NATIONAL GEOLOGICAL MAP
OF THE REPUBLIC OF
ECUADOR

THIS MAP REPRESENTS ONLY A PART OF NATIONAL TERRITORY

50 40 30 20 10 0 50 100 kms

Scale 1:1,000,000
1982
(Segunda Aproximación)

Ministerio de Recursos Naturales y Energéticos
Ministro Dr. EDUARDO ORTEGA

Dirección General de Geología y Minas
Director Ing. PEDRO FREILE

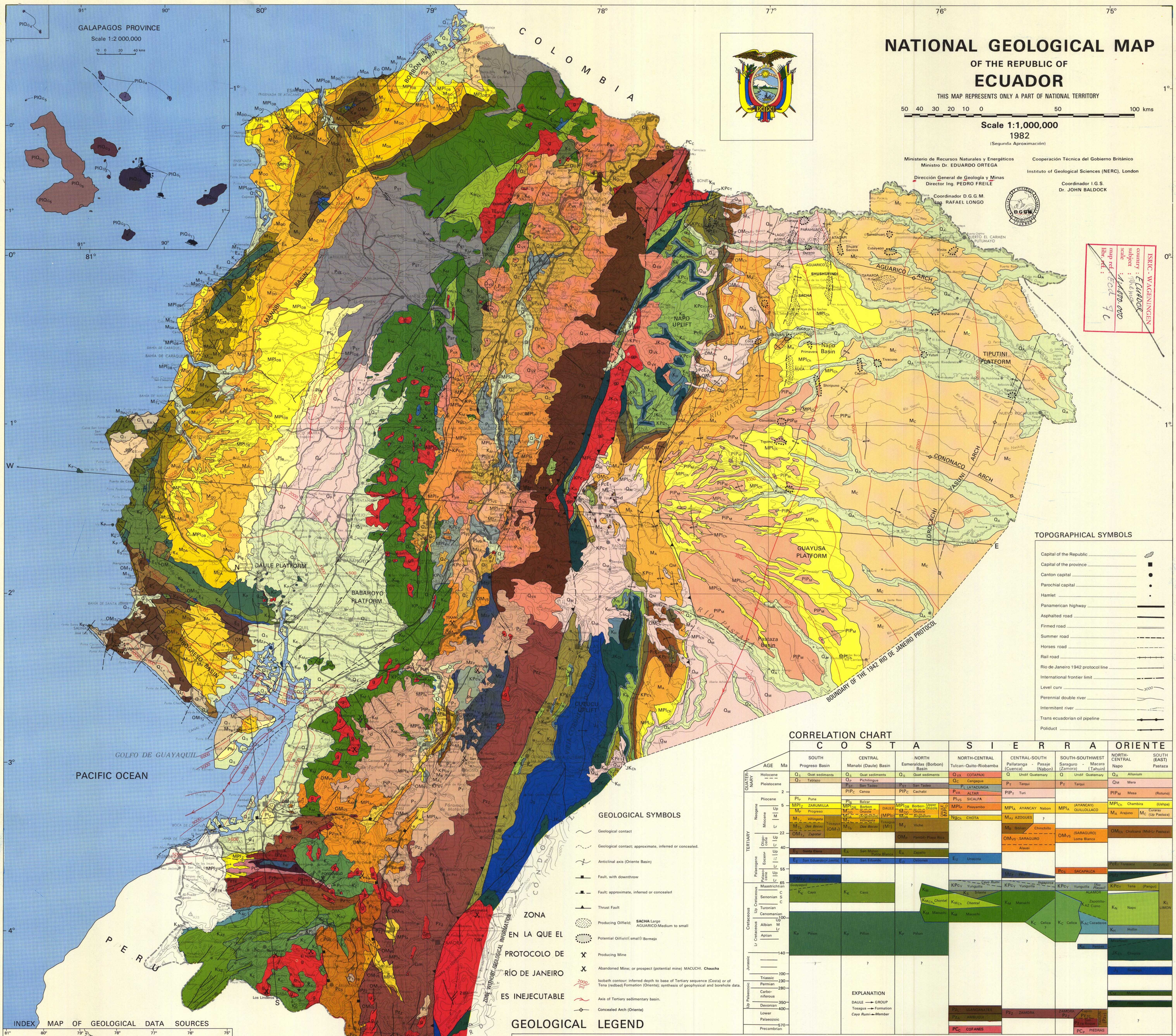
Coordinador D.G.G.M.
Ing. RAFAEL LONGO

Cooperación Técnica del Gobierno Británico

Instituto of Geological Sciences (NERC), London

Coordinador I.G.S.
Dr. JOHN BALDOCK

ISRIC - WAGENINGEN
country : Ecuador
subject : Nat. map
scale
map ref : ECU 1C
libr. ref : 4.1.000.000



TOPOGRAPHICAL SYMBOLS

- Capital of the Republic
- Capital of the province
- Canton capital
- Parochial capital
- Hamlet
- Panamerican highway
- Asphalted road
- Firmed road
- Summer road
- Horses road
- Rail road
- Rio de Janeiro 1942 protocol line
- International frontier limit
- Level curv
- Perennial double river
- Intermitent river
- Trans ecuadorian oil pipeline
- Poliduct

CORRELATION CHART

AGE	Ma	COSTA: SOUTH Progreso Basin	COSTA: CENTRAL Manabi (Daule) Basin	COSTA: NORTH Esmeraldas (Borbon) Basin	SIERRA: NORTH-CENTRAL Tulcan-Quito-Riobamba	SIERRA: CENTRAL-SOUTH Pallatanga (Cuenca) - Pasaje (Nabon)	SIERRA: SOUTH-SOUTHWEST Saraguro (Zamora) - Macara (Tahuin)	ORIENTE: NORTH-CENTRAL Napo	ORIENTE: SOUTH (EAST) Pastaza
QUATERNARY – Holocene		Q_S Quat sediments; Q_T Tablazo	Q_S Quat sediments	Q_S Quat sediments	Q_{VX} COTAPAXI; Q_C Cangagua	Q Undif Quaternary	Q Undif Quaternary	Q_A Alluvium	
Pleistocene	2		Q_P Pichilingue; P_{ST} San Tadeo	P_{ST} San Tadeo	P_L LATACUNGA; P_{VA} ALTAR	P_T Tarqui	P_T Tarqui	Q_M Mera	
