Figure S1: Horizontal fitting and their residuals in periods other than in manuscript: Comparison of the observed (black) and the calculated (red) horizontal velocity in (a) the 3rd, (b) the 4th, (c) the 5th and (d) the 6th years. The distribution of horizontal residuals in (e) the 3rd, (f) the 4th, (g) the 5th and (h) the 6th years.

![Horizontal fitting and their residuals](image1)

Figure S2: Vertical fitting and their residuals in periods other than in manuscript: Comparison of the observed (colored circles) and the calculated (contour with color scale) vertical velocity in (a) the 3rd – 4th and (b) the 5th – 6th years. The distribution of vertical residuals in (c) the 3rd – 4th and (d) the 5th – 6th years. The contour interval is 2 mm/year.

![Vertical fitting and their residuals](image2)
Figure S3: The inputs and results of checkerboard resolution test. The color indicates slip magnitude and the arrow indicates the slip vector of each subfaults. (a) and (b) Assumed slip on the subfaults. 30 cm slip in the direction of N115°E, opposite to the relative plate motion, is assumed on the red subfaults and no slip is assumed on the white subfaults. (c) and (d) The results of checkerboard resolution test. (c) and (d) are the estimated slip from synthetic displacement by the assumed slip distribution (a) and
The dotted line indicates the depth of plate interface with an interval of 20 km.

Figure S4: The error of the estimated 3-month afterslip. Color indicates the error of the estimated slip on subfaults. The dotted line indicates the depth of plate interface with an interval of 20 km.
Figure S5: The distribution of reduced $\chi^2$: The colored star, triangles, and circles indicate the distribution of combinations of the model parameters, and the color indicates the value of the reduced $\chi^2$. The star and triangles represent the optimum and the acceptable combinations of viscoelastic parameters, respectively. The distribution of reduced $\chi^2$ with respect to (a) the combination of thickness $H$ and time constant $B$ and (b) the combination of viscosity $\eta$ and time constant $B$, respectively.
Figure S6: Horizontal calculated velocity due to afterslip and viscoelastic relaxation in periods other than in manuscript: Comparison of the calculated horizontal velocity due to afterslip and viscoelastic relaxation of the 2003 Tokachi-oki earthquake. Viscoelastic relaxation due to the 2004 Kushiro-oki earthquakes is not included in the figures of viscoelastic relaxation. Calculated velocity due to afterslip in (a) the 3rd, (b) the 4th, (c) the 5th, and (d) the 6th years. Calculated velocity due to viscoelastic relaxation in (e) the 3rd, (f) the 4th, (g) the 5th, and (h) the 6th years.

Figure S7: Vertical calculated velocity due to afterslip and viscoelastic relaxation in periods other than in manuscript: Comparison of the calculated vertical velocity due to afterslip and viscoelastic relaxation of the 2003 Tokachi-oki earthquake. Viscoelastic relaxation due to the 2004 Kushiro-oki earthquakes is not included in the figures of viscoelastic relaxation. Calculated velocity due to afterslip in (a) the 3rd – 4th and (b) the 5th – 6th years. Calculated velocity due to viscoelastic relaxation in (c) the 3rd – 4th and (d) the 5th – 6th years. The contour interval is 2 mm/year.
Figure S8: Horizontal residuals of the observed and the model calculated velocity, which consists of afterslip and viscoelastic relaxation with the fixed parameters $H = 50$ km, and $\eta = 1.0 \times 10^{22}$ Pa·s, in (a) the 2nd, (b) the 3rd, (c) the 4th, (d) the 5th, (e) the 6th and (f) the 7th year.

Figure S9: Calculated velocity due to afterslip viscoelastic relaxation with the estimated time constant $B$. Arrows indicate horizontal velocity in (a) the 2nd and (b) the 7th year, respectively. (c) Color and contour indicates vertical velocity in the 2nd – 3rd year. The contour interval is 1 mm/year.