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MESOZOIC SHELF & SHELF MARGIN SEDIMENTS & ASSOCIATED IGNEOUS ROCKS

K

Calcareous & non-calcareous mudstone, shale, siltstone, sandstone, conglomerate, limestone; rare volcanics locally turbidites; Estherid black shales, polymict ophiolitic/metamorphic congl. Orbitolina limest, volcanoclastic rocks & andesitic/rhyolitic lavas, tuffs, breccia

C & NW Kalimantan: Selangkai Formation, Pedawan Formation & Belakai Conglomerate
W Sarawak: Pedawan Formation

SE Kalimantan: Menunggul Group-Renteulejung Tabetan & Pamali Fms.; Alino Group-Keramalan & Pudek Fm.; Batununggal & Paniungan Fms.

Ju

Calcareous slate, shale, sandstone fossiliferous, ammonites limestone. Shallow to open marine

NW Kalimantan: Brandung Formation, Bau Limestone Formation
W Sarawak: Bau Limestone Formation Pedawan Formation

JK

Mudstone, claystone, siltstone, shale, slate, sandstone; rare limestone, phyllite, schist, gneiss. Commonly tuffaceous. Terrestrial to marine

SW Kalimantan: Ketapang Complex, Menunuk Volcanics; Kemperi Sandstone
?Kemperi Sandstone

F₁ J

Shale, slate, mudstone, siltstone sandstone, tuffaceous sandstone, tuff; minor conglomerate. Commonly carbonaceous; ammonites, belemnites, pelecypods (Halobia, Monotis). Shallow to open marine

NW Kalimantan: Benkeyang Group; Sadong Fm Banau Fm., Sungeibetung Fm.
SW Kalimantan: Matan Volcanic Complex
W Sarawak: Sadong Formation

F₂ + +

Lava, breccia, tuff, agglomerate andesitic to basaltic commonly amygdaloidal (zeolite), altered
++ Granodiorite, locally porphyritic

W Kalimantan: Sekedau-Jambu & Serian Volcanics; ?Belung Volcanics
SW Kalimantan: Matan Volcanic Complex
W Sarawak: Serian Volcanics & Jagoi Granodiorite (?195Ma)

LATE PALEOZOIC SHELF SEDIMENTS & METAMORPHIC COMPLEXES

PT R

Granite, granodiorite, diorite, gabbro, commonly metamorphosed, foliated schist, gneiss, migmatite, quartzite, serpentinite

C Kalimantan: Embai Complex (263-204Ma)
Busang Complex (235-207Ma)

CP

Slate, phyllite, shale, hornfels, quartzite, sandstone, tuffaceous sandstone, tuff & low grade marble; locally siliceous, graphitic; fusulinids. Open marine.

W Central Kalimantan: Balseibut Group
W Sarawak: Terbet Formation

PRE-CARBONIFEROUS BASEMENT

Pz M

Slate, hornfels, phyllite, schist, gneiss, migmatite; graphitic; minor metavolcanics & amphibolite.

C & NW Kalimantan: Plioh Metamorphics and Seminis Formation
W Sarawak: Tuang Fm., Kerait Schist Fm

OCEANIC BASEMENT, OVERLYING SEDIMENTS & TURBIDITE BASINS

PALEOGENE

Pox

Turbidites, thin to very thick in N

N & W Sabah: Crocker Fm

SW Sabah & E Brunei: Temburong Fm

Px

Thin turbidites, weak to intense regional metamorphism

Sabah: Trusmi & Sapulut Formations

N & C Kalimantan: Melinau Formation

N Sarawak: Mulu & Kelalan Formations



Tectonic melange comprising exotic blocks of sedimentary rocks including limestone, chert; also ultrabasic rocks; all enclosed in a pervasively sheared clay-shale matrix

W Sarawak: Lubok Antu Melange (?Cret-Eoc) Serebang Fm (?Lr.Cret)

C Kalimantan: Danau & Kapuas Complexes with exotic blocks incl. Devonian coralline limestone - the oldest fossiliferous rocks in Borneo

MESOZOIC

KPx

Flysch, rare tuff, limestone, breccia & agglomerate.

