

## 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

	<b>Tectonic events</b>	<b>Climatic events</b>	<b>Bio-events</b>	<b>Magmatic events</b>	<b>Plume-tectonics</b>
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 2. Southeast intrusion of Sundaland			High PT metamorphism and granitization	
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 7~8°C 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 (b) (I) 20-15.5 Ma parallel drift of SW Honshu Opening Tsushima Strait (II) 16-14 Ma 50° clockwise rotation of SW Honshu Closing of Tsushima Strait 2) Borneo, the Celebes Sea basin, and western arm of Sulawesi rotated 50° counter-clockwise 3) The south China Sea and Sula basins effectively began to develop		19-18 Ma High diatom production at north Pacific 15 Ma Abrupt appearance of a cold-water fauna on Pacific coast of NE Japan	16-14 Ma Granitic magmatism	Subducted plume at the back-arc of Japan arc
15-6 Ma	Banggai and Sula Islands collided with Sulawesi		15-12 Ma Extensive hiatus along the Pacific coast of SW Japan 14 Ma Abrupt and extensive development of biosiliceous lithofacies along Pacific coast of Peru		Subducted plume at the Indonesia Peninsula

Table 1. Continued.

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