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Introduction and revaluated chronostratigraphic range of regional litho- and biostratigraphic units of the Mediterranean Tethys and Paratethys Neogene; application of results of the IGCP No. 25; part 1

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Abstract

The author of the contribution, who suggested, organized and managed the mentioned international project, proceeds after its conclusion to the application of the attained results. In the present introductory paper he presents up-to-date reambulated chronostratigraphic values of litho- and biostratigraphic Neogene units of Tethys and Paratethys relics on the intercontinental territory between the Atlantic and Indopacific oceans. In further papers of this series the author intents to deal with the problems of subsidence and sedimentation rate, reasons of occurrence of coal and evaporite deposits, vulcanic activity and the intensity of young orogenic phases in time and space.

Introduction

The international project No. 25 'Stratigraphic Correlation Tethys-Paratethys Neogene' of the International Geological Correlation Programme of UNESCO/IUGS, planned, managed and realized on the Geological Institute of the Slovak Academy of Sciences in Bratislava in the years 1973—1983, has been succesfully concluded.

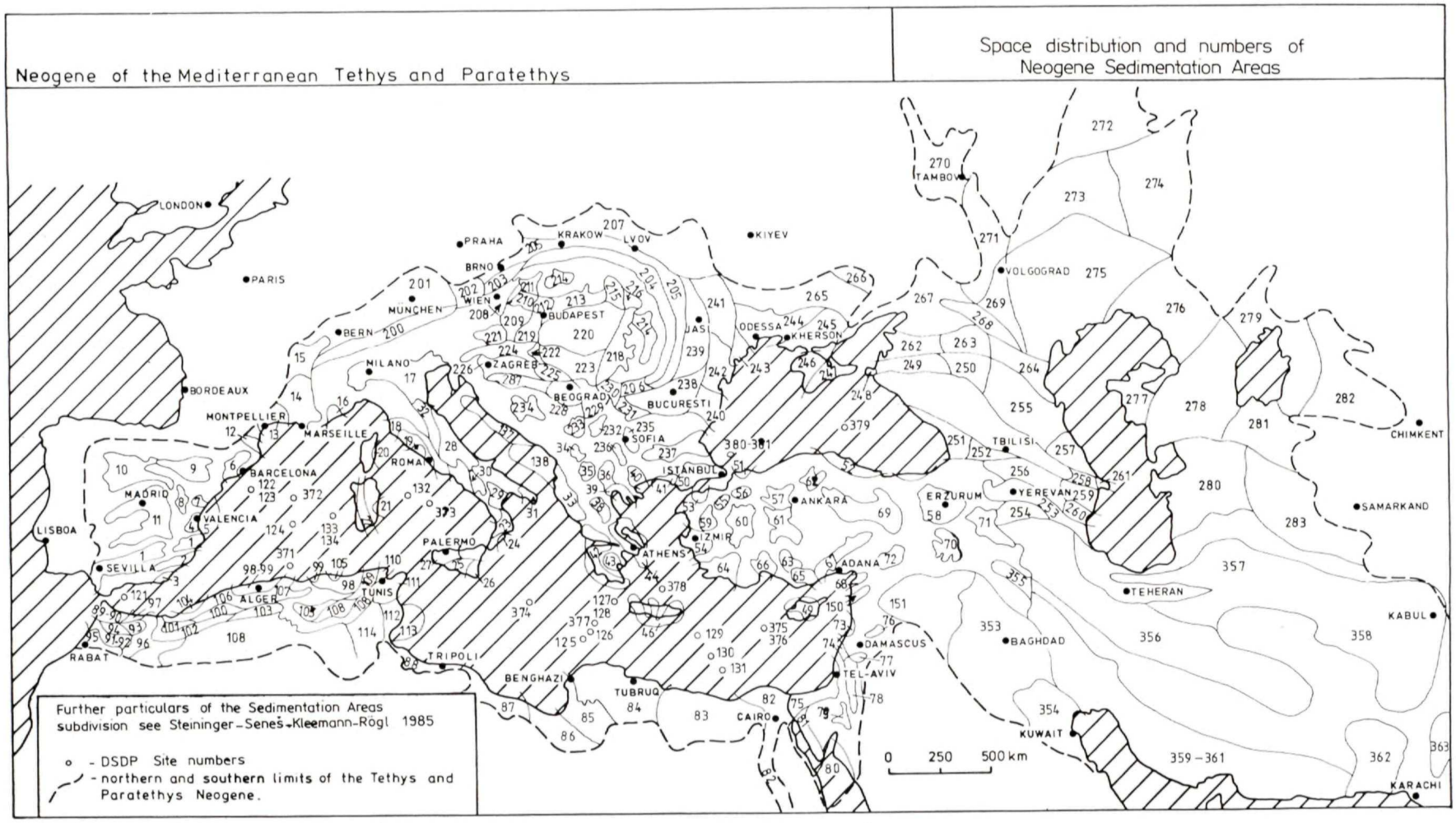
The programme comprised a stratigraphical reanalysis and age correlation of various developments of almost 400 Neogene sedimentation and volcanogenic regions. 310 scientists from 27 European, African and Asian countries participated in the project (Seneš, 1985).

Thanks to the cooperation of the Regional Committee on Mediterranean Neogene Stratigraphy of IUGS, the project included a revision of the chronostratigraphic value of each Neogene basin on the basis of biozones (from temperate, subtropical and tropical zones), radiometric and paleomagnetic data. As a matter of course, this revision brought some revolutionary knowledge reflected now in totally new paleogeographical and geodynamical conceptions of Neogene on this extensive territory (see Seneš, 1976, 1977, 1985, 1988). As individual topics of this project, essential unsolved problems concerning the boundaries of Stages and stratigraphic correlation, especially of the region of Tethys relic, Western, Central and Eastern Paratethys have been worked upon.

The results of the revaluation and correlation of litho- and biostratigraphic units have been published in two Project Final Reports. The solution of problems related to 12 first-order topics of the project was presented briefly in a paper by Seneš (1985). 540 stratigraphic correlation tables comprising all paleobiologic, radiometric, paleomagnetic, volcanologic and geodynamic characteristics, including a demonstration of the lithostratigraphic development with a separate description for each sedimentation area, have been presented in greatest detail in the Final Report of the project (Steininger et al., 1985). Shorter partial results have been presented by the participants of the project in more than 700 publications (see References in IGCP Catalogue I—II, 1973—1977, 1978—1982).

