Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

SCG66-01 Room:414 Time:April 30 09:00-09:15

Development of heterogeneous rheological model of the Tohoku Island arc-trench system

MUTO, Jun[1*] ; SHIBAZAKI, Bunichiro[2]

[1]Dept. Earth Sci., Tohoku Univ., [2]Building Res. Inst.

Subduction zone earthquake cycles can be characterized by various deformation processes taking place around the plate boundary and surrounding area. For example, after slip, viscoelastic relaxation and locking of the plate boundary are three primary processes among them. In order to illuminate the recovery of plate coupling after the Mw 9.0 Tohoku-Oki earthquake and strain budgets of island arc during cycles, the detailed viscoelastic structure of the Tohoku region is developed using seismologically determined subsurface structures and densely measured geothermal gradient data. The model is oriented perpendicular to the Japan Trench and also transects an area of large coseismic slip of the 2011 Tohoku Oki earthquake. Petrological model proposed by the laboratory measurement of seismic velocity of various rocks [Nishimoto et al., 2005] was utilized to infer rheologically major minerals from seismic velocity structures. We used geothermal gradient data from the inland Hi-net borehole [Matsumoto, 2007], as well as geothermal gradient data compiled from around Japan [Tanaka et al., 2004]. The strain-rate-dependent, steady state effective viscosity was calculated using constitutive laws of various rocks under the assumption of homogeneous geologic shortening rate [Sato, 1989]. The calculated viscosity structures show lateral viscosity gradients both parallel and normal to the trench axis. Moreover, the minimum viscosities are predicted to be 10^{19} Pa s in the mantle wedge and 10^{20} Pa s in the oceanic mantle. The values are consistent with previous estimates obtained by postseismic deformation analysis of subduction zone earthquakes with similar magnitudes (Mw ~9). However those minimum values only appear in depths of 30-100 km in the upper mantle and the viscosity increases further with depths because of the pressure hardening effect. Taking the high values of viscosities in shallower part of the lithosphere, the thickness of high viscous layers found to have lateral variations implying the heterogeneous elastic layer thickness. Model viscosity structures of the Tohoku region utilizing realistic temperature and rheological properties of rocks can be used to evaluate the effect of rheological heterogeneity in the postseismic deformation field of the Tohoku-Oki earthquake observed by dense network of geodetic observations. In the presentation, we will mention the detailed information on the choice of the flaw law parameters, and physical and ambient conditions for NE Japan to calculate the viscosity structures. We also show how these heterogeneities affect the crustal deformation of the NE Japan during subduction zone earthquake cycles.

Keywords: rhology, Tohoku, viscoelastic relaxation, earthquake cycle, Tohoku oki earthquake

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SCG66-02 Room:414 Time:April 30 09:15-09:30

Detailed seismic attenuation structures beneath the Hokkaido corner, northern Japan (3)

KITA, Saeko[1*] ; NAKAJIMA, Junichi[2] ; HASEGAWA, Akira[2] ; UCHIDA, Naoki[2] ; OKADA, Tomomi[2] ; KATSUMATA, Kei[3] ; ASANO, Youichi[1] ; KIMURA, Takeshi[1]

[1]NIED, [2]RCPEV, Graduate School of Science, Tohoku University, [3]ISV, Hokkaido University

1. Introduction

In the Hokkaido corner, the Kuril fore-arc sliver collides with the northeastern Japan arc. Using travel-time data compiled from the nationwide Kiban seismic network and a dense temporary seismic network [Katsumata et al, 2002], Kita et al. [2012] determined high-resolution 3D seismic velocity structure beneath this area for deeper understanding of the collision process of the two fore-arcs. In this study, we merged waveform data from the Kiban-network and from the temporary network, and estimated the seismic attenuation structure to understand seismotectonics and collision process beneath Hokkaido.

