The strong enhancement of ULF waves during the super storm on October 29-31,2003

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Strong enhancements of ULF wave activities were observed during the period of the super storm occurred from October 29 to 31, 2003. They appeared with many different kinds of wave modes at different locations over a wide spatial range from interplanetary space to ground. One of interesting magnetic oscillations was the oscillations observed by the Wind satellite in the midnight distant tail at about - 160 Re. The oscillations occurred only in the x component of the magnetic field with a period of about 30 min and a peak to peak amplitude of about 40 nT, and were associated with changes of orientation of interplanetary magnetic field (IMF), suggesting that these oscillations manifest the flapping motions of the stretching tail magnetic field in the midnight distant tail. Other interesting ULF waves were large amplitude Pc 3 and Pc 5 waves, which were also observed in a wide range of location from space to ground. The Pc 5 oscillations were one of the largest amplitude oscillations ever recorded, and their excitation might be triggered by some enhancement of solar wind dynamic pressure during the northward IMF Bz. The remaining one was strong activities of Pc 3, which were observed continuously from upstream interplanetary space to the evening side magnetosphere along the course of the Geotail trajectory. The corresponding Pc 3 enhancements were also confirmed in the dayside magnetosphere and on the low latitude ground stations, suggesting that these activities of Pc 3s in the magnetosphere and on the ground might be closely related to the enhanced activities of upstream Pc 3s.