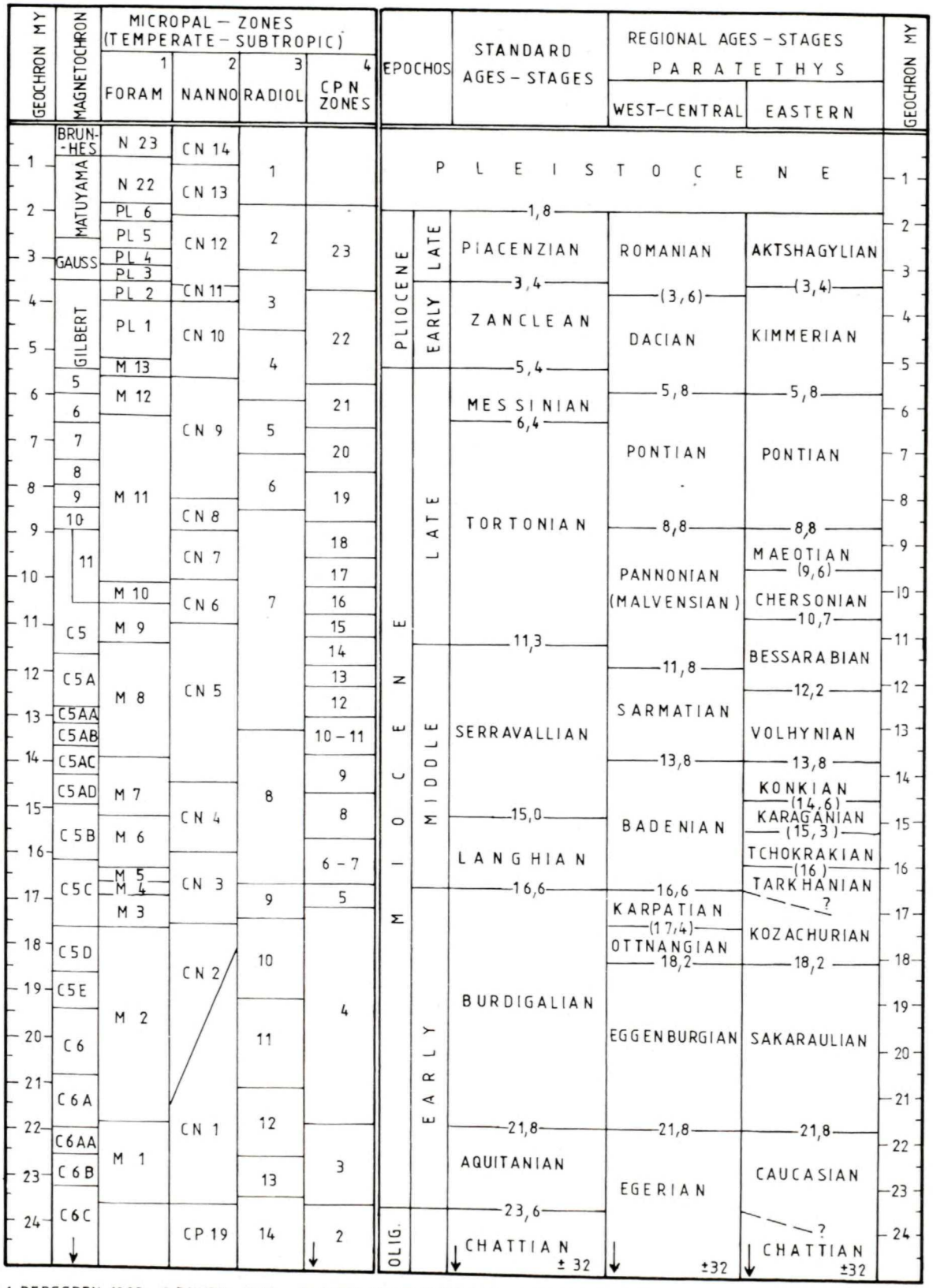
The obtained results serve without doubt as a basis not only for information on the development of Neogene between the Atlantic and Indopacific regions, but above all for further paleogeographical and geodynamical studies and for the interpretation of palinspastic reconstructions of the last 30 million years of the existence of our planet. Thus, these results will in many ways contribute to the knowledge of the causes and rules of occurence of especially sedimentary raw materials in time and space.

In this *first* contribution from a series of papers I intent to present the results of the revision and revaluation of chronostratigraphic (i. e. time) classification of the revised litho- and biostratigraphic units from the Circummediterranean region. They are


Neogene of the Mediterranean Tethys and Paratethys
Space distribution and numbers of Neogene Sedimentation Areas
LONDON
PARIS
BERN
MÜNCHEN
WIEN
PRAHA
BRNO
KRAKOW
LVOV
KIYEV
BUDAPEST
ZAGREB
BEOGRAD
BUCURESTI
SOFIA
ISTANBUL
ODESSA
KHERSON
VOLGOGRAD
TAMBOV
MILANO
ROMA
BORDEAUX
MONTPELLIER
MARSEILLE
BARCELONA
MADRID
VALENCIA
LISBOA
SEVILLA
RABAT
ALGER
TUNIS
PALERMO
TRIPOLI
BENGHAZI
TUBRUQ
CAIRO
ATHENS
IZMIR
ANKARA
ADANA
DAMASCUS
TEL-AVIV
BAGHDAD
KUWAIT
ERZURUM
YEREVAN
TBILISI
TEHERAN
SAMARKAND
CHIMKENT
KABUL
KARACHI
0 250 500 km
Further particulars of the Sedimentation Areas subdivision see Steininger-Seneš-Kleemann-Rögl 1985
o - DSDP Site numbers
- northern and southern limits of the Tethys and Paratethys Neogene.

TAB. 1

Correlation of Neogene Stages of the Circummediterranean Area (According to Berggren et al., 1985; Cicha et al., 1975; Semenenko, 1987; Seneš, 1985; Steininger et al., 1985 compiled by Seneš, 1988)



1. BERGGREN 1983, 2. BUKRY 1980, 3. RIEDL & SANFILIPPO 1979, 4. CICHA & AL. 1975

based on the stratigraphic correlation tables presented in the abovementioned Final Report of the project.

This introductory paper is necessary for the comprehension of the following contributions concerning the application of the results. They will deal with time and space distribution of coal-bearing and evaporite sediments, neovulcanic activity, rate of subsidence and thickness of sediments, time range and areas of various intensity of young orogenic processes and other geological phenomena of this extensive intercontinental territory.

For a better orientation of the reader I attach to this paper a table of our present knowledge and opinions on the correlation of regional stages (i. e. time units) of West-Central and Eastern Paratethys Neogene with the stages of the Mediterranean relic of the Tethys region, as well as a map with an outline of the area of Neogene Circumediterranean region, including the contours and numbering of individual basins. (In this place I would like to mention that the numerical denotation of regions indicated in the map in the meantime acquired international validity almost everywhere, as well as the fact that the sedimentation areas denoted by numbers according to their variability of lithologic successions and facial development are mostly still divided into partial basins, denoted in the Final Report by alphabetical symbols, or even in greater detail by auxiliary numerical indices).

In the following columns of individual sedimentation areas only those lithostratigraphic units are included which have been denoted by the authors as Group or Formation, in accordance with the rules of the International Stratigraphic Guide (Hedberg, 1976). In this paper I do not deal with the lowest-order lithostratigraphic unit (Member) or units denoted (by some authors perhaps only by a mistake or because of unfamiliarity with the Guide) as "Series" or "Unit". I make an exception only in regions where there are linguistic differences in terminology, as e. g. in the U.S.S.R., where Formations are usually denoted as "Svita" and Groups as "Seriya". I consider it necessary to mention also the chronostratigraphic range of biozones used locally or regionally in the studied regions, provided they are included in the stratigraphic correlation tables of the Final Report, in the column "Regional biozones".

I tried to arrange the basins consecutively according to their numbering. However, in many cases I have been forced to alter this succession because of genetic affinity of some sedimentation areas, as well as because of paleogeographic aspects. The latter concerns especially continental boundary regions between Neogene Tethys and Eastern Paratethys, above all the territory of eastern Anatolia, Iraq and Iran. I present also the chronostratigraphic evaluation of Upper Oligocene (Chattian or Early-Middle Egerian) in areas where an uninterrupted lithologic development or transitory time range of regional stages between Oligocene and Miocene this demands.