Pliocene	5	Pl_P Puna	PIP_C Canoa	PIP_C Cachabi	Pl_{VS} SICALPA	PIP_T Turi		PIP_M Mesa (Rotuno)	
Neogene Miocene Up		MPI_Z ZARUMILLA; M_P Progreso	Pl_B Balzar; MPI_{DB} Borbon; M_{DO} Onzole (Angostura); M_{DA} Angostura (Tosagua)	MPI_{DB} Borbon; M_{DO} Onzole; M_{DA} Angostura (Daule Gp)	MPI_P Pisayambo	MPI_A AYANCAY Nabon	MPI_A (AYANCAY) QUILLOLLACO	MPI_{Ch} Chambira (Ushpa); M_A Arajuno; M_C Curaray (Up Pastaza)	
Miocene Lr	22	M_{Tv} Villingota; M_{Tb} Dos Bocas; OM_T Zapotal	M_{Tv} Villingota; M_{Tb} Dos Bocas; OM_T Zapotal (Tosagua)	M_U Viche; OM_P Pambil-Playa Rica	Ng_{Ch} CHOTA	M_{AZ} AZOGUES; M_B Biblian; Chinchillo; OM_{VS} SARAGURO; Alausi	OM_{VS} (SARAGURO) Loma Blanca	OM_{Ch} Chalcana (Mid-Lr Pastaza)	
Oligocene	40	E_S Santa Elena	E_A San Mateo (Punta Blanca)	E_A Zapallo					
Eocene	55	E_E San Eduardo (+Javita)	E_E San Eduardo	E_O Ostiones	E_U Unacota		PC_S SACAPALCA	PcE_T Tiyuyacu (Cuzulca)	
Paleocene	65	PMz_P Santa Paula				M_{PS} PALTA			
Cretaceous Up – Maastrichtian		Guayaquil; K_K Cayo	K_K Cayo	?	KPc_V Yunguilla; Cayo Rumi	KPc_V Yunguilla; Ingapirca	KPc_V Yunguilla (Río Playas)	KPc_T Tena (Pangui)	
Senonian				K_M	K_S Silante		ALAMOR	K_N Napo	K_L LIMON
Turonian				K_{MCh} Chontal	K_{MCh} Chontal	K_M Macuchi	Zapotillo-K_{AZ} Ciano		
Cenomanian	100			K_M Macuchi	K_M Macuchi	K_C Celica ?	K_C Celica; K_{AC} Cazaderos	K_H Hollín	
Albian		K_P Piñon	K_P Piñon	K_P Piñon	?	?		K_R Raspas	
Aptian	140								
Jurassic	200	?	?	?				JK_{Ch} Chapiza	
Triassic	230							J_S Santiago	
Permian	280								
Carboniferous	350							TrM_C Macuma	
Devonian	400								
Lower Palaeozoic	570				PZ_L LLANGANATES; PZ_A AMBUQUI	PZ_Z ZAMORA	ZAMORA PZ_Z; Capiro PZ_{TC}; Tahuin PZ_{TR}; Roque PZ_{TR}		
Precambrian					PC_C COFANES		PC_P PIEDRAS		

GEOLOGICAL SYMBOLS

- Geological contact
- Geological contact; approximate, inferred or concealed.
- Anticlinal axis (Oriente Basin)
- Fault, with downthrow
- Fault; approximate, inferred or concealed
- Thrust Fault
- Producing Oilfield; SACHA: Large AGUARICO: Medium to small
- Potential Oilfield (small): Bermejo
- Producing Mine
- Abandoned Mine; or prospect (potential mine) MACUCHI, Chaucha
- Isobath contour: inferred depth to base of Tertiary sequence (Costa) or of Tena (redbed) Formation (Oriente); synthesis of geophysical and borehole data.
- Axis of Tertiary sedimentary basin.
- Concealed Arch (Oriente)

GEOLOGICAL LEGEND

COSTA

South to Central

- QUATERNARY – Holocene: Q_S Quaternary sediments (Marine, estuarine clays)
- PLEISTOCENE: Q_T **Tablazo Fm** (50-100m) Marine bioclastic terraces
- PLIOCENE: Pl_P **Puná Fm** (c. 1300m) Shales, clays, sands.
- MIOCENE: MPI_Z **Zarumilla Gp** Sands, conglomerates. M_P **Progreso Fm** (500-2700m) (inc **Subibaja Fm**, in part) Sands, silts, clays, shales
- M_{Tv} **Villingota Mbr** (0-650m, inc parts of **Subibaja**, **Charapoto Fms**) White diatomaceous shales, silty shales
- M_{Tb} **Dos Bocas Mbr** (0-2400m, inc **Subibaja** in part) Choc shales, calc, siltstones
- OLIGOCENE: OM_T (Tosagua Fm) **Zapotal Mbr** (0-1100m) Congloms, sandstones, shales
- EOCENE: E_S **Santa Elena Oliostromic Complex** Cretaceous to Eocene Olistolitha
- E_E **San Eduardo Fm** (0-200m) Limestones, shales.
- PALAEOCENE: **Punta Piedra Fm** Phyllites, schists.
- CRETACEOUS: K_K **Cayo Fm** (c. 3000m) (inc **Guayaquil Mbr**: cherts, argillites) Shales, tuffaceous slates, breccias, lavas.
- K_P **Piñon Fm** Basaltic lavas, tuffs, breccias

Central to North

- Q_P **Pichilingue Fm** (100-1200m) Terraces, fluvial seds
- P_{ST} **San Tadeo Fm** (100-1000m) Lahars, fanglomerates, ash/mud flows
- PIP_C **Canoa-Cachabi Fms** (50-400m) Sands, clays, conglloms.
- Pl_B **Balzar Fm** (c. 300m) Marine conglloms, sands, clays.
- MPI_{DB} **Borbon Fm** (inc **Upper Onzole**) Conglloms, sands, calc muds.
- M_{DO} **Onzole Fm** (inc **'Charapoto'** in part) Shales, siltstones, conglloms (<550m)
- M_{DA} **Angostura Fm** Conglloms, sandstones, muds, (<600m)
- M_V **Viche Fm** (600-950m) Shales, sandstones, conglloms
- OM_P **Playa Rica-Pambil Fms** (1000-1500m) Shales (+sandstones, conglloms)
- E_A **San Mateo-Punta Blanca-Zapallo Fms** Sst-Cg; shales-clay; 'limestones' shales (500-1500m)
- E_O **Ostiones Fm** (c. 100m) Limestones, mudstones
- K_P **Piñon Fm** Basaltic lavas, tuffs, breccias

North to Central/South

- Q_{VX} **Cotopaxi Gp** (Strato volcanoes) Andesitic lavas, pyroclastics
- Q_C **Cangagua** (10-150m) Ash, pumice.
- P_L **Latacunga Gp** (inc **Palmira, Chichi**) Pumice tuffs, ignimbrites, volcaniclastics
- P_{VA} **Altar Gp** (strata-volcanoes) Andesitic lavas, pyroclastics
- Pl_{VS} **Sicalpa Gp** (inc **Sagatoa, Igualata**) Andesitic agglloms, tuffs, lavas
- MPI_P **Pisayambo Fm** (1000-2000m) Andesitic lavas, pyroclastics
- Ng_{Ch} **Chota Gp** (c. 2500m) Conglloms, tuffaceous sediments
- E_U **Unacota Fm** (500-1500m) Limestones, shales, volcaniclastics
- KPc_V **Yunguilla Fm** (c. 3000m) inc **Cayo Rumi Mbr** (conglloms) Shales, limestones, volcaniclastics
- K_C **Silante Fm** (2000-5000m) Redbed volcaniclastics
- K_{MCh} **Macuchi Fm: Chontal Mbr** (500-3000m) Shales, cherts, sandstones
- K_M **Macuchi Fm** (>8000m) Andesitic volcaniclastics, lavas, tuffs (+minor sediments)
- PZ_L **Llanganates Gp** Schists, quartzites, gneisses.
- PZ_A **Ambuqui Gp** Schists, phyllites, quartzites
- PC_C

Central / South to South West

- Q Quaternary deposits (Alluvium, terraces, tillite)
- P_T **Tarqui Fm** (inc **Llacao**) (c. 1200m) Rhyodacitic pyroclastics, lavas
- PIP_T **Turi Fm** (300-1200m) Conglloms, tuffs, breccias
- MPI_A **Ayancay Gp** (1500-2700m) (inc **Quillollaco, Nabon Gps**) Clays, sandstones, conglloms (+coal)
- M_{AZ} **Azogues Gp** (100-800m) Shales, arenotuffaceous seds
- M_B **Biblian Fm** (c. 1000m) Clays, arenaceous seds, lavas.
- OM_{VS} **Saraguro Gp** (>1500m) (inc **Chinchillo, Loma Blanca, Alausi**) Andesitic lavas, pyroclastics. r. rhyolite
- PC_S **Sacapalca Gp** (c. 3000m) Andesitic lavas, pyroclastics, shales.
- **Paute Gp** (>5000m) **San Francisco Fm**: meta-volcanics **El Pan Fm**: slates, phyllites
- KPc_V **Yunguilla Fm** (c. 3000m) (inc **Ingapirca Mbr** (sandstone), **Río Playas Mbr**) Shales, limestones, volcaniclastics
- K_{AZ} **Alamor Gp: Zapotillo-Ciano Fms** (c. 2000m) Shales, greywackes, pyroclastics.
- K_{AC} **Alamor Gp: Cazaderos Fm** (c. 1200m) Conglloms, sandstones, shales.
- K_C **Celica Fm** (>5000m) Andesitic lavas, pyroclastics
- K_R **Raspas Fm** Pelitic schists.
- PZ_Z **Zamora Gp** Schists, quartzites, gneisses.
- PZ_{TC} **Tahuin Gp: Capiro Fm** Schists, quartzites
- PZ_{TR} **Tahuin Gp: San Roque Fm** Gneisses, schists, amphibolites
- PC_P **Piedras Gp** Greenschists, amphibolites, quartzites

SIERRA

- Q_A Quaternary Alluvium (Clays, sands)
- Q_M **Mera Fm** (50-200m) Terrace deposits (conglloms, sandstones, tuffaceous shales)
- PIP_M **Mesa (Rotuno) Fm** (100-400m) Conglloms, sandstones, volcaniclastics (dissected terraces)
- MPI_{Ch} **Chambira Fm** (1000-1500m) Sandstones, shales, tuffs
- M_C **Curaray Fm** (200-700m) Clays, tuffaceous shales, gypsum
- M_A **Arajuno Fm** (500-1000m) Clays, sandstones, lignites
- OM_{Ch} **Chalcana Fm** (600-1100m) Redbed shales, gypsum
- PcE_T **Tiyuyacu Fm** (70-550m) Conglloms, sandstones, redbed shales
- K_N **Napo Fm** (200-650m) Shales, limestones, sandstones
- K_H **Hollín Fm** (35-200m) Quartzitic sandstones
- K_R **Chapiza Fm** (1000-4500m) (inc **Misahuallí Mbr**: lavas, pyroclastics) Redbed sandstones, shales
- J_S **Santiago Fm** (1200-2700m) Limestones, shales, sandstones
- TrM_C **Macuma Fm** (1200-1600m) Limestones, shales
- PC_P **Pumbuiza Fm** (>1000m) Slates, quartzites
- K_L **Limon Gp** Undifferentiated shales slates, quartzites, limestones

ISLANDS

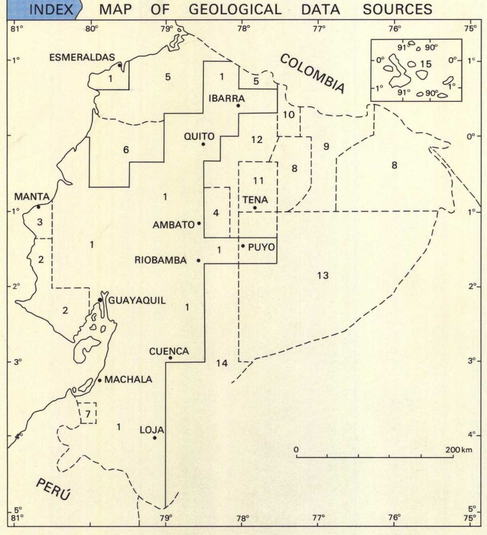
- **Galapagos Gp** Basaltic lavas, pyroclastics, minor sediments (Units 1-5: Oldest to Youngest; see explanation)

INTRUSIVES

- g Granitic/Acid intrusives
- d Dioritic/Intermediate intrusives
- Gabbroic/Basic-Ultrabasic intrusives
- } TO CRETACEOUS
- gp Granite, granodiorite (inc monzonite porphyry, subvolcanic rocks of Guacamayos Series) — ? JURASSIC
- G Granitic intrusives
- Gm Metasomatic or metamorphosed granites.
- } PALAEOZOIC?

Note: This legend does not depict all stratigraphic relationships. For example, in central Ecuador, the Onzole Fm (Daule Group) conformably overlies the Tosagua Fm (Villingota-Dos Bocas Mbrs.) See also Correlation Chart above.

INDEX MAP OF GEOLOGICAL DATA SOURCES



1 DGGM-IGS
2 DGGM-IGS-IFP
3 DGGM-IFP
} Systematic geological mapping, 1:100 000 scale
4 IGS (Kennerley)-DGGM
5 DGGM-INERHI-IGS
6 IFP-IEPC-AEOC
7 EPN (Feininger)-DGGM
8 SHELL-AEOC-IFP
9 TEXACO-SHELL
10 SHELL-OKC-INECEL
11 SHELL-CEPE (-INECEL)
12 SHELL-INECEL-Sauer
13 SHELL-CLIRSEN/CEEA-IGS(IL)
14 Sauer-IFP-SHELL-IGS(IL)
15 Sauer-EPN (Hall)

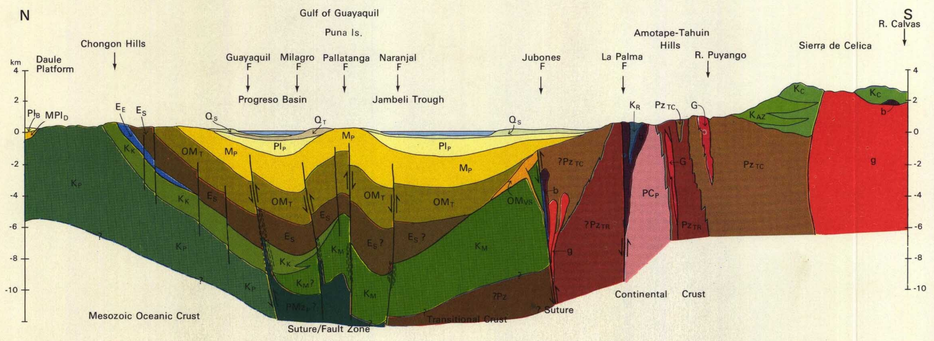
DGGM-Dirección General de Geología y Minas

CEEA-Comisión Ecuatoriana de Energía Atómica
CLIRSEN-Centro de Levantamientos Integrados de Recursos Naturales
INECEL-Instituto Ecuatoriano de Electrificación
INERHI-Instituto Ecuatoriano de Recursos Hidráulicos
CEPE-Corporación Estatal Petrolera Ecuatoriana
EPN-Escuela Politécnica Nacional

IGS-Institute of Geological Sciences
(IL)- Interpretation of Landsat

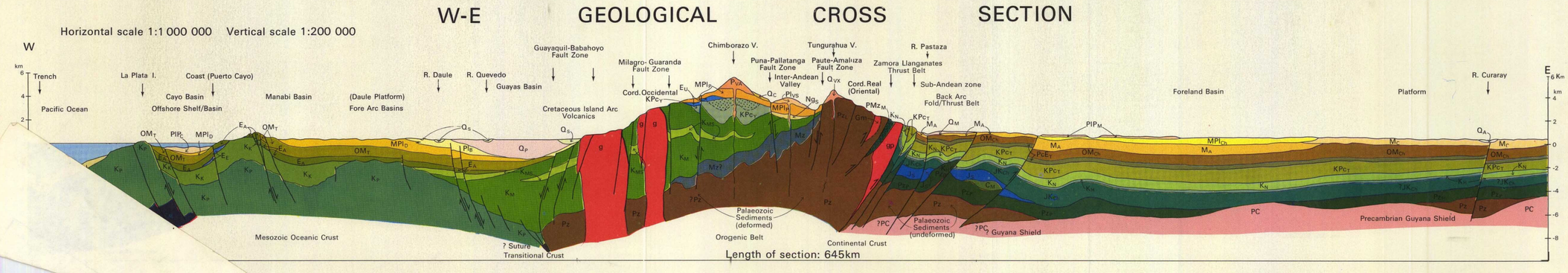
IFP-Institut Français du Petrole
AEOC-Anglo Ecuadorian Oil Company
IEPC-International Ecuadorian Petroleum Company

N-S GEOLOGICAL CROSS SECTION



W-E GEOLOGICAL CROSS SECTION

Horizontal scale 1:1 000 000 Vertical scale 1:200 000



Legend for Cross-sections

Symbols as in geological legend, in addition:

- Ng_S Neogene sediments
- KPc_V (Stippled) Cayo Rumi Mbr, Yunguilla Fm.
- K_{MS} Macuchi Fm, sediments (equiv Chontal Mbr)
- Mz ? Mesozoic metamorphics
- Pz ? Palaeozoic metamorphics and/or Palaeozoic sediments
- PC Precambrian (Piedras Group or Guyana Shield)
- ? Neogene Oceanic Crust
- Mesozoic Oceanic Crust
- Geological contact
- Base of Tertiary sequence in Costa (inferred) Base of Tena (redbed) Fm in Oriente (inferred)
- Fault

Color separation by the Drayting and Printing System of Instituto Geográfico Militar 1982.

6700 AJ Wageningen
The Netherlands