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The variations of prominence activities during solar cycle

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The prominence activities (prominence eruption/disappearance) in the solar atmosphere closely relate with the CMEs that cause great influences on heliosphere and magnetosphere. Gopalswarmy et al. (2003) reported that 72 % prominence eruptions were clearly associated with CMEs. Considering the observational result, the statistical properties of prominence activities are important and fundamental data for the space weather. However, the previous databases of prominence eruptions are made from the events that are detected from H alpha images by the eye, and were influenced from the weather at the observations.
The Nobeyama Radioheliograph (NoRH) is observing Sun in microwave (17 GHz) since 1992. At a flare, the main component of the microwave from Sun is emitted from non-thermal electrons that are accelerated by flare. On the other hand, the main component of the microwave is thermal emission when Sun is quiet, and a prominence is clearly observed in microwave because there is the prominence on the limb. We developed the automatic prominence activity detection program based on 17 GHz images observed by NoRH, and investigated the variation of the properties of the prominence activities that occurred from 1992 to the end of 2009. We found the following results. 1. The variation in the number of prominence activities is similar to that of sunspots during one solar cycle but there are differences between the peak times of prominence activities and sunspots. 2. The frequency distribution as a function of the magnitude of the prominence activities the size of activated prominences at each phase shows a power-law distribution. The power-law index of the distribution does not change except around the solar minimum. 3. The number of prominence activities has a dependence on the latitude On the other hand the average magnitude is independent of the latitude. In the paper, we will also discuss the relationship the other properties of prominence eruptions, solar cycle and the photospheric magnetic field.

Keywords: solar cycle, prominence activities, CME, microwave observation, automatic detection program