In the chronostratigraphical revaluation I use the following abbreviations:

Fm. — Formation, Gr. — Group, Z. — Biozone, l — late, m — middle, e — early, A. — Area, B — Basin, Corr. — Corridor, D. — Depression, Fd. — Foredeep, R. — Ranges, Th. — Through

Neogene Tethys Stages (Standard Stages):

PI	— Piacenzian	LA	— Langhian
ZA	— Zanclean	BU	— Burdigalian
ME	— Messinian	AQ	— Aquitanian
TO	— Tortonian	CH	— Chattian
SE	— Serravallian		

Western — Central Paratethys Stages:

RO	— Romanian	BA	— Badenian
DA	— Dacian	KA	— Karpatian
PO	— Pontian	OT	— Ottnangian
PA	— Pannonian = ML Malvensian	EG	— Eggenburgian
		EGR	— Egerian
SA	— Sarmatian s. s.		

Eastern Paratethys Stages:

AK	— Aktchagylian	KO	— Konkian
KI	— Kimmerian	KAR	— Karaganian
PO	— Pontian	TCH	— Tchokrakian
MAE	— Maeotian	TAR	— Tarkhanian
CHE	— Chersonian	KOZ	— Kozachurian
BE	— Bessarabian	SAK	— Sakaraulian
VO	— Volhynian	CA	— Caucasian

A. Mediterranean Tethys Area

1. Guadalquivir D., Betic R., Betic D. (E.)

Red sands Fm.	PI
Sima Grande Fm.	mIPI
Alborizas Fm.	mME
Sabiode-Ubeda Gr.	TO-eME
Pliocene I. Fm.	lME-ePI
Alboziras I. Fm.	mBU-mLA
Alboziras II. Fm.	lLA-eTO
Sima grande Fm.	mIPI

2. Ronda B., Betic R., Granada B., Balearic D. (E.)

Pliocene II. Fm.	mIPI
Guadix Fm.	mME-ePI
Baza Fm.	lME-ePI
Seron-Caniles Fm.	mTO-mME
Ronda Gr.	mTO-lME
Rio Fordes II. Fm.	mTO-mME
Rio Fordes I. Gr.	lLA-eTO
Clay Blocks Fm.	mBU-LA
Las Millanos Fm.	lAQ-eBU
Viñuela Fm.	mAQ
Espejos Fm.	mAQ
Ciudad Grande Fm.	eAO
Aloziana Fm.	lCH
Forues-Moraleda Fm.	ZA-ePI
Pinos Genil Fm.	lME-ZA
Son Talent Limestones Fm.	emSE

Son Vardera Limestones Fm.	lSE-eTO
Murchas Fm.	BU-LA
Reef Complex Fm.	eME
Heterosteg. calc. Fm.	TO
Son Mir calcisilts Fm.	ZA-emPI
Son Verdera Lmst. Fm.	emSE-eTO
Son Talent Lmst. Fm.	emSE
1b Z. (Ronda B.)	mTO
1c Z. (Ronda B.)	lTO
2a Z. (Ronda B.)	emME

3. Malaga Coastal A., Betic R., Betic D., Almerian Corr. (E.)

Velez Fm.	lTO-eME
Malaga Fm.	ZA
Alamo Fm.	mAQ-eBU
Corres, Cresta del Gallo Fm.	mBU-mLA
Gomara, Umbria, Mofor Fm.	mBU-mLA
Relogero, Atalaya I. Fm.	lLA-eTO
Chozas Fm.	lLA-eTO
Hondo, Serrata Fm.	mTO-eME
Turre Fm.	mTO-eME
Atalaya II, Torremendo, Virgen Fm.	mTO-eME
Granaderos Fm.	mME-ePI
Cuevos Fm.	mME-ePI
Olistolithes Fm.	mME-ePI
Terminal Complex Fm.	mME-ePI
Chozas Fm.	TO
Espirito Santo Fm.	PI
1c Z.	lTO
2a Z.	eME
MP 1—2 Z.	eZA
MP 1—3 Z.	lZA
MP 1—6 Z.	ePI

4. Valencian D. (E.)

Mugrón Fm.	lBU-mLA
Calizas de Fuelcaliente Fm.	eTO
Venta del Moro-Villatoya Fm.	ME-emZA
Rio Jucar Fm.	ZA

5. Valencia Platf. — Balearic Th. (E.)

Upper Ebro Gr.	mPI
Ebro sands Fm.	mPI
Lower Ebro Gr.	lME-ePI
Ebro clays Fm.	lME-ePI
Upper Castellon Gr.	mTO-mME
Castellon sandst. Fm.	mTO-mME
Lower Castellon Gr.	lLA-eTO
Castellon shales Fm.	lLA-eTO
S. Carlos Salou Gr.	lBU-mLA
Alcanar-Casablanca	mAQ-mBU
Alcanar breccia Fm.	lCH-eAQ
Tarraco-Barcelona Gr.	CH

8. Iberic D. (E.)

Peral Fm.	emTO
Tortajada Fm.	mTO-mZA
Alfambra Fm.	mTO-ePI

9. Ebro D. (E.)

Villarroya Fm.	lZA-PI
La Plana Fm.	eME
Alcubierre Fm.	lTO
Bernues Fm.	AQ-BU
Nájera Fm.	lCH-SE
Haro Fm.	lCH-SE
Sos Fm.	lCH
Yesos de Navarra Fm.	emCH
16 Z.	AQ
17 Z.	BU
19 Z.	LA
23 Z.	PI

10. Duero B. (E.)

Raña Fm.	mZA-ePI
Calizas Termin. Fm.	lME
Los Paramos Fm.	mTO
Black Beds Fm.	mTO
Aranda Fm.	lSE-mTO
Manvirgo Fm.	lSE-eTO
Rábano Fm.	eSE-mTO
Garcihernandez Fm.	LA-mTO
Tierra Campos Fm.	LA-mTO
Cantalapiedra Fm.	LA-mTO
Tordesillas Fm.	lBU
Las Omañas Villaroquel Fm.	mBU-mME
Ferreras-Velilla Fm.	mBU-mME
Cimanez Fm.	mBU-lLA
Paladin Fm.	lCH-eAQ
Tapira Ribera Fm.	lCH
Ordas Fm.	mlCH

11. Tajo, Guadiana B., Fosa de Madrid, Madrid B. Altomira, Jucan. (E.)

Raña Fm.	mZA-ePI
„M-5" Gr	ME-mZA
„M-3" Gr.	LA-TO
„M-1 + M-2" Gr.	AQ-BU

12. Province (F.)

Moustiers Fm.	lTO-ePI
Conglomerat Fm.	lTO-ePI
Aiguines Fm.	eSE-mTO
Vancon Fm.	lLA
Ganagobie Fm.	BU
Tuilerie de Monosque Fm.	CH-AQ
GF-1 Z.	lCH-eAQ
GF-2 Z.	lCH-eAQ
GF-3 Z.	mlAQ
GF-4 Z.	eBU
I. Z.	lTO-ePI
II. Z.	mlPI

15a. Moyen Vallée du Rhône (F.)