Sarawak: Kapit, Pelagus, Meteh & Bewang Members of Belega Formation Bukit Mersing pillow basalts

Sabah: ?Trusmi, ?Sapulut & ?Kulap Fms

Kx

Mudstone, sandstone, conglomerate limestone; radiolarian chert, spilite, breccia, basalt, gabbro

C Kalimantan: Embaluh Group, Mentarang and Selangkai Formations

W & C Sarawak: Lupa & Layer Members of Belega Fm; Pakong Mafic Complex

Sabah: Sapulut Fm; Chert-Spilite Formation with Lr. Cret. radiolaria

Kxu

Serpentinised peridotites, pyroxenites & associated rocks

SE Kalimantan: Meratus ophiolite (116Ma)

Sabah: P.Banggi, Upper Segama and Labuk valleys, Darvel Bay, Kinebalu, G. Jambuyukan P. Melawati

Pelaihari phyllite; Heuran Schist (108-4Ma)

Phyllite, slate, epidote-hornblende schist

Volcanoclastic turbiditic sandstones & mudstones with radiolarian chert

Alino Group: Keramaian & Puduk Fms (Lr.Cret)

JKx

Slate, shale, phyllite, siltstone metasilstone, quartz to lithic sandstone, metasilstone, conglomerate, metaconglomerate, chert (commonly with Radiolaria), spilite, metavolcanics, diorite, metadiorite, Open marine, partly turbidite

W & C Kalimantan: Kapuas Complex

C Kalimantan: Peking Formation & associated dolerite/gabbro of 'Adio suture'

W Sarawak: Serebang, Sejingket & Sebangen Formations

Jx

Serpentinite, peridotite, gabbro metabasalt, metabasalt, metadiorite, meta-meladiorite

NW, C & E Kalimantan: Danau Mafic Complex

E Sabah: Darvel Bay ophiolites-Silumpet

Gneiss gabbro layer (101-140Ma)

Gneiss, schist, amphibolite, granite, granodiorite, tonalite

E Sabah: Crystalline Basement derived probably by sub-seafloor metamorphism of oceanic crust (160-87Ma); K-granitoid (210Ma) a discordant age; oldest granite in Borneo?

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SCHWANER MOUNTAINS VOLCANO-PLUTONIC ROCKS

UPPER CRETACEOUS INTRUSIVES & VOLCANICS

Ku4	Granite, granodiorite, diorite	Pueh(75-81Me) & Ere(76-79Me) Granites
Ku3	Gabbro, minor diorite	Biwa Gabbro(88Me)
Ku2	Decite to basalt lava, breccia, tuff, agglomerate; dykes, sills and stocks of decite/granodiorite, andesite/diorite, basalt/gabbro; volcanoclastic rocks	Kerebai Volcanics(65-75Me) Bunga Basalt
	Decite/trachyandesite/rhyodacite rhyolite, quartz keratophyre	?Metan Complex
Ku1	Granite, quartz monzonite, alkali-felspar granite; rare granodiorite, tonalite monzonite, diorite, gabbro	West & Central Kalimantan: Sukadana Granite Suite(80-91Me)

LOWER CRETACEOUS INTRUSIVES & VOLCANICS

KI4	Andesite lava, breccia, tuff, agglomerate; commonly altered	Raye Volcanics(106Me) Betung Volcanics(98Me)
KI3	Granite	Menyukung Granite(125Me); Alan Granite(121-131Me)
KI2	Granodiorite, granite, tonalite; minor quartz diorite, diorite	Mensibau Granodiorite (95-130Me)
KI1	Tonalite, granodiorite, granite; minor quartz diorite, diorite, gabbro. Locally foliated.	Sepauk Tonalite (95-130Me), Laur Granite