2. Data and method

We estimated corner frequency for each earthquake by the spectral ratio method of coda waves [e.g. Mayeda et al., 2007]. Then, we simultaneously determined values of $t*$and the amplitude level at low frequencies from the observed spectra after correcting for the source spectrum. Seismic attenuation (Q-1 value) structure was obtained, inverting $t*$values and employing the 3-D ray-tracing technique of Zhao et al. [1992]. The study region covers an area of 41-45N, 140.5-146E, and a depth range of 0-300 km. We obtained 154,293 $t*$at 316 stations from 6,196 events (Mj$>$2.0) that occurred during the period from Aug. 1999 to Dec. 2012. Horizontal and vertical grid nodes were set with spacing of 0.1-0.3 degrees and 10-30 km, respectively.

3. Results

The calculated stress drops are distributed from 0.1 to 100 MPa. Stress drops of intraslab earthquakes increase with focal depth. The values of stress drops of events in the slab mantle tend to be larger than those in the slab crust at depths of 80 to 170 km, which might contribute to understanding of the physical nature of intraslab earthquakes.

Seismic attenuation structure is imaged for the region above the subducting Pacific slab at depths down to ˜80 km. For the forearc side of the eastern and western parts of Hokkaido, high-Qp zones are generally imaged at depths of 10 to 80 km in both the crust and mantle wedge above the Pacific slab. In contrast, low-Qp zones are clearly imaged in the mantle wedge of the backarcside.They are distributed in deeper parts and reach the Moho beneath the volcanic front. Locations of these low-Qp zones correspond to the low-Vp and low-Vs zones imaged by Zhao et al. [2012]. These suggest that the upper head of the mantle-wedge upwelling flow is detected beneath Hokkaido also by our seismic attenuation imaging.

In the Hokkaido corner, to the west of the Hidaka main thrust a broad low-Qp zone is imaged at depths of 0?60 km. Location of this broad low-Qp zone almost corresponds to that of the low-V zone in the collision zone found by Kita et al. [2012]. Fault planes of the 1970 M6.7 and 1982 M7.1 earthquakes are located at the edges of a broad low-Qp zone, being in contact with a high-Qp zone at 10 to 35 km. These results suggest that the occurrence of these anomalously deep and large inland earthquakes is related to the presence of hydrous minerals or fluids.

The subducting oceanic crust beneath the Hidaka region is imaged as a low-Q zone whose location corresponds to the low-Vp and low-Vs zone of Kita et al. [2012], suggesting the existence of hydrated materials at the top of the slab. Just above the slab surface, moderately low-Q zones are imaged at depths of 90 to 100 km beneath eastern and southern Hokkaido and at depths of 110 to 130 km beneath the corner, which are located at depths deeper than the upper plane seismic belt. These observations suggest the existence of the hydrated mantle wedge by the aqueous fluids supplied from the oceanic crust right below.

Keywords: Seismic attenuation structure, Seismotectonics, arc-arc collision process, Stress drops of intraslab earthquakes

SCG66-03 Room:414 Time:April 30 09:30-09:45

Crustal deformation in the Mid-Niigata area and its implication for strain concentration

SAGIYA, Takeshi[1]* ; MENESES, Angela[1]

[1]Nagoya University

The Mid-Niigata area is located within the concentrated strain belt along the eastern margin of the Japan Sea. This area suffered from two large earthquakes, the 2004 Chuetsu and the 2007 Chuetsu-oki earthquakes. Based on GPS velocity data calculated from daily coordinate time series of GEONET, we identified significant time dependence of the interseismic crustal deformation patterns before, between, and after these two earthquakes. Modeling results of the deformation pattern changes are summarized as follows. 1) Contraction before 2004 occurred between the source regions of the two earthquakes and it was attributed to aseismic faulting across almost the whole elastic layer, implying that the observed strain was largely inelastic. This interpretation is also supported from a fact that the historical seismic energy release in this area is much smaller than that expected from geodetic strain accumulation. 2) After two earthquakes, aseismic faulting seems to have continued without explicit time decay. The aseismic faulting is estimated close the source fault of the main shocks, implying that postseismic strength recovery did not occur on the main shock fault or a nearby parallel fault was activated to accommodate regional contraction. This is consistent with an idea that the upper crust in this area is segmented to smaller blocks and the mechanical behavior is very sensitive to external stress changes.

