An earthquake (M6.2) which occurred in a seismic gap off eastern coast of Aomori prefecture on August 14, 2001(Part2)

Tamao Sato[1], Akio Morishita[2], Kazutoshi Imanishi[3], Naoyuki Kato[4]

[1] Earth and Environmental Sci., Hirosaki Univ, [2] Faculty of Science, Hirosaki Univ, [3] AIST, [4] ERI, Univ. Tokyo

The 1968 Tokachi-oki earthquake (Mw8.2) was caused by the faulting of two asperities. The 1994 Sanriku-haruka-oki (Mw7.7) earthquake ruptured only the southern asperity and the northern asperity remained unbroken. Therefore the northern asperity is considered a seismic gap which has potential of generating Mw7.7 earthquake. On August 14, 2001, an earthquake with M6.2 occurred at the eastern tip of this seismic gap. In the previous paper we investigated the source parameters of the event and estimated the change of Coulomb Failure Stress at the seismic gap associated with the event, etc.

In this paper, we investigated crustal deformation associated with the 8.14.2001 event using the GPS data of GEONET from 1996.4 through 2001. 11. First, we studied the crustal deformation in an extented area surrounding the event over the entire period. The crustal deformation observed in Aomori and northern Iwate for the period is characterized by an average acceleration of 2mm/y/y toward WNW with Watari in Miyagi prefecture as a fixed point. Note that the estimated rate is an averaged one over the entire period. Actually the west-north-westwards acceleration has been gradually decreasing with time. The acceleration may be ascribed to the recovery of once weakened interplate coupling off eastern Aomori and off northern Sanriku after the 1994 Sanriku-haruka-oki earthquake. The acceleration of 2mm/y/y can be interpreted as being due to a back-slip acceleration of 2cm/y/y. The 8.14.2001 event occurred at the tip of the seismic gap while the interplate coupling had been recovering in the extended area surrounding the event.

No clear coseismic deformation associated with the 8.14.2001 event is seen in the GPS data. A set of fault parameters obtained from the previous waveform inversion predicts an eastward coseismic displacement of a few millimeters in Simokita Peninsula which is the nearest to the event. It is likely that the small displacement cannot be discerned due to a scatter of daily GPS data of comparable magnitude. We investigated the temporal change of residuals obtained by subtracting a linear trend plus seasonal variation from the original data. For three months before the 8.14.2001 event a displacement of a few millimeters toward N to NW is discernible for stations along the eastern coast of Aomori, while a displacement of 3-4 mm toward SE prevails in the same area for three months after the event. We cannot deny the possibility that the latter displacement is the coseismic one that cannot be resolved from short-term data but can be detected by referring to data for a longer time window. Or it may represent the effect of an afterslip following the 8.14.2001 event. The details of the afterslip will be made clear when the data after November 2001 will be available in the future.