MERATUS MOUNTAINS VOLCANO-PLUTONIC ROCKS

UPPER CRETACEOUS INTRUSIVES & VOLCANICS

Ku3	Gabbro, diorite, granodiorite, granite plutonic masses	Rimuh Plutonic Complex associated with Pitank Volcanic Formation & Pitap Fm(Heruyan Member),
	Microdiorite dykes, sills & plugs	Julong Microdiorite (63.3Me)
Ku2	Amygdaloidal basaltic-andesitic lavas, flow breccia & pyroclastics	Pitank Volcanic Formation Batununggal Group:Heruyan Member (pyrox.basalt + polymict breccia)
	Hornblende andesitic lavas & pyroclastics(agglo.+ breccia)	Manunggul Group:- - Kayujohare Volcanic Formation - Alimukum Agglomerate
	Andesitic & rhyolitic lavas & breccias	- Benusiam Volcanic Formation - Malineu Basaltic Andesite - Mendiangin Rhyolite (87.5-83Me)
Ku1	Adamellite	Kintap Granite (95.3Me) ?-type associated with and intruding the volcanoclastic Alino Group

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CENOZOIC IGNEOUS ROCKS

QUATERNARY

Qv	<i>Pleistocene/Holocene basalt & dacite</i>	<i>Sabah: Kunak & Tawau areas</i>
	<i>Pleistocene andesitic pyroclastic rocks and lava</i>	<i>Pulau Gaya & other nearby islands; NE Tawau</i>
	<i>Plio-Pleistocene dacitic & andesitic pyroclastic rocks</i>	<i>Semporne Peninsula & Tawau</i>
	<i>Andesite porphyry, diorite, microgranitoids and tonalite</i>	<i>Semporne Peninsula & Tawau</i>

NEOGENE

Npv	<i>Flood basalt composed of basalt to andesite lava, breccia, tuff, agglomerate, lahar and partly preserved volcanic plateaux & cones</i>	<i>Central Kalimantan: Metakung Volcanics, Niut Volcanics 8-1.6 Ma</i>
		<i>C Sarawak: Nieuwenhuis Mts, Usun Apau Plateau, Hose Mts., Linau-Balui Plateau</i>
		<i>E Kalimantan: Longiram-?Acu Fm</i>
Nmg	<i>Subalkaline monzogranite to leucomonzonite; rare rhyolitic tuff; emplacement at high crustal level; tin-bearing</i>	<i>E Kalimantan: Long Lai (Sn) granite 26-17.5 Ma</i>
Nmv	<i>Plugs, stocks, dykes, sills ranging in composition dacite-granodiorite-andesite-diorite, minor basalt-dolerite, I-type characteristics</i>	<i>W & C Kalimantan and W Sarawak</i>
	<i>Dominantly dacitic</i>	<i>Sintang Intrusive Suite, Lapung Volcanics 30-15 Ma</i>
		<i>N Sarawak: Basalt dykes along Tinjar fault zone</i>
		<i>E Kalimantan: Sempahan-basalt dykes?</i>
		<i>C Sabah: Diorite plugs and dykes in Cenozoic Basins</i>
Nmi	<i>I-type adamellite & granodiorite; microtonalite</i>	<i>Sabah: G Kinebalu</i>
		<i>N Sarawak: Bt Kelulong, Bt Punan</i>

PALEOGENE

Pev	<i>Andesite, dacite & rhyolitic lavas; andesite, basalt & gabbro intrusives</i>	<i>C Kalimantan: Muller, Piyembung, Nyuan and Serentak Volcanics 48-50 Ma</i>
	<i>tuff, agglomerate, breccia & volcanoclastic rocks; lahars</i>	<i>W & Central Sarawak: Bt. Piring granite, Arip andesite & rhyolite lavas, Bt Kunang gabbro, Bt Besai basalt/andesite</i>