Keywords: Strain concentration, Niigata-Kobe Tectonic Zone, 2004 Chuetsu earthquake, 2007 Chuetsu-oki earthquake, aseismic faulting, inelastic deformation

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SCG66-04 Room:414 Time:April 30 09:45-10:00

Tectonic stress fields in subduction zones governed by frictional strength of plate interfaces

MATSU'URA, Mitsuhiro[1*] ; NODA, Akemi[2] ; TERAKAWA, Toshiko[3] ; FUKAHATA, Yukitoshi[4]

[1]Institute of Statistical Mathematics, [2]Kozo Keikaku Engineering Inc., [3]Nagoya University, [4]Kyoto University

Tectonic crustal motion in plate convergence zones varies from mountain building (e.g., Himalaya) to back-arc spreading (e.g., Mariana) [1, 2, 3]. Such difference in tectonic crustal motion reflects the diversity of tectonic stress fields. So our question is what causes the diversity of tectonic stress fields in plate convergence zones. Recently, from a theoretical study [4], we revealed that the tectonic stress field consists of basically two different sorts of stress fields; one of which is a horizontally compressional stress field due to frictional resistance at plate interfaces, and another is a horizontally tensile stress field due to steady plate subduction. On a geological timescale, the former can be regarded as constant in time, but the latter increases with time. So, if the earth's crust were infinitely strong, tectonic stress fields in plate convergence zones would become tensile in time everywhere. Actually, the earth's crust includes a number of defects with low strength, over which inelastic deformation (brittle fracture and/or plastic flow) occurs so as to release the tectonic stress caused by mechanical interaction at plate interfaces. From these considerations, we may conclude as follows. When the plate interface is very weak in comparison with the earth's crust, a horizontally tensile stress field becomes dominant, which causes back-arc spreading as in the case of Mariana. When the plate interface is very strong, a horizontal compressional stress field becomes dominant, which causes mountain building as in the case of Himalaya. Tectonic stress fields in most subduction zones, where the strength of plate interfaces are comparable to that of the earth's crust, are between these two extreme cases.

References

[1] Takada, Y. and M. Matsu'ura, 2004. A unified interpretation of vertical movement in Himalaya and horizontal deformation in Tibet on the basis of elastic and viscoelastic dislocation theory, Tectonophysics, 383, 105-131.

[2] Hashimoto, C. and M. Matsu'ura, 2006. 3-D simulation of tectonic loading at convergent plate boundary zones: Internal stress fields in northeast Japan, Pure Appl. Geophys., 163, 1803-1817.

[3] Hashima, A., Y. Fukahata, and M. Matsu'ura, 2008. 3-D simulation of tectonic evolution of the Mariana arc-back-arc system with a coupled model of plate subduction and back-arc spreading, Tectonophysics, 458, 127-136.

[4] Matsu'ura, M., A. Noda, and T. Terakawa, 2013. Strength of plate interfaces and tectonic stress fields in subduction zones, Seismological Society of Japan 2013 Annual Meeting, D22-08, Yokohama.

Keywords: subduction zone, tectonic stress field, plate interface, frictional strength, mountain building, back-arc spreading

SCG66-05 Room:414 Time:April 30 10:00-10:15

Sequential inversion of GPS time series data to estimate spatiotemporal change in interplate coupling

NODA, Akemi[1*] ; MATSU'URA, Mitsuhiro[2]

[1]Kozo Keikaku Engineering Inc., [2]Institute of Statistical Mathematics

To estimate steady increase rates of slip deficits at plate interfaces, first, we obtain linear trends of the time series of GPS daily coordinate data by removing seasonal variations and coseismic and postseismic changes due to episodic events. Then, we invert the linear trends (surface displacement rates at GPS stations) into steady slip-deficit rate distribution on a plate interface with completely relaxed slip-response functions for an elastic-viscoelastic layered half-space model under gravity (Noda et al., 2013, GJI). Noda et al. (SSJ 2012 Annual Meeting) demonstrated that this method is applicable to GPS time series data in northeast Japan for the interseismic period (March 1997-February 2008) before the 2008 Ibaraki-oki (Mw6.8) and Fukushima-oki (Mw6.9) earthquakes. After these events, the trends of GPS time series data gradually change with time (Suito et al., 2011, EPS), indicating spatiotemporal change in interplate coupling preceding the 2011 Tohoku-oki mega-thrust earthquake.

