

## Special magnetic activity of the solar cycle 23

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We investigated the relation between the number of sunspots and that of great magnetic storms ( $Dst \leq -100nT$ ) from 1957 to 2004, and we also lay equal stress on solar activity, interplanetary disturbance and ground-based magnetic record during three 2003 giant storms so as to study both general and detail aspect of the solar cycle 23. Both statistics analysis and case study are carried out. It was found that the number of great magnetic storms in the descending years of solar cycle 23 is extremely special compared with other solar cycles. Also, all three giant storms were caused by frontside full halo coronal mass emission (FFHCME) and long-duration strong southward interplanetary magnetic field (IMF), and the variations of Dst index lagged behind the interplanetary disturbance at 1AU 3~4 hours. The result of statistical analysis indicates that the correlation coefficient between sunspot numbers and great magnetic storm numbers decreases as the intensity of great magnetic storms strengthens, and the numbers of giant storms ( $Dst \leq -300nT$ ) are not related with sunspot numbers. Furthermore, the magnetosphere current systems causing the ground magnetic field disturbance during the three giant storms of 2003 are really complicated, and cannot be explained only by ring current.