspot numbers and earthquakes ($M \geq 6$), solar 10.7 cm radio flux and earthquakes, solar proton events and earthquakes have been analyzed in this paper. It has been found that: ① Earthquakes occur frequently around the minimum years of solar activity. Generally, the earthquake activities are relatively less during the peak value years of solar activity, some say, around the period when magnetic polarity in the solar polar regions is reversed. ② The earthquake frequency in the minimum period of solar activity is closely related to the maximum annual means of sunspot numbers, the maximum annual means of solar 10.7 cm radio flux and solar proton events of a whole solar cycle, and the relation between earthquake and solar proton events is closer than others. ③ As judged by above interrelationship, the period from 1995 to 1997 will be the years while earthquake activities are frequent. In the paper, the simple physical discussion has been carried out.

Key words: solar activity sunspot numbers solar radio flux solar proton events

Introduction

Most of earthquakes are induced by the mutual squeeze and collision between the crustal plates as far as the earth own is concerned. However, many geophysicists do not deny that any disaster cannot be all attributed to the motion of earth own. The sun is an energy source of the earth; its variations influence and modulate the motion and variation of the whole of the earth or its certain part. Therefore, many studies about the relation between solar activity and earthquakes have come out one after another. Generally, most of them studied the relation between the recurrent variation of sunspot numbers and earthquake activity and found that the earthquake activity has the cycles about 11 and 22 years like as solar activity cycles (Luo and Li, 1978; Jiang, 1991; Wu, 1991; Shen, 1991). Occasionally, the relation between solar proton events and earthquake activities was studied. This studies pointed that the strong earthquakes occur after about one year that a very strong solar proton event (ground-level events) occur in (Yu, 1991). We know the reliable observed data of solar particle events can be only obtained since the cycle 19. Since the history, that they had observed was rather short, the study for the relation between solar particle events and earthquakes mainly focused on the statistical analysis of the relation between individual event formerly.

It should be a global scale that the sun influences the earth. Therefore, the effect that the sun triggers and induces the earthquakes should be also a global scale. Therefore, to analyze the relation between the earthquakes of whole world and solar activities may be more reasonable, scientific than analysis for the relation between the earthquakes of a certain region and solar activity.

^{*} Received July 4, 1997; revised November 25, 1997; accepted November 25, 1997.