The change in slip-deficit rate distribution disturbs a steady stress state in the asthenosphere, and so we need to use the viscoelastic transient slip-response functions for the analysis of GPS time series data after the 2008 events (Noda et al., 2013, GJI). An exact treatment of the viscoelastic inverse problem to estimate cyclic slip processes at a plate interface has been given by Fukahata et al. (2004, GJI), but it is not applicable to the present problem because the change in slip-deficit rate distribution is not a cyclic but transient process. So, we propose a simple inversion technique, called sequential inversion of GPS time series data, to estimate spatiotemporal changes in slip-deficit rates at plate interfaces. A similar sequential inversion technique has been used by Lubis et al. (2013, GJI) for the analysis of afterslip distribution following the 2007 southern Sumatra earthquake (Mw8.5) on the assumption that the asthenosphere has been in a steady stress state until the 2007 event.

In the present study, we estimate the spatiotemporal change in interplate coupling by applying the sequential inversion technique to GPS time series data for March 2008-February 2011, and reveal the slip history at the North American-Pacific plate interface off Tohoku during the 14 years before the 2011 Tohoku-oki mega-thrust earthquake.

Keywords: GPS time series data, sequential inversion, viscoelastic transient response, change in interplate coupling, the 2011 Tohoku-oki earthquake

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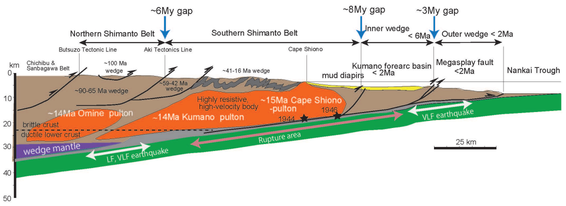
SCG66-06 Room:414 Time:April 30 10:15-10:30

Middle Miocene swift migration of the TTT triple junction and rapid crustal growth in SW Japan

KIMURA, Gaku[1*] ; HASHIMOTO, Yoshitaka[2] ; KITAMURA, Yujin[3] ; YAMAGUCHI, Asuka[4] ; KOGE, Hiroaki[1]

[1]Dept. Earth and Planetary Science, The University of Tokyo, [2]Kochi University, [3]Kagoshima University, [4]Atmosphere and Ocean Research Institute, The University of Tokyo

We review recent progress in geological and geophysical investigation in SW Japan, the Nankai Trough and the Philippine Sea Plate (PSP), and propose a comprehensive hypothesis for the Miocene tectonics of the Nankai Trough. New interpretations are as follows: Near-trench magmatism in the outer zone of SW Japan might have various reasons. The possibility of an arc-arc collision in particular should be examined, in addition to the previous model of an oceanic ridge and hot PSP subduction. The indentation structure at Capes Ashizuri, Muroto in Shikoku, and Shiono on the Kii Peninsula may be explained by the collision of the active arc or topographic peaks such as seamounts, contrary to the previous "kink-folding" model due to recent E-W compression. This inference is drawn from comparison between the many modern examples of seamount collision and sandbox analogue experiments. Crustal components of SW Japan might consist mainly of igneous plutonic rocks, in contrast to the previous inference of Cretaceous to Tertiary accretionary complexes. This is especially the case in the outer zone to the north of Capes Ashizuri, Muroto and Shiono. This is inferred from geophysical observation of gravity anomalies, velocity and resistivity, together with geological estimations of caldera age and the size of its root pluton. Episodic crustal growth due to intrusion of igneous rock and subduction of the PSP may have stopped after ˜11 Ma and restarted at ˜7-8 Ma. New accretionary prism was again developed after ˜6 Ma. This inference is suggested by recently conducted ocean drilling program.



