# Topics on Neogene evolution of Pacific Ocean gateways, a summary of the IGCP-355

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During the five year duration of the IGCP-355 Project (1993-1995), we have obtained and learned quite a lot of information dealing on the different geoscientific specialties. These, in turn, have been beneficial to our effort in trying to understand parts of our earth system in and around the Pacific.

Though a reconstruction of the Circum Pacific region back to 40 Ma, we would have selected a number of geo-events (geotectonic, magmatic, environmental and biological events) in the Pacific region from some typical reports, as shown in table (Ibaraki, 1997; Molina-Cruz,1997; Tsuchi, 1997; Nishimura and Suparka, 1997; Beu *et al.*, 1997; Haung *et al.*, 1997; Linthout *et al.*, 1997; Ogasawara, 1998; Takahashi, 1998; Barron, 1998; Wei, 1998; Parkinson, 1998; Soeria-Atmadja *et al.*, 1998; Srinivasan and Sinha, 1998; Kamata, 1998). In this table, there are some time lags in their results. During this project, we could not decide the age of these events precisely. I would like to discuss the geotectonic topics of Pacific Ocean Gateways on this table in the future

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Table 1. Neogene evolution of Pacific Ocean Gateways

| | **Tectonic events** | | **Climatic events** | | **Bio-events** | | **Magmatic events** | **Plume-tectonics** |
|---|---|---|---|---|---|---|---|---|
| 80-60 Ma | Continental drift | | | | | 80~60 Ma | Granitic Magmatism | Super plume |
| 50 Ma | Collision between Indian and Eurasian continents | | | | | | | |
| 45-17 Ma | 1. Uplift of Himalayan belt | | | | | | High PT mentamorphism and granitization | |
| | 2. Southeast intrusion of Sundaland | | | | | | | |
| 42-40 Ma | Opening of the Tasman seaway south of Australia | | | | | | | |
| 25-23.5 Ma | Opening of Drake Passage | 30-20 Ma | Eocene cooling events with a 7~8ºC decrease of the annual mean temperature in middle latitude of north part of Pacific Ocean | | | 30 Ma | Metabasite magmatism in east Sulawesi, Indonesia | |
| 20-15 Ma | 1) Opening of Japan Sea | | | | | | | |
| | (a) Parallel drift with block movements of NE Honshu | | | 19-18 Ma | High diatom production at north Pacific | | | Subducted plume at the back-arc of Japan arc |
| | (b) (I) 20-15.5 Ma parallel drift of SW Honshu Opening Tsushima Strait | | | 15 Ma | Abrupt appearance of a cold-water fauna on Pacific coast of NE Japan | | | |
| | (II)16-14 Ma 50º clockwise rotation of SW Honshu Closing of Tsushima Strait | | | | | 16-14 Ma | Granitic magmatism | |
| | 2) Borneo, the Celebes Sea basin, and western arm of Sulawesi rotated 50º counter-clockwise | | | | | | | |
| | 3) The south China Sea and Sula basins effectively began to develop | | | | | | | Subducted plume at the Indonesia Peninsula |
| | | | | 15-12 Ma | Extensive hiatus along the Pacific coast of SW Japan | | | |
| 15-6 Ma | Banggai and Sula Islands collided with Sulawesi | | | 14 Ma | Abrupt and extensive development of biosiliceous lithofacies along Pacific coast of Peru | | | |

Table 1. Continued.

| Tectonic events | | Climatic events | | Bio-events | | Magmatic events | | Plume-tectonics |
|---|---|---|---|---|---|---|---|---|
| | | | | 9 Ma | Diatom accumulation rate increased in the N.W.Japan and off northeast Japan (global warming) | 8 Ma | Ophiolite complex at Seram | |
| 8-3 Ma | | | | | | | | Subducted slab break down at the depth of ~40km at SW Honshu arc |
| | Banda arc collided with Australian continent | 7.17-6.7 Ma | Late Miocene cooling in the north part of Pacific Ocean | | | | | Subducted slab break down at the depth of ~230km at Sunda arc |
| | The north and south New Guinea collided | | | | | | | |
| 6.5 Ma | Buru and Seram rotated 50º counter-clockwise | | | 6.5 Ma | Expansion of diatoms in north Pacific | | | |
| 5.5 Ma | Arc-continent collision in North Taiwan | | | 5.2 Ma | Indonesian Seaway become an effective biogeographic barrier to planktonic foraminifera | | | |
| 5 Ma | Onset of west Atlantic glaciation | | | | | | | |
| | Tectonic closure of the New Guinea Seaways | | | 4.5 Ma | Diatom accumulation rate declined in middle latitudes of north Pacific, increased in high latitude of north Pacific | | | |
| 4.4 Ma | | | | | | | | |
| | Southward drift of the Tasuman Front | | | 3.5 Ma | 1) Expansion of coastal up-welling in south Pacific | | | |
| 3.7-3.0 Ma | | 3.15-2.5 Ma | Pliocene cooling events in the north part of Pacific Ocean | | 2) Abrupt cooling of surface water temperature along the coast of Ecuador | | | |
| | The final closing of central America Seaway | | | | | | | |
| 3-0 Ma | | | | 3.2 Ma | Relative abundance of radiolarian and nasseeliarians in Central America | | | |
| | Sunda Strait and northern part of Makassar Strait began to open | | | | | | | |
| | | | | 2.7 Ma | Major cooling of surface water temperature in north Pacific (diatom) | | | |
| | | 1 Ma | Most extreme Pleistocene glaci-ation at Antarctic Seaway | | | 0.30 Ma | Alkali volcanism termi-nated at Sunda arc | |
| | | | | | | 0.02 Ma | Alkali volcanism (all vol-canism)terminated at SW Honshu arc | |
| | | 0.01-0 Ma | Pleistocene cooling at north part of Pacific Ocean | | | | | |