CENOZOIC SEDIMENTARY ROCKS-E MALAYSIA & BRUNEI

QUATERNARY

Q

Alluvium, terrace sand, clay
silt, sand, gravel; peat in freshwater
mixed swamp forests

Coastal areas, major river estuaries,
river terraces, intermontane basins
mostly in Sabah

NEOGENE

Np

Sand, clay, conglomerate, often
pyritic/carbonaceous, fossil wood;
unconsolidated; coal & lignite

C Sarawak: Balingian, Begrih & Liang Formations
N Sarawak, Brunei, SW Sabah: Liang Formation
Sabah: Liang, Timohing, Togop, Balung &
Umas-Umas Formations

Nm

Melange & Broken Formations
of Middle Miocene age

NW & E Sabah: Weriu, Ayer, Kalumpang, Kuamut,
Kelabakan & Garinono Formations

Nm

Quartz & lithic sandstones, mudstone
rare conglomerate; locally coal &
coral limestone; occasional volcanic
lava, tuff, agglomerate & breccia
Benthic & planktonic foraminifera

W Sarawak: ?Plateau Sandstone Formation
? Kayan Basins
C Sarawak: Sibuti, Lambir, Belait Formations
N Sarawak, Brunei, SW Sabah: Upper Meligen
Formation; Miri, Seria, Tunku &
Setap & Belait Formations
Coal in Brunei, Labuan, C & E Sabah
Major hydrocarbons offshore NW Borneo
Sabah: 3 Banggi, Tanjong, Kelabakan, Kapilit,
Gomentong Limestone, Libong Tuffite, Tabanak
Conglomerate, Tunku, Bongaya, Ganduman,
Sandakan & Sehabat Formations

PALEOGENE

Po

Quartz & lithic sandstones, mudstone
shale, conglomerate, limestone,
fossiliferous; fluvial-estuarine-
lagoon-shallow marine; deltaic
towards the E. Commencement
of major hydrocarbon zones

C & N Sarawak: Nyaleu, Tubau, Setap, Tengep,
Lambir Formations
NE Sarawak: Kelabit Formation
N Sarawak, Brunei, SW Sabah
Temburong, ?Lr Meligen Formation
West Crocker Formation
N, C & E Sabah: Kudat & Labang Formations
Coal basins in Rajang Valley
Major hydrocarbons offshore
C Sarawak: Taseu Formation & Arip Volcanics
W Sarawak: Silantek Formation
(Ketungau Basin) =
N Sarawak: Melinau Limestone Formation
(extends to Lower Miocene)

Pe

Terrestrial sediments, carbonaceous
quartz, felspar, chert, volcanics,
rare limestone; mostly terrestrial
with few shallow marine incursions

W Sarawak: Kayan Basins
(extends through Eocene to ?Oligocene)

Pp

Conglomerates, terrestrial clastics
Clasts include granitoids

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CENOZOIC SEDIMENTARY ROCKS - KALIMANTAN

QUATERNARY

Alluvium, terrace sand, clay
silt, sand, gravel; peat in freshwater
mixed swamp forest

SE Kalimantan: Mertapura Formation

NEOGENE

Sand, clay, highly carbonaceous,
coal, conglomerate, pyritic, fossil
wood, unconsolidated

E & SE Kalimantan: Kampung Baru Fm

SE Kalimantan: Dohar Formation

Quartz, lithic sandstone, mudstone,
rare conglomerate; locally coal &
coral limestone; occasional volcanic
lava, tuff, agglomerate & breccia
Benthic & planktonic foraminifera
Hydrocarbon provinces in NW &
SE Borneo

S Central Kalimantan: Kelinjau Fm

SE Kalimantan: Warukin, Balikpapan, Pulabelang &
Bebulu Formations

PALEOGENE

Quartz lithic sandstone, mudstone,
shale, conglomerate, fossiliferous,
fluvial-estuarine-legoosn:
shallow marine deltaic towards
the East.
Commencement of
major hydrocarbon zones