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SCG66-P01 Room:Poster Time:April 30 18:15-19:30

Spatial relationship between the volcanic chain and high gravity anomalies in subduction zones

FUKAHATA, Yukitoshi[1*]

[1]DPRI, Kyoto University

The most conspicuous features of arc-trench systems are active seismicity, characteristic topography and gravity anomalies, and volcanism. The topography and gravity anomalies are low in the trench and high in the arc, which can be theoretically explained by mechanical interaction between the subducting oceanic plate and the overriding plate (Sato & Matsu'ura, 1993, GJI; Hashimoto et al, 2004, PAGEOPH). Because the topography is more complicated to be understood, free-air gravity anomaly is more suitable to be compared to the theoretical model. Free-air gravity anomalies with long wave length basically represent the effect of tectonic force, which disturbs gravity equilibrium.

Volcanoes align along the volcanic front in most arcs. Since both of the high free-air gravity anomalies and volcanic front have a subparellel strike to the trench, it should be possible to classify arc-trench systems according to the spatial relationship between them. Based on such an idea, Fukahata (2008, JPGU meeing) classified arc-trench systems, but there was a problem that the recognition of the location of high gravity anomalies was quite subjective. So, in this study, I improved this process.; the location of high gravity anomalies were more quantitatively recognized. As a result, the location of high gravity anomalies relative to the volcanic front did not change for most arcs, but I found that it was difficult to define its location in some arcs (mostly tensile). Using the result, I discuss the spatial relationship between the volcanic chain and high gravity anomalies in subduction zones and consider causes of topographic evolution of island arcs.

Keywords: island arc, subduction zone, gravity anomaly, volcanic front

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SCG66-P02 Room:Poster Time:April 30 18:15-19:30

Uplift and denudation history of the Yoro-Suzuka-Nunobiki Mountains: Constraints from apatite FT thermochronology

SUEOKA, Shigeru[1*] ; TSUTSUMI, Hiroyuki[2] ; TAGAMI, Takahiro[2] ; HASEBE, Noriko[3] ; TAMURA, Akihiro[3] ; ARAI, Shoji[3] ; SHIBATA, Kenji[1]

[1]Japan Atomic Energy Agency, [2]Kyoto University, [3]Kanazawa University

The Yoro-Suzuka-Nunobiki Mountains are fault block mountains distributed along the Isewan-Tsurugawan Tectonic Line, a tectonic boundary between the Kinki and Chubu districts. The Kinki district on the west of the mountains is characterized by predominance of reverse faults and alternation of N-S trending mountain ranges and basins (Kinki Triangle; Huzita, 1962), whereas the Chubu district on the east of the mountains has predominance of strike-slip faults and westerly tilting landforms (Chubu tilting block; Kuwahara, 1968). Miyoshi & Ishibashi (2008) mentioned that the Philippine Sea Plate slab beneath the region around the Yoro-Suzuka-Nunobiki Mountains has shallow subduction angle and form a convex shape (Isewan-Kohoku slab) and proposed this shallow slab resulted in the tectonic boundary between the Kinki and Chubu districts in the region. On the eastern and western sides of the Yoro-Suzuka-Nunobiki Mountains, two major subsidence areas have formed and moved northward since the end of the Miocene as recorded by deposition of the Tokai group and Kobiwako group (e.g., Yokoyama, 1995; Yoshida, 1990). On the other hand, there is some debate over the formation process and mechanism of the Yoro-Suzuka-Nunobiki Mountains; Okada (2004) speculated the mountains have uplifted from south to north generally corresponding to the northward moving of the subsidence areas, whereas Ohta and Takemura (2004) proposed the formation of the mountains were still later and independent from the formation of the subsidence areas.

We are attempting revealing uplift and denudation history of the Yoro-Suzuka-Nunobiki Mountains in the past few million years by using apatite fission-track (AFT) thermochronology. We have obtained AFT ages and length distribution data in one site for the Yoro Mountains, eight sites for the Suzuka Range, and one site for the Nunobiki Mountains. Highlights of the results are as below: 1) the AFT ages range 47-30 Ma, 2) the ages were youngest in the middle to south parts of the Suzuka Range and get older to the north and south, 3) thermal histories calculated from the AFT ages and length distributions indicate rapid cooling events in the past few million years in the middle to south parts of Suzuka Range, but not in the Yoro and Nunobiki Mountains and the north part of the Suzuka Range, 4) the rapid cooling events in the past few million years are attributable to the the uplift of the Suzuka Range since ~1.3 Ma (Yokoyama, 1995). We are conducting additional AFT analyses in seven sites of the Nunobiki Mountains to expand our results to the south. In this presentation, we are planning to provide progressed discussions containing the results of the additional data.

