Tropospheric Delay Variation
During the August 18, 2000 Miyakejima Eruption

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As it has been reported in VRC-ERI website, relatively large eruption occurred on the August 18 2000, starting from 17:00 JST until 19:00 JST. The volcanic materials were ejected more than 8 km high.

The previous study of GPS baselines change during the eruption [Setyadjie, et.al, 2001] shows that the highest eruption within the interval time can be detected, indicated by fluctuation of the GPS baselines and satellite residuals to several ten centimeters. The fluctuation was expected due to the tropospheric excess path delay contribution rather than the crustal movement beneath the volcano. The ejected materials were regarded as one of the most highly error sources to the GPS signal.

We are therefore interested in estimating the signal delay as it can be used for studying local atmospheric condition during the eruption. Data span, collected by four GSI continuous stations, from 16:00 JST until 19:00 JST were processed by using GIPSY-OASIS II package software to estimate Zenith Wet Delay (ZWD) variation around the volcano.

Figure 2 shows time sequence of ZWD time series for all of the GPS stations. The time series plotted in the figure have a similar pattern. At the beginning of the eruption, ZWD decreased gradually and then increased at the end to reach the normal fluctuation.

This similar pattern may indicate that the eruption can contribute to the atmospheric condition over the volcano area.

However, we find a rather peculiar characteristic shown by M4 station. At the beginning, ZWD increased gradually within a short period before it decreased and then increased again to reach the normal fluctuation.

Furthermore, it also can be seen that just before the eruption ZWD had a normal fluctuation within 2 cm, while the eruption was going it had fluctuated up to 10 cm. The highest fluctuation was experienced by M4 station, which is located in the western part of Oyama caldera. It can be understood, since abundant ash felt mainly in the western part of the volcano island.

Relatively low ZWD during the eruption maybe due to low humidity around the volcano. Distribution of ash cloud might have made the humidity becomes lower than before and after eruption.

Figure 1. Distribution of the GPS stations

Figure 2. Zenith wet delay (ZWD) variation