Mistrals Fm.	lTO-eME
Yinsobres Fm.	mTO
St. Pantaleon Fm.	eTO
Yalreas Fm.	SE
Grignan Fm.	LA
St. Restitut Fm.	BU
A Z.	emBU
B Z.	lBU-mLA
C Z.	lLA-SE
D Z.	emTO

15b. Lyon — Bas Dauphine, Vercors (F.)

Molasse Fm.	BU-TO
A Z.	mBU
B. Z.	eTO

15c. Lyon — Dombes — Bresse (F.)

Bresse Fm.	mZA-PI
Dombes Fm.	emTO
S. Fons Fm.	mLA-eTO
D Z.	lSE-eTO

16. Ligurian B. Border (F.)

Nice Cimiez Fm.	mlPI
Roja Rivers Fm.	ZA-ePI
Roquebrun-Cap Martin	AQ-mTO
Ste. Luce Fm.	AQ-mSE
Vence Fm.	AQ-mSE
Cap d'All Fm.	lCH
Antibes — Biot Fm.	lCH

17. Piemont B., Po B., Veneto — Friuli, Salsomaggiore, Emilia — W. Apennine, Romagna-Apennine (I.)

Gesosso Solifera Fm.	e/mME
Serravalle Fm.	SE
Lequio Fm.	SE
St. Agata Fossili Fm.	TO
Cessole Fm.	LA
Cortemilia Fm.	AQ-BU
Costa montada Fm.	AQ-BU
Costa aresa Fm.	AQ (-eBU)
Variano Fm.	lBU
Confolite Gr.	CH-eTO
Monesiglio Fm.	CH-AQ
Rachetta Fm.	CH
Monastero Fm.	CH
GL Z.	uBU
PG Z.	uBU
OU Z.	eSE
GP Z.	mSE
GN Z.	lSE
GM Z.	eTO
GO Z.	mCH
GK Z.	lCH
CD Z.	lCH
GS Z.	lBU
GM Z.	eTO
MPL-1 Z.	lmZA
MPL-2 Z.	mZA-PI

18. Val d'Elsa B., Siena B., Radicofani B., Valdi Tevere, Volterra (I.)

Rosignano Fm.	mME
Lacustrin Fm.	eME
Grotti Fm.	eZA
Ponsano Fm.	lTO

20. Corsica (F.)

Aleria Fm.	mTO-ME

Aghione Fm.	lBU-mSE

22. Sardinia, Sassari B. (I.)

Samassi Fm.	mlZA
Capo S. Marco Fm.	lTO
Marmilla Fm.	AQ
Cixerri Fm.	CH
A Z.	CH
B-1, B-2 Z.	AQ-eBU
C-3, -4, 5, 6 Z.	mlBU
D-6 Z.	LA
D-7, D-8 Z.	SE
E-9, -10 -11 Z.	emTO
F Z.	lTO-ME
G Z.	PI

23—24. Calabria, Crotone B., Punta Stilo (I.)

Trubi Fm.	ZA
Evaporitico inf. — sup. Fm.	mME
S. Nicola Fm.	mSE
Arenacea — marnosa Fm.	BU

25—26. Sicily (I.)

Trubi Fm.	ZA-PI
Capodarso Fm.	mPI
Enna Marla Fm.	lZA-ePI
Belice Valley Fm.	lZA
Baucina Fm.	eME
Tripoli Fm.	eME
Gypsum Fm.	mlME
Calcare di base Fm.	eME
S. Ciprirello Fm.	LA-TO
Globiger. Marls Fm.	mlTO
Tarravecchia Fm.	mTO
Tellaro Fm.	mTO
Corleone Fm.	lAQ-lBU
Palazzolo Fm.	AQ-eME
Ragusa Fm.	lCH-eLA
Numidian Flysh Fm.	CH-BU
Bonifato Fm.	CH

28. Marches Abruzzes B. (I.)

Colombacci Fm.	ME
Di Tetto Fm.	eME
Gesosso Solif. Fm.	lTO-eME
Chioli di Letto Fm.	mlTO
S. Spirito — Bolognano Fm.	CH-mTO

29. Bradanica Foredeep (I.)

Daunia Fm.	SE
Serra Palazzo Fm.	LA
Gorgoglione Fm.	BU
Carleto Perticara Fm.	AQ

30. Intra Apenninic B. (I.)

Frosoline Fm.	TO-eME
Longano, Pietraroia Fm.	lSE-eTO
Cusano Fm.	lBU-SE
Montagnola Fm.	CH-mBU

136. Maltese Isl. (M.)

Upp. Coral Lmst. Fm.	mTO-ME
Greensand Fm.	lSE-eTO
Blue Clay Fm.	lLA-mSE
Upp. Globig. Lmst. Fm.	emLA
Midd. Globig. Lmst. Fm.	BU
Low. Globig. Lmst. Fm.	AQ
Low. Corall. Lmst. Fm.	CH

33. Internal — Middle — External Ionain Zone (GR.)

Ioannina Fm.	PI
Arkhangelos Fm.	ZA-PI
Riza Fm.	lTO-mME
Parga Fm.	LA-eTO
Radhovizi Fm.	CH-AQ
Ayii Pantes Fm.	CH-AQ
Distraton, Potamia Fm.	mCH

37. Corfu, Lefkas, Kefallinia, Zakynthos (GR.)

Ayios Petros Fm.	TO-eME
Lazarata Fm.	lBU
Katokhori Poros Fm.	lCH-AQ
Episkepsis Fm.	CH-eBU

38. Grevana B., Mesohellenic B., Thessalia B. (GR.)

Ondrias Fm.	lTO
Orlias Fm.	lBU
Zevgostasi Fm.	mBU
Omorphoklissia Fm.	emBU
Tsotylion Fm.	lAQ-eSE
Pendalofon Fm.	lCH-eAQ
Heptakhorion Fm.	lCH

Local Biozones of Areas No. 33, 37, 38 (Bizon and Bizon 1968) and 49 (Baroz and Bizon 1974) — see in References Steininger-Seneš et al. 1985, Vol. 1, p. 29—31, 36.

41. Thracian marginal B., Nestos river delta (GR.)

Post evaporitic Fm.	ZA-PI
Evaporitic Fm.	mTO-ME
Intercalated Fm.	lBU-eTO
Lower Fm.	AQ-mBU

42. Pyrgos (GR.)

Vounargon Fm.	lZA-PI
Platana Fm	lZA

46. Crete (GR.)

Galini Gr.	lZA-PI
Galini Fm.	lZA-PI
Fenikia Gr.	ZA-PI
Zounaki Fm.	ZA
Asteri Fm.	ZA
Francocastello Fm.	ZA
Dhramia Fm.	ZA
Mirtos Fm.	ZA
Hellenikon Gr.	lME
Vrisses Gr.	emME
Khaeretiana Fm.	emME
Gallou Fm.	em ME
Mylopotamou Fm.	emME
Rhethymnon Fm.	emME
Ammoudhares Fm.	lTO-mME
Varvara Fm.	lTO-mME
Ambelouzos Fm.	mTO
Fotokadhon, Potamidha	TO
Makrilia Fm.	TO
Apostoli Fm.	TO
Paleokhora Fm.	lSE
Topolia Fm.	emSE
Ilias Fm.	mSE
Kalamavka Fm.	mSE
Males Fm.	mSE
Skinias Fm.	lSE
Viannos Fm.	lSE
Pandanassa Fm.	lSE-eTO
Tefalion Gr.	SE-TO
Prina Gr.	lLA-mSE
Mithi Fm.	lLA-eSE