Keywords: Yoro-Suzuka-Nunobiki Mountains, apatite fission-track thermochronology, denudation, eastern margin of the Kinki Triangle

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SCG66-P03 Room:Poster Time:April 30 18:15-19:30

Self-affinities for Amplitude and Wavelength of Folds

KIKUCHI, Kazuhei[1*] ; NAGAHAMA, Hiroyuki[1]

[1]Department of Earth Science, Graduate School of Science, Tohoku University

In general, many folds are apparently curved or jagged on a wide range of scales, so that their geometries appear to be similar when viewed at different magnifications. By Matsushita and Ouchi (1989a, b)'s method, we also analyzed the self-affinities of folds in the North Honshu Arc, Japan (Kikuchi et al., 2013). Based on this analysis, geometries were found to be self-affine and can be differently scaled in different directions. We recognize the self-affinities for the amplitude and the wavelength of folds and a crossover from local to global altitude (vertical) variation of the geometries of folds in the Northeast Honshu Arc.

Buckingham's Pi-theorem is sufficient to the first problems of fold systems (Shimamoto, 1974). However, the complete similarity cannot give us the self-affinities of folds. A general renormalization-group argument is proposed to the applicability of the incomplete self-similarity theory (Barenblatt, 1979). Based on the general renormalization-group argument, we derive the self-affinities for the wavelength (L) and the amplitude (a) of folds:

$$L^{(1-d)} \propto a.$$

The relationship between Hurst exponents H of fold (Kikuchi et al., 2013) and d are equation:

$$1\text{-}d=H,$$

where H is index of the continuity of a given fold curve and obtained by the ratio between horizontal scaling exponent and vertical scaling exponent. d is an exponent of a given incomplete self-similarity theorem.

In $d \neq 0$ case, the Hurst exponent $H \neq 1$ indicates self-affinities for the given fold curve. In this case, scale invariance of the fold might be affected by a variety of tectonic processes under the anisotropic stress field. In $d = 0$ particular case, the Hurst exponent $H = 1$ indicates self-similarity for the given fold curve. In this case, scale invariance of the fold might not be affected by a variety of tectonic processes under the anisotropic stress field. These results imply that anisotropic stress fields by gravitation and tectonic stresses might cause self-affinities of folds. Self-similarity and self-affinities of the fold might be affected and by a variety of tectonic processes under the isotropy or anisotropic stress field.

Reference

Barenblatt, G.I. (1979)*Consultants Bureau*, New York.
Kikuchi, K., K. Abiko, H. Nagahama, H. Kitazato, and J. Muto (2013) *Acta Geophysica*, **61**, 6, pp. 1642-1658.
Matsushita, M. and S. Ouchi (1989a) *Physica D*, **38**, 1, pp. 246-251.
Matsushita, M. and S. Ouchi (1989b) *Journal of the Physical Society of Japan*, **58**, 5, pp. 1489-1492.

Keywords: Fold, Self-affinity, Buckingham's Pi-theorem, Incomplete self-similarity theory

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SCG66-P04 Room:Poster Time:April 30 18:15-19:30

Reason for strange appearance of Mt. Hakone, and Reason why the Boso Triple Junction has moved to the west most

MASE, Hirofumi[1]*

[1]none

(Refer to the chart)

Mt. Fuji penetrates through the north end of the Philippine Sea Plate(PHSP), and is the front of land side plate incision, and is the starting point of Suruga and Sagami Trough(1). Mt. Hakone and Mt. Mihara have decided the position of Sagami Trough.

"Tokai Slab" seems to stop beneath the north side of Mt. Fuji. On the other hand, "Sagami Slab" seems to sink and reach the interior of Kanto.(3) It is unnatural as one board. Though the crustal deformation that GPS caught shows that the Izu Peninsula moves to the west, tendencies of Izu islands and Southern part of Kanto to move to the north are strong(4). In 135-140*east, it has been understood that the section of especially 140*meets the requirement of the temperature structure that the power to make the Pacific Ocean's side go north is generated. In a word, I think that only the side of "Sagami Slab" sank greatly in PHSP in the past and the current situation was caused.

