Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

SGL37-P01 Room:Convention Hall Time:May 24 18:15-19:30

Burial process of segmented backarc basins: Hokuriku-oki, San'in-oki and Kitakyushu-oki shelves of southwest Japan

ITOH, Yasuto[1*]

[1]Osaka Prefecture University

Backarc sedimentary basins of southwest Japan have developed since the Miocene rifting and opening of the western part of Japan Sea. They are bordered by the eastern Noto Plateau and western Korean Peninsula, and segmented by the Oki Plateau in between. From east to west, Hokuriku-oki, San'in-oki and Kitakyushu-oki shelves have undergone different burial histories reflecting spatiotemporal variation of tectonic events. Hokuriku-oki subbasin is characterized by large topographic reliefs of Oki Trough and Oki Ridge, which were originated from divergent rift system of the western part of Japan Sea. It has a complicated deformation history reflecting successive collision episodes in front of the Izu-Bonin arc and Fossa Magna region. Miocene sedimentation pattern implies development of gentle warping of the backarc shelf having nearly perpendicular trend to the elongate direction of the arc. Thermally subsided margin of the San'in-oki subbasin is buried by a thick pile of Miocene sediments accumulated after post-opening stagnant sedimentation in middle Miocene. Distribution and stacking pattern of the Miocene clastics suggest emergence of highs and lows aligned across the arc, just the same as those in the Hokuriku-oki shelf. Apart from the northern domains, northwestern shelf of the Kyushu Island was a site of Miocene short-lived pull-apart basin formation upon a regional right-lateral fault system bounding the Japan Sea backarc basin. The most remarkable transversal tectonic event on these segments is a strong N-S compression and deformation around the end of Miocene, which is probably related with a change of convergence mode of the Philippine Sea Plate. Seismic profiles delineate intensive folding along the backarc margin and clear angular unconformity at that age for both of the Hokuriku-oki and San'in-oki subbasins. Rifting-induced horst/graben blocks on the Oki Plateau were also strongly inverted and their landward extension is known as the Shinji Folded Zone generated at ca. 5 Ma. The regional fold zone was converging on the Tsushima Islands at the western end of the San'in-oki subbasin, and some of numerous transcurrent faults in the Kitakyushu-oki subbasin were reactivated in an opposite (left-lateral) sense. The latest tectonic episode was brought about by the Quaternary fluctuation of convergence mode of the Philippine Sea Plate. As a result of enhanced highly oblique subduction on the Philippine Sea/Eurasian margin, recent southwest Japan has suffered wrench deformation under simple shear stress, and the backarc shelf is eventually bisected by a right-lateral fault running parallel to the Median Tectonic Line. Although the westward indentation of the forearc sliver of southwest Japan inevitably causes active extrusion of the Kyushu Island, the deformation front has not reached backarc domain since the Kitakyushu-oki subbasin is immune from notable neotectonic deformation.

Keywords: sedimentary basin, tectonics, Japan Sea, southwest Japan, backarc, Cenozoic

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Cenozoic interaction processes of forearc, strike-slip and foreland basins along the NE Japan and Kuril arc junction

TAKANO, Osamu[1*] ; ITOH, Yasuto[2] ; KUSUMOTO, Shigekazu[3]

[1]Japan Petroleum Exploration, [2]Osaka Prefectural University, [3]University of Toyama

The N-S trending zone from the forearc side of the northern NE Japan arc to central Hokkaido, which corresponds to the Sorachi-Yezo belt or Ishikari-Teshio belt, demonstrates a complex tectonic history during the Cenozoic, since forearc, strike-slip and foreland settings had been interacted as the junction zone between the NE Japan and Kuril arcs. This study investigated the Paleogene to early Neogene sedimentary basin history along this zone to reveal the temporal and spatial interaction processes between the three tectonic settings, mainly based on 2D and 3D seismic survey, exploration well and outcrop survey data sets.