47. Aegean Isl. (GR.)

Nenita Fm.	lTO-eZA
Keramaria Fm.	emTO
Zyfia Fm.	lSE-eTO
Thymiana Fm.	lLA-mSE

48. Rhodos (GR.)

Vasti Fm.	lPI
Monolithos Kritica	PI
Damatria Fm.	lZA-ePI
Maritsa-Salakos Fm.	eZA
Istros Fm.	mTO

49. Cyprus (CY.)

Pissouri Fm.	PI
Athalassa Fm.	PI
Nicosia Fm.	mlZA
Mirtou Fm.	emZA
Mesaoria Gr.	ZA-PI
Potami Fm.	ZA-PI
Kalavasos Fm.	ME
Lapatza Fm.	lTO-mME
Yiolou Fm.	TO-eME
Davlos Fm.	mlTO
Trapeza Fm.	SE-eTO
Mia Milea Fm.	SE-TO
Panagra Fm.	LA
Dhali Gr.	BU-mME
Pakhna Fm.	BU-SE (TO)
Flamoudi Fm.	AQ-BU
Kithera Gr.	-CH-ME
Lefkara Fm.	CH-AQ
Klepini Fm.	lCH
Bellapais Fm.	mCH
Lapithos Gr.	-CH

54. Izmir — Urla (TR.)

Urla Fm.	AQ-BU

60. Muratdagi, Simav (TR)

Husarcik Fm.	PI

Burhaniye Fm.	ZA-PI
Emet Fm.	ZA
Kizilbük Fm.	lSE-eTO
Tasbasi Fm.	AQ-LA(SE)
Kirantarla Fm.	AQ-SE

61. Polatli, Haymana (TR.)

Agesivri Fm.	BU-mTO
Sogulca Fm.	AQ-ePI

65b. Karaman B. (TR.)

Kalif Fm.	TO-lME

66. Antalaya Bay (TR.)

Kötekli Fm.	ZA-PI

67—68. Adana B., Antakya B.(TR.)

A Z.	eSE
B Z.	mlSE
C Z.	emTO
D Z.	lTO
E Z.	eME
F Z.	lME-eZA
G Z.	mZA
H Z.	lZA
I Z.	PI

69b. Darende — Balaban B. (TR.)

Caybasi Fm.	mZA-PI
Tahtali Tepe Fm.	BU

72. Gaziantep-Adiyaman-Urfa (TR.)

Lahti Fm.	emZA
Adiyaman Fm.	LA-mME
Lice Fm.	AQ—mTO
Midyat Fm.	CH
Gaziantep Fm.	AQ

150b. Aleppo Plateau (SYR.)

Jeribe Fm.	lBU-SE

75a. Tel-Aviv — El-Arish (IL.-ET.)

Pleshet Fm.	PI
Yafo Fm.	ZA-PI
Bet Nir Fm.	lTO-lME
Mavoiim Fm.	lTO-mME
Ziolag Fm.	lTO
Ziqim Fm.	LA-TO
Bet Guvrin Fm.	CH-BU
Lakhish Fm.	CH-BU
1 Z. (partim)	CH
2 Z.	AQ-BU
3 Z.	LA-mSE
4m—1 Z.	mSE-mTO
4m—2 Z.	lTO-mME
4p—1 Z.	lME
4p—2 Z.	ZA
5 Z. (partim)	PI

77—78. Tiberias B., Jordan Rift Valley (IL.)

Sedom Fm.	lZA-mPI
Gesher Fm.	lZA-mPI
Bira Fm.	emZA
Herod Fm.	mLA-eME

79. Yeroham B., Hazeva B. (IL.)

Hazeva Fm.	mAQ-ePI

80.—81. Red Sea B., Gulf of Suez B. (ET.)

Shukheir Fm.	ZA-PI
Shagara Fm.	lZA-PI
Gabir Fm.	emZA
Gasus Fm.	mlTO
Sarbut El Gamal Fm.	mlTO
Samh Fm.	TO
Abu Dabbab Fm.	lSE-eTO
Ras Malaab Fm.	eSE-TO
South Garib Fm.	eSE-eTO
Zeit-South Garib Fm.	eSE-TO
Belayim Fm.	lLA-eSE
Kareem Fm.	mLA
Zug El Bahar Gr.	LA-eTO
Gebel El Rusas Fm.	LA-eSE
Ras Malaab Gr.	mLA-TO
Nukhul Fm.	mlBU
Abu Girfan Fm.	eBU
Gharamul Fm.	mBU-eSE
Gharandal Fm.	mBU-eSE
Gharandal Gr.	mBU-mLA
Rudeis Fm.	mBU-eLA
Abu Zenima Fm.	(m)lCH
A — E Z.	mBU-eSE

82. Nile Delta B. (ET.)

Helwan Fm.	PI
El Wastani Fm.	PI
Hamzi Fm.	mlPI
Kafr El Sheikh Fm.	mlZA
Kom El Shelul Fm.	mlZA
Abu Madi Fm.	eZA
Rosetta Anhydr. Fm.	mME
Quawasin Fm.	emME
Hagul Fm.	emME
Sidi Salem Fm.	TO-mME
Genefe Fm.	SE
Hammath Fm.	LA
Sadat Fm.	mlBU
Moghara Fm.	AQ-eLA
Quatrani Fm.	CH-eAQ
Abu Zabaal Fm.	lCH-eAQ
Gebel Ahmar Fm.	lCH
Ghoroud Fm.	CH
A — E Z.	ZA-ePI

83. Libyan Plateau (ET)

Dabaa Fm.	ZA-PI
Sidi Salem Fm.	mLA-SE
Marmarica Fm.	mLA-SE
Mamura Fm.	AQ-eLA

84. Cyrenaique Platf. (LAR.)

Qaret Meriem Fm.	mTO-ME
Mesus Fm.	lSE-eTO
Al Jakbubh Fm.	LA-TO
Faidia Fm.	BU

85. Augila Depr. (LAR.)

Sahabi Fm.	ZA-PI
Mesus Fm.	lSE-mTO
Sceleidima Fm.	emSE
Benghazi Fm.	LA
Faidia Fm.	BU

86. Sirte B. (LAR.)

Marada Fm.	BU-eTO
Diba Fm.	CH

87. Misurata Corridor (LAR.)

Marada Fm.	mBU-mTO
Beddahach Fm.	AQ-eBU
Fortina Fm.	eAQ

109. Khoumirie-Megods (TN.)

Raf-Raf (Fm?)	mlZA
Hakima (Fm?)	mTO-ME
Babouch (Fm?)	AQ-eBU
Gres Numidiens (Fm?)	lCH

110. Bizerte (TN.)

Raf-Raf Fm.	ZA
Segi Fm.	lME
Oued El Khedim Fm.	lTO-mME
Kchabta Fm.	lTO
Hakima Fm.	mTO

111—112. Cap Bon, Sahel (TN.)