Central Kalimantan

Melewi Basin: Payak, Tebidah, Sekayem, Hamisan Fm's
Alat Sandstone

W Kutei Basin: Ujoh Bilang Fm., Batu Belah

Limestone Member, Lemmuring Sst, Merah Fm

E Kutei Basin: Ujoh Bilang, Wehau Formations

SE Kalimantan

Berei Limestone & Binuang Formations

Pamaluan & Tuyu Formations

Terrestrial sediments, carbonaceous
quartz, felspar, chert, volcanics,
rare limestone; mostly terrestrial
with few shallow marine incursions

W Kalimantan: Ketungau & Mandai Basins

Central Kalimantan

Melewi Basin: Mengen Sst, Muller Volc., Ingar Fm

Dangkan Sst, Muarejuloi Fm, Silet Shale Member

W Kutei Basin: Kihim Haloq Sst., Batu Kelsu Fm

Batsu Aysu & Merah Formations

E Kutei Basin: Atan Fm

SE Kalimantan: Tanjung, Telakaj & Kuera Fms

Clastic chert sandstone, ultrabasic
conglomerates, terrestrial clastics

SE Kalimantan: Tanjung Formation

Hydrocarbons in SE Borneo

Terrestrial/shallow marine clastics
including clasts of granitoids

NW Kalimantan: Kayan Basins

extends through Eocene to ?Oligocene

APPENDIX B

STRATIGRAPHIC CORRELATION CHART FOR WEST & CENTRAL KALIMANTAN AND SARAWAK

SYSTEM	NW Kalimantan & West Sarawak	Kuching & Serian	Lubok Antu - Kapuas	Boyan Melange Zone	Schwaner Mts	Age (Ma)
Quaternary						
Pliocene	Niut Volcanics		Metalang volcanics			
Miocene	Genozoic dacites - Sintang Volcanics etc.	Genozoic dacites - Sintang Volcanics etc.	Genozoic dacites - Sintang Volcanics etc. Lupang volcanics	Genozoic dacites - Sintang Volcanics etc.	Genozoic dacites - Sintang Volcanics etc.	
Oligocene						23
Eocene	Kayan Sst. Basin	Kayan Sst. Basin	Kertungau Basin Shantik Fm	Melawi Basin		36
Paleocene	Seratak volcanics (51 Ma) Sawang dacite (51 Ma)		Lubok Antu melange ? Muller Volc. Pyrambung V (48-50 Ma)	? Boyan melange ?		53
Upper Cretaceous			Lupar Mts. Lupar Fm Balaga Fm Embaluh Group			65
Lower Cretaceous	Selangai Fm (mass flow in part) Bau Lmt Fm Selingkat Serabang Fm	Pedawan Fm Memibau granite (95-125 Ma) Kedadam Fm ? Serabang Complex	Era granite (76-79 Ma) Total granite (77 Ma) Memuk Volc (125 Ma)	Selangai Fm (mass flow)	Batu liat (63-74 Ma) Kerang Volc (63-74 Ma) Suladina granite suite (80-91 Ma) Bawa gabro (80 Ma) Laur granite (103 Ma) Serabang Metagabbro (95-130 Ma) Alai granite (72-130)	85 105
Jurassic		Jagol granite (195 Ma)				135
Triassic	Bankayang Group Sakau Volcanics	Sadong Fm Emboi Complex (204-263 Ma)	Buang Complex (107-233 Ma)		Belaban Volc (154 Ma) Knapang Complex Mazan Volcanic Complex Betung volcanics	205
Permian	Belaisbut Group	Terbat Fm				290
Carboniferous						
Pre-Carboniferous	Pinh Metamorphics (Pm) ? Semina Fm	Tuang Fm ? Serabang Kerati Schist Complex				355

Appendix B Stratigraphic correlation chart for W & C Kalimantan and W Sarawak