Then, where is the crack (lateral fault) that becomes a boundary? There is the earthquake-prone zone that symbolizes subducting of Slab on the north side of the Mt. Hakone(5). If the edge of west side within the range of that distribution is traced, the Mt. Hakone and Mt. Mihara can be connected in a smooth line(red broken line). The line of blank for south-north, that divides the earthquake-prone zone to the east and the west, passes the Mt. Hakone(blue broken line). Because there was no fault in the south from Mt. Mihara, I think the slipping fault shifted to the fault shown in blue broken line though there was an age that the fault shown in red broken line slipped. The Mt. Hakone has the meaning of the west edge of PHSP in the Izu-islands-east and of the starting point of subducting.

On the other hand, why has the trench axis around the Boso Triple Junction moved to the west most? Pacific Plate that goes west compresses land side Plate and PHSP that get on on it into the direction of east-west. And, pulls them for south-north. The Part where land side Plate and PHSP overlap shifts mutually and the overlap becomes shallow. The upper plates expand for south-north to Pacific Plate. As a result, the trench axis becomes easy to go west by the east-west compression. Land side Plate and PHSP and Pacific Plate become tight in the direction of east-west. And, fold and collapse occur in them. As a result, the trench axis becomes easy to go west further. Because usual stresses are absorbed to the fold and collapsing, the trench axis is not easy to returns east even if a massive earthquake occurs. This is the cause that the trench axis moves to the west.

Reference literature

(1)Hirofumi MASE(2009)/SSJ2009/P3-64/http://jglobal.jst.go.jp/detail.php?JGLOBAL_ID=200902239527416838

(3)Shinji TODA(2005)/A new image of plate configuration and seismotectonics of the triple junction beneath the Kanto region/Fig.1(Noguchi1999)/AFRC.AIST/release06/10/2005/http://www.aist.go.jp/aist_j/new_research/nr20050610/nr20050610.html

(4)GSI/Animation of Crustal Deformation in Japan/http://mekira.gsi.go.jp/ENGLISH/crstanime.html

(5)JMA/Monthly Report on Earthquakes and Volcanoes in Japan December 2001/Tokai and South-Kanto/Fig.5/http://www.seisvol.kishou

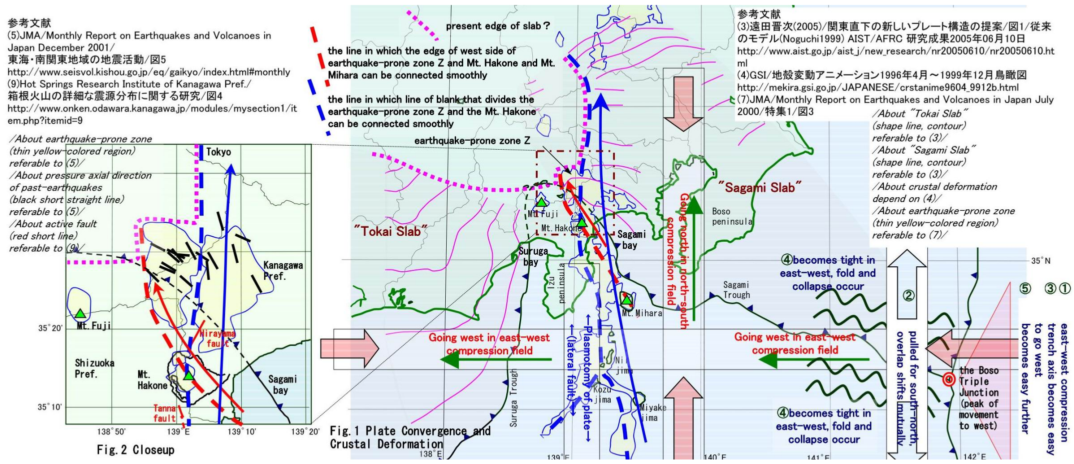

Fig. 2 Closeup
Fig. 1 Plate Convergence and Crustal Deformation