Oum Douil Gr.	mSE-ME
Saouaf Fm.	mTO-ME
Cap Bone Gr.	mBU-mSE
Ain Grab Fm.	mBU-mLA
Ain El Hamman Fm.	mlBU

113. Plateau Sous-marin Kerkennah, Golfe de Gabes (TN.)

Melqart Fm.	mlTO
Aouaf Fm.	mlTO
Beglia Fm.	mSE-eTO
Oum Douil Gr.	mSE-ME
Upp. Ketatna Fm.	mlBU
Cap Bone Gr.	BU-mSE
Midd. Ketatna Fm.	lCH-AQ
Low. Ketatna Fm.	mCH
Ketatna Gr.	CH-BU

114. Chott Jerid (TN.)

Segui Fm.	lTO-PI
Saouaf Fm.	lTO-ME
Beglia Fm.	mTO
Sehid Fm.	AQ

89/97. Chaines calc. Oued Lau (MA.)

Ametrasse Fm.	emAQ

89/97. Chaines calc./ Oued Lau (MA.)

Supra Numidienne Fm.	AQ-mBU

Gres Numidiens (Fm?)	lCH
Argiles sous Numidien.	-CH

89—97 (MA.) and 98—108b (DZ.)

p-3 Z.	PI
p-2 Z.	lZA
p-lb Z.	mZA
p-la Z.	eZA
m-6b Z.	mlME
m-6a Z.	lTO-eME
m-5b Z.	mTO
m-5a Z.	lSE-eTO
m-4c Z.	mlSE
m-4b Z.	mSE
m-4a Z.	mLA-eSE
m-3 Z.	lBU-eLA
m-2b Z.	mBU
m-1, m-2a Z.	AQ-eBU
g-2, g-3 Z.	mlCH

103. Bassin du Hodna (DZ.)

Magra Fm.	lME-ZA
Selmane Fm.	mTO-mME
Menaguer Fm.	mTO
Jaunes Fm.	mlSE
Ksob Fm.	mLA-eSE
Tarmount Fm.	mBU-mLA

In other Areas of MA and DZ „Fm." or „Gr." are not indicated.

151. Mesopotamian B. West (SYR.)

Bakthiari Fm.	ZA-PI
Upper Fars Fm.	ME
Lower Fars Fm.	TO
Jeribe Fm.	LA-SE
Dibbane Fm.	AQ (BU?)

353. Mesopotamian B. Centr. (IRQ.)

Bakhtiari Fm.	mZA-PI
Midd.-Upp. Fars Fm.	mTO-mME
Low. Fars Fm.	lSE-mTO
Jeribe Fm.	emSE
Thiban Anhydrit Fm.	mlBU
Euphrates Fm.	BU
Serikagni Fm.	BU

354. Persian Gulf B. (KWT.)

Dibdibba Fm.	lSE-PI
Low. Fars Fm.	LA-lSE
Ghar Fm.	lAQ-lBU

359, 360, 361. Zagros B. (IR.)

Bakhtiari Fm.	mME-PI
Akhadjari Fm.	mLA-TO
Mishan Fm.	mBU-mLA
Gachsaran Fm.	mAQ-mBU
Razak Fm.	mAQ-mBU
Asmari Fm.	CH-lAQ

362. Baluchistan B. (PAK.)

Gwadar Fm.	PI
Hinglaj Fm.	AQ-ZA
Khojak Fm.	-CH

363. Lower Indus B. (PAK.)

Soan Fm.	PI
Siwalik Gr.	LA-ZA
Dhok Pattan Fm.	mlZA
Nagri Fm.	LA-eZA
Momani Gr.	-CH-BU
Gaj Fm.	AQ-BU
Nari Fm.	CH

364. Upper Indus B. (PAK.)

Soan Fm.	PI
Siwalik Gr.	TO-PI
Dhok Pattan Fm.	lZA
Negri Fm.	mZA
Chenji Fm.	TO-eZA
Rawalpindi Gr.	AQ-SE
Kamljal Fm.	LA-SE
Murree Fm.	AQ-BU

B. Paratethys Area

B. 1. Transitory Area between the Central Paratethys and the Mediterranean Tethys

224 b, 224 c. Transtethyan Trench Corridor, Mura B. (YU.)

Mura Fm.	DA-RO
Lendava Fm.	mPa-PO
Spielfeld Fm.	mBA
Kungota Fm.	emKA
Urban Fm.	OT
Govške Fm.	EGR-mEG

B. 2. Western and Central Paratethys Area

200, 201, 202, 203a (D, CH, A) „Molasse Zone" — see Steininger — Seneš — Kleemann — Rögl 1985.
204, 205, 206, 207, 208, 210, 216, 217, 218, 237, 238, 239, 240, 242. CPN (Central Paratethys Neogene) Biozones — see Stratigraphic Table in this work.

204a/205c. West-Northcarpahtian Foredeep (PL.)

Krakowiec Fm.	SA
Tarnow Fm.	lBA
Bochnia Fm.	mBA
Skawina Fm.	emBA
Balich Fm.	mlKA
Bielsko Fm.	emKA
Sucha Fm.	lOT
Stebnik Fm.	OT-eKA
Upper Krosno Fm.	mlEGR
Lower Krosno Fm.	emEGR

204b. Flysh Zone USSR (SU.)

Upper Krosno Fm.	lEGR-EG
Middle Krosno Fm.	mEGR
Lower Krosno Fm.	eEGR

205d. Subcarpathian Miocene Foredeep (SU.)

Daschava Fm.	SA
Kosov Fm.	lBA
Tiras Fm.	mBA
Bogorodtchan Fm.	eBA
Balitsh Fm.	EG-mKA
Dobrotov Fm.	lEGR
Stebnik Fm.	lEGR
Sloboda Fm.	mEGR
Vorotishe Fm.	mEGR
Polanica Fm.	eEGR
Vorotishe Gr.	EGR

204c. East Carpathian Flysh Zone (R.)

Salt Fm.	mBA
Grey Gypsum Fm.	KA
Low. Gypsum Fm.	lEG—lOT

205e, f, g. Subcarpathian folded Foredeep (R.)

Rimna Fm.	RO
Milcov Gr.	ML—DA
Grey Gypsum Fm.	KA
Salt Fm.	lEGR—EG

206. South Carpathian Foredeep (R.)

Coal Fm.	lDA
Oltenian Fm.	mML
Izvoru Birzii Fm.	eML
Valea Morilor Fm.	SA

Mátău Congl. Fm.	emKA
Marls Fm.	emEGR

203b, c. Ždánice—Subsilesian, Pouzdřany Unit (CS.)

Karpatian Fm.	KA
Zaječí Fm.	lOT—KA
Lužice Fm.	eEG
Ždánice—Hustopeče Gr.	EGR
Pouzdřany Gr.	-emEGR

203a. *Waschberg Zone (A)*

Unnamed Fms.	EGR—PA

207a. Upper Silesia, Holy Cross Mt., Roztocze (PL.)

Kedzieryn Fm.	mlSA
Skawina Fm.	emBA
Lignitic Fm.	eBA
Klodnica Fm.	lKA-eBA

207b. Miocen of the Podolian Massif (SU.)

Buglow Fm.	lBA
Rzehakia Fm.	OT
Berezany Fm.	OT

239. East European Plateau, Birland Depr. (R.)

Evaporitic Fm.	mBA

208a2, b, c — 209b. Vienna B., Eisenstädter—Landseer Bucht (A)

Fm. or Gr. unmarked	lEGR—DA
A—E Z.	PA
F—H Z.	PO

208a 1, 2. Vienna B. (North) (CS.)

