Generation of atmospheric variations associated with the ground motion from the 2003 Tokachi-oki earthquake

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Clear atmospheric variations acsociated with the 2003 Tokachi-oki earthquake are observed at Enoshima, Tsukuba, Awaamatsu, Nokgiriyama, Nakaizu, Sugeno, Muroto, and Kirishiam, from nothern part of Japan through southern part of Japan. The pressure change is about 0.02 pascal and the duration is more than 30 minutes with dominant pressure change period of about 15-20 seconds. Near each site there is a broadband seismic stations operated either by ERI or NIED. Comparing seismograms at these sites with the barograms the pressure change starts as the ground starts vibrates and the maximum pressure change is recorded when the Rayleigh waves arrive. Among these barogram stations, Nakaizu, Sugeno, Nokogoriyama, Tsukuba are co-located with the broabdband STS1 sensors, and show clearly that the peaks of ground motion coincde with the peaks of atmospheric pressure change. Similar pressure varitions associated with the largest aftershok with magnitude 7.4 are also recorded.

Ground motions, allrecorded by STS-1 broadband sensors, shows that upward maximum velocity corresponds to the maximum pressure and vice versa. From the spectrum amplitude ratio between the ground velocity and the pressure change two spectrum have the same phase below the period of about 50 seconds. Response function is not well determiend because at longer periods pressure noise increases.

The amount of pressure change is about (atmospheric density)x(sound velocity in the atmosphere)x(ground vertical velocity). This means the infrasound is generated by the ground motion.

We have observed the acoustic coupling between the atmosphere and the ground motion in both atmospheric pressure change and the ground motion at the same site. This data can be used for the confirmation of the acoustic coupling thory between the atmosphere and the solid Earth.