During the Paleogene, the northern part of this zone was situated in a territory of a strike-slip setting between the Okhotsk block and Eurasia Plate, whereas the southern part was situated in a forearc setting along the Pacific Plate subduction zone. Sedimentary basins created along the northern strike-slip part were characterized by en echelon-arranged small basins, whereas those along the southern forearc part were characterized by uplifted trench slope break (TSB) on the subduction zone side of the forearc basins and by a bay to fluvial depositional system in the basin infilling sediments. The transition point between the strike-slip and forearc settings was originally located in central Hokkaido in early Paleogene, but it gradually shifted toward the south through the Paleogene. In addition, even in the southern forearc zone, strike-slip tectonics affected the forearc basins to be segmented into subbasins. When the strike-slip motion was the maximum at around mid Oligocene, transpressional uplift occurred along the trench slope break, and regional unconformity was created (Ounc: Oligocene Unconformity). After the formation of Ounc, the southern forearc part started to subside, forming a slope type deep marine forearc basins. During the Early Miocene, the Miocene unconformity (Munc) was created again due to Japan Sea opening-related NE Japan arc uplift, which was induced by eastward migration of the NE Japan arc. After this event, westward migration of the forearc sliver of the Kuril arc induced the collision of the Hidaka block, resulting in the formation of foreland basins along this zone in central Hokkaido, in which strike-slip faults were converted to a thrust belt. The thrust block on the Hidaka side provided a large amount of clastics into the basin to form a thick pile of turbidite successions in the foreland basins. Geohistory diagrams showing basin subsidence history after this collision event demonstrate a completely different pattern between the forearc and foreland territories.

Keywords: Sanriku-oki, central Hokkaido, Early Cenozoic, forearc basin, strike-slip basin, foreland basin

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Fault geometry and its characteristics in the southern part of Abukuma ridge, offshore Fukushima Prefecture, Japan

CHIYONOBU, Shun[1*] ; ARATO, Hiroyuki[1]

[1]Faculty of International Resource Sciences, Akita University

The Abukuma ridge extends for more than 100 km from off the Soma to off the Kashima city along Japan Trench where the Pacific Plate is being subducted beneath the North American Plate. 3D seismic survey and its observations were carried out in this area off the Iwaki city, Fukushima prefecture, northeastern Japan by METI (JOGMEC, 2011). We referred to boreholes MITI Jhoban Oki (JAPT. 1993) in order to connect our seismic interpretation and stratigraphic data. As a result, nine seismic horizon (reflectors) were assigned upper limit of Santonian, upper limit of Campanian, upper limit of Maastrichitian, upper limit of Paleocene, upper limit of Oligocene, upper limit of Lower Miocene, upper limit of Middle Miocene, upper limit of Upper Miocene, and upper limit of Pliocene respectively. Abukuma ridge are distributed in north-northeast (NNE) to south-southwest (SSW) trending anticline recognized within pre-Middle Miocene strata. A number of lineaments, normal faults, bunch perpendicular within Abukuma ridge, most of which were initiated in the Cretaceous and had been active through the Paleogene, Miocene, and Pliocene. Fault morphology is classified into west-dipping north-south trending faults and north dipping east-west trending faults. They displaced by several hundreds to tens of meters. The most remarkable feature is the Abukuma ridge structure divided by large faults across the seismic section. It is apparent that there are dividing four areas where large faults and these faults are concentrated. Some of the large faults have significant strike-slip component. Subsurface structures delineated by reflection 3D seismic data suggest a different phase of activities of Abukuma ridge. Fault geometry is reflecting a complicated slip history in this area.

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Subsurface structure of northern Osaka basin based on borehole database

INOUE, Naoto[1*] ; KITADA, Naoko[1] ; TAKEMURA, Keiji[2]

[1]Geo-Research Institute, [2]Institute for Geothermal Sciences, Kyoto University

Several large cities and metropolitan areas, such as Osaka and Kobe are located in the Osaka basin, which has been filled by the Pleistocene Osaka group and the later sediments. The basin is surrounded by E-W trending strike slip faults and N-S trending reverse faults. The basin consists of granitic basement and overlaying thick unconsolidated sediment called as the ”Osaka Group”. Several marine clay layers (Ma-1 to Ma13) of the Osaka Group are key layer for stratigraphy and are assigned to the oxygen isotope events. An interval accumulation rate between two marine clay layers represents a cycle of eustatic sea level changes, and thus indicates a tectonic subsidence rate.

Kansai Geo-informatics Network has compiled a large number of borehole data and has constructed borehole database. The many borehole data have been interpreted by compared with several geological investigated borehole and extend the lithological and geological information in lateral direction. The distribution of interpreted marine clay layers (Ma9 to Ma13) was investigated in the northern part of Osaka. The tectonic subsidence rates represent differential subsidence around the Uemachi fault and branched flexure in detail.

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Keywords: Osaka basin, Uemachi fault, borehole database