Upper Coal Fm.	lDA
Lower Coal Fm.	mPO
SA/A—E Z.	SA
PA/A—E Z.	PA
PO/F—G Z.	PO

210. South Slovakian Danube B. (West-Centr.) (CS.)

Upper Coal Fm.	mDA
Variag. Fm.	mlPO
Sand-Coal Fm.	ePO
Lower Coal Fm.	lPA-ePO

211. Megasynklinal of Brezov (CS.)

Lelovec Fm.	DA (-eRO?)
Nováky—Handlová Fm.	SA
Bánovce Fm.	OT—KA
Čausa Fm.	EG
Klačno Fm.	EGR

212. South Slovakian Danube B. (East) (CS.)

Malá Fm.	emSA
Bajtava Fm.	eBA
Kováčov Fm.	EGR

213a, b. South Slovakian Ipeľ B., Rimava B., Lučenec B. (CS.)

Fiľakovo Basalt Fm.	RO
Poltár Fm.	eDA
Podrečany Fm.	lPO
Lysec Fm.	lBA
Opava Fm.	mBA
Vinica Fm.	mBA
Príbelce Fm.	eBA
Salgótarján Fm.	mlOT
Bukovinka Fm.	eOT
Fiľakovo Fm.	emEG
Lučenec Fm.	EGR

209. Sopron Mt., West Hungarian B., 213c. N. Hungary, Börzsöny Mt., Tokaj Mt., 222. Mecsek Mt., 224a. Zala — Dráva B. (H.)

Dunántúl Fm.	DA—RO
Peremarton Fm.	lPA
Edelény Fm.	mPA
Cserhát Fm.	ePA
Tisza Gr.	lSA—RO
Tokaj Fm.	lSA
Tinnye Fm.	mlSA
Kozárd Fm.	mSA
Sajóvölgy Fm.	eSA
Szilágy Fm.	lBA
Fertörákos Fm.	lBA
Mátra Fm.	mBA
Sámsonháza Fm.	eBA
Nógrádszakál Fm.	eBA
Baden Fm.	BA
Pécsszabolcs Fm.	eBA
Tekeres Fm.	KA—eBA
Tar Fm.	lKA
Hasznos Fm.	lKA
Ligeterdö Fm.	KA
Fot Fm.	emKA
Garáb Fm.	emKA
Egyházasgerge Fm.	emKA
Budafa Fm.	emKA
Salgótarján Fm.	mlOT
Gyulakeszi Fm.	eOT
Brennberg Fm.	OT
Zagyvapálfalva Fm.	lEG
Putnok Fm.	mEG
Budafok Fm.	lEG
Becske Fm.	lEGR
Eger Fm.	mEGR
Pétervására Fm.	mEGR
Bér Fm.	eEGR
Szászvár Fm.	EGR
Cs, Cn, Cp, Ld Z.	PA—PO
Cuc, Cb, Uw Z.	DA—RO

215. East Slovakian B. (CS.)

Upper Variag. Fm.	DA—mRO
Inačov Coal Fm.	lPO
Variag. Fm.	emPO
Pozdišovce Fm.	mPO
Upper Coal Fm.	mlPA
Sejkov Coal Fm.	mlPA
Lower Coal Fm.	lSA
Kolčov Fm.	lBA
Evaporitic Fm.	mBA
Čelovec Fm.	mlEG
Prešov Fm.	emEG

216a. Zakarpatia B. (SU.)

Tereblia Fm.	mBA
Novoselitsa Fm.	emBA
2—6 Z.	BA
7—8 Z.	SA
9—10 Z.	PA
11 Z.	ePO

216b. Maramures B. (R.)

Volcano-sediment Fm.	mML—mDA
Borsa Fm.	EGR
D—E Z.	mlML

219. Transdanubian Central Mt., Budapest Area (H.)

Galgavölgy Fm.	mSA
Hidas Fm.	mBA
Pusztamiske Fm.	BA—SA
Öcs Fm.	BA—SA
Tar Fm.	mlKA
Bántapuszta Fm.	mOT—mKA
Csatka Fm.	EGR
Gyulafinátót Fm.	SA
Zsámbék Fm.	eBA
Mány Fm.	mEGR
Prv Z.	RO
Uw Z.	RO
Cuc, Cb Z.	DA
Cp Z.	PO
Cc Z.	lPO
Lp Z.	ePA
La Z.	mPA

220. Great Hungarian Plain B. (H.)

Heves Fm.	DA—RO
Csongrád Fm.	PO
Jászkunság Fm.	mlPA
Maros Fm.	ePA
Hajduszoboszló Fm.	mlSA
Dombegyháza Fm.	emSA
Ebes Fm.	lBA
Makó Fm.	mBA
Abony Fm.	eBA
Nyírség Fm.	BA—SA
Kiskunhalas Fm.	KA
Madaras Fm.	OT

223. Bačka B., N—S Banat B. (YU.)

PS Z.	lPO—eDA
R, D Z.	lPO
P, G, X, Lo, L' Z.	emPO
Pn Z.	ePO(lPA?)

225. Slavonia — Syrmian B. (YU.)

PS Z.	lPO—eDA
R, D Z.	lPO

Lo, L' Z.	mPO
P, G, X Z.	ePO
Pn Z.	ePO(1PA?)

227. Intradinarid Tuzla B. (YU.)

Salt Fm.	1KA

228. Kolubara B. (YU.)

Bd Z.	(m)1PO
Hp, pr Z.	e(m) PO
Tl, Sc, Hc, Aa (E), Pc (D), Ht (C), Hl (B), Hl (A), Z.	PA
Ps Z.	1SA
Elph. Z.	mSA
E. r. Z.	eSA
Ab Z.	1BA
Cib. Z.	mBA
Sc. Z.	mBA

229. Morava B. (YU.)

Cgs Z.	1PA—ePO
CgP Z.	mPA
Cgb Z.	ePA
Pz Z.	1SA
Eh Z.	mSA
E/c Z.	eSA
Rb Z.	1BA
Bb Z.	1BA
Sc. Z.	mBA
L Z.	eBA

224a 1. Drava B. (YU.)

Bilogora Fm.	1PO—RO
Kloštar Ivanić Fm.	emPO
Ivanić Grad Fm.	(m)1PA
Moslavacka Fm.	EGR—mPA

217. Transylvanian B. (R.)

Baraolt Coal Fm.	RO
Volcanic-sedim. Fm.	mPO—RO
Feleac Fm.	SA
Mermesti Fm.	mlML
Hălmagiu Fm.	mML
Cimpie Fm.	1BA
Upp. Sălătruc Fm.	eBA
Almasu Mare Fm.	OT
Lueta Fm.	EG—OT
Talmaciu Fm.	EGR—OT
Bradet Fm.	EGR—OT
Gostila Fm.	EGR
Buzas Fm.	EGR
C, D, E Z.	emML
CPN 2—13 Z.	EGR—1SA

218. East Intra-Carpathian Depression (R.)

Freshwater Fm.	1PO—eDA
Tigeru Fm.	mML
Volcano-sedim. Fm.	SA
Minis Fm.	1BA
Bozovici freshw. Fm.	mlBA
Volcano-sedim. Fm.	emBA
Coal Fm.	eBA
A—E Z.	ML
F—G Z.	PO
H Z.	eDA
CPN 6—12	eBA—mSA

B. 3. Transitory and boundary Areas between the Central — and Eastern Paratethys

241. Moldavian Platform (SU.)

Kagulsk Fm.	MAE
Balt Fm.	MAE
Podol Fm.	emBA

230. Danubian Corridor (R. — YU.)

Freshwater Coal Fm. mlBA (other Fm. unmarked ?OT—eSA)

238. Dacic B. (R.)

Freshwater and terrestric Fm. (other Fm. or Gr. unmarked)	RO
CPN 6—12 Z.	eBA—mSA

240a, 242b. South Dobrodgea, Danubian Delta (R.)

