Unusual Migration of the Prominence Activities in the Southern Hemisphere during Cycle 23–24

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The solar activity in Cycle 23-24 shows differences from the previous cycles that were observed with modern instruments, e.g. long cycle duration and a small number of sunspots. To appreciate the anomalies further, we investigated the prominence eruptions and disappearances observed with the Nobeyama Radioheliograph during over 20 years. Consequently, we found that the occurrence of the prominence activities in the northern hemisphere is normal because the period of the number variation is 11 years and the migration of the producing region of the prominence activities traces the migration of 11 years ago. On the other hand, the migration in the southern hemisphere significantly differs from that in the northern hemisphere and the previous cycles. The prominence activities occurred over -50 degrees latitude in spite of the late decay phase of Cycle 23, and the

number of the prominence activities in the higher latitude region (over -65 degrees) is very small even near the solar maximum of Cycle 24. The results suggest that the anomalies of the global magnetic field distribution started at the solar maximum of Cycle 23. Comparison of the butterfly diagram of the prominence activities with the magnetic butterfly diagram indicates that the timing of the rush to the pole" and the polar magnetic field closely relates to the unusual migration. Considering that the rush to the pole is made of the sunspots, the hemispheric asymmetry of the sunspots and the strength of the polar magnetic fields are essential for understanding the anomalies of the prominence activities [1].

Reference





Figure 1: The butterfly diagram of the prominence activities and the photospheric magnetic field. The red dots indicate the dates and latitudes of the prominence activities and the grayscale shows the magnetic field distribution. The blue and green dashed lines indicate the solar minimum and maximum.