電離層觀測技術對惡劣風暴警報系統之應用

Severe Storms Warning System Using an Ionospheric Observation Technique

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Ground-based ionospheric sounding array observed gravity waves with wave periods of 13 to 28 minutes (mostly around 13 minutes) and with horizontal phase velocities of 90 to 220 m/sec during tornadic storms; infrasonic waves with wave periods of 3 to 7 minutes and with horizontal phase velocities of 500 to 800 m/sec during thunderstorms; and infrasonic waves with wave periods of 30 to 200 seconds and a horizontal phase velocity of around 3000 m/sec during the activity of oceanic tidal waves or tsunamis. By using the technique of group ray tracing computation, it is found that the signals excited by tornadic storm systems were 2 to 4 hours ahead of the touchdown of tornadoes. Based on this presursory phenomena of tornado-excited infrasonic-gravity waves, a tornado warning system could be established by taking advantage of the ionospheric observation technique. On the other hand, the infrasonic waves created by the vertical motion of earthquakes, which is the primary motive of the generation of oceanic tidal waves or tsunamis, propagate upward and disturb the ionosphere with speed 10 times faster than the speed of tsunamis. A tsunami warning system also could be easily installed by detecting the ionospheric disturbances caused by oceanic tidal waves.

摘要

利用高頻率電波從電離層上的反射，我們可以觀測東方天候所產生在電離層上的擾亂。在颱風暴時，我們可以在電離層上的相速度600至800 m/sec之超低頻率音波及重力波。在電離層上觀測到周期3至7分鐘及位相速度100至220 m/sec之重力波。海嘯(由垂直運動之大陸邊沿海底地震所引起)時，最初夫大學亦在電離層上觀測到周期1.5至4分鐘及位相速度3000 m/sec之超低頻率音波。風暴中心可以由波段追踪法計算出来。在旋風暴或颱風時，更有趣的是旋風暴觸地2至4小時前，我們已在電離層觀測到初期旋風暴所激發的超低頻率音波及重力波。因之，我們可以利用在電離層上所觀測到的旋風等所產生的予兆現象做為風暴警報系統之應用。同時在海嘯時，由海嘯所激發超

低頻率音波在電離層上的傳播速度為海嘯傳播速度之10倍以上。因此，我們未來可以利用這些超低頻率音波在電離層上之傳播特性做為電離層觀測技巧應用到風暴警報系統上。