Type Yalpong Fm.	ePO
(other Fm. unmarked	1BA—RO)
CPN 5—7 Z.	mKA—eBA

231b-e. Lom Gulf (BG)

(Unnamed Fms.	eBA—mRO)

235a, b. Sofia B., Hrabarsko, Cukrovo B. (BG.)

Lignit Fm.	e(m)PO
Basale Fm.	eBA
Lignit Fm.	m(l)BA

237a, b. Plovdiv B., Zagore B. (BG.)

Ezerovo Fm.	-eEGR
Dragoinovo Fm.	mEGR
Maritza Fm.	EGR

237c. Tundza B. (BG)

Elhovo Fm.	mPO—RO (mPO—AK)

B. 4. Transitory and boundary Areas between the Neogene Tethys and the Eastern Paratethys

50a-f. Thrace—Ergene B., Gelibolu, Cannakale, Ezine — Gülpinar (TR.)

Gelibou Fm.	PI (= AK)
Kircasalih Fm.	1PI (= 1AK)
Celibi Fm.	ZA—PI (= mlKI—AK)
Eceabat Fm.	mlZA (= mlKI)
Kilitbahir Fm.	mlME (= 1PO—eKI)
Danismen Fm.	AQ—SE (= CA—eBE)
Cöpköy Fm.	AQ—BU (= CA—KOZ)
Muhacir Fm.	CH (= CA part?)
T—1 Z.	ZA—PI (= mlKI—AK)
Kizilhisar Z.	TO—ME (= CHE—PO)

51. Istanbul Area (TR.)

Unnamed Fms.	mTO—eZA (= PO—1KI)
Kizilhisar Z.	TO—ME (CHE—PO)

52. Sinop, Giresun Area (TR.)

Sarikum Fm.	1ME—PI (= eKI—AK)
Hanegi Fm.	AQ—PI (= CA—AK)

53. Can-Biga, Balikeshir Area (TR.)

ÜSt Gr.	ZA (= KI)
Pyroklast. Gr.	TO—ME (= BE—eKI)
Kirectasi Gr.	mlSE (= KO—eBE)
Desit Gr.	eSE (= TCH—KAR)
Aglomera Gr.	BU (= SAK—KOZ)

55. Harmancik Area (TR.)

Unnamed Fms.	AQ—mPI (= CA—mAK)

56. Centr. Sakarya, Gölpazari (TR.)

Gemiciköy Fm.	LA—SE (= TAR?—eBE)

57. Beypazari—Nallihan (TR.)

Unnamed Fms.	AQ—PI (= CA—AK)

58. Erzincan, Erzurum Area (TR.)

Gelinkaya Fm.	ZA—PI (= mKI—AK)

Horasan Fm.	ZA—PI (= mKI—AK)
Neftlik Fm.	mTO (= MAE)
Coraktepe Fm.	mTO (= MAE)
Yastiktepe Fm.	1SE—TO (= VO—CHE)
Örtü Kagalari Fm.	LA—mME (= 1TAR?—1PO)
Zilkofomu Fm.	LA-mTO (= TAR?—MAE)
Henesdüzü Fm.	BU (= SAK-eTAR?)
Dumanli Fm.	eBU (= SAK)
Güneytas Fm.	1BU (= KOZ—eTAR?)
Kemerkaya Fm.	AQ—BU (CA—KOZ)
Yayla Fm.	1AQ (1CA)
Vartik Fm.	mAQ—1BU (= mCA—SAK)
Engice-Balikli Fm.	mAQ (e? mCA)
Tercan Fm.	eAQ (= e? mCA)
Pülk Fm.	eAQ (= e? mCA)
Lakoglu Fm.	CH (= CH—? eCA)

62. Cankiri — Kalecik Area (TR.)

Çandir Fm.	mlSE (= KO—eBE)

70a, b. Hinis B., Karayazi — Erzurum Area (TR.)

Zirnak Fm.	ZA—PI (= mKI—AK)
Alibonca Fm.	TO—ME (= BE—eKI)
Haciömer Fm.	TO—ME (= BE—eKI)
Mescitli Fm.	LA-mSE (= 1TAR?—KO)
Hanesdüzü Fm.	BU (SAK-eTAR?)
Cigilgan Fm.	CH (= CH—?eCA)

B. 5. Eastern Paratethys Area

52a. Sinop Area (TR.)

Unnamed Fms.	TAR—CHE
Sarikum Fm.	KI—AK

240a—f. Burgas, Varna, Balcik Area (BG.)

Unnamed Fms.	TAR—CHE

242. Danubian Region of the Scythian Platform (SU.)

Podol Fm.	TCH

244. Near Black Sea Depr. (W—E). (SU.)

Majatkov Fm.	KOZ
Tchernobaev Fm.	SAK
Korolev Fm.	KOZ
Gornostaev Fm.	CA
Askanskij Fm.	1CH (eCA?)

246, 247. The Steppe Crimea, Kerch Peninsula (SU.)

Korolev Fm.	KOZ
Bathysyphon Fm.	SAK
Upp. Kerleut Fm.	CA
Low. Kerleut Fm.	CH—eCA?

248, 249. Taman Peninsula, W part S. Ciscaucasia (SU.)

Clay-siderite Fm.	(1SAK?) KOZ
Voskovogor Fm.	1CA—eSAK
Alkun Fm.	e(m)CA
Abadzech Fm.	CH—eCA?

250. Central part S. Ciscaucasia (SU.)

Armavir Fm.	MAE—ePO
Olgin Fm.	mlSAK
Karadjalgin Fm.	eSAK
Rizev Fm.	KOZ
Zelentshuk Fm.	(m)1CA
Alkun Fm.	emCA
Batalpashin Fm.	CH—eCA?

252. Upper part of Kura D. (SU.)

Alasan Fm.	AK
Krasnokolod Fm.	KI
Dushet Fm.	MAE—PO
Shirak Fm.	MAE—PO
Nazchor Fm.	CHE
Eldar Fm.	1BE—CHE
Ior Fm.	eCH

253. Sevan, Shirak, Arak Depr., Erevan Synklinorium (SU.)

Noraduz Fm.	1KI?—Ak
Sisan Fm.	1KI?—AK
Zachkunjaz Fm.	KI
Vochthaberd Fm.	MAE—PO
Megrin Fm.	MAE—PO
Djadjur Fm.	MAE—PO
Razdan Fm.	VO-mCHE
Oktemberjan Fm.	mTAR—mKAR
Gyps—saltifer. Fm.	mTAR—KO

255. E part South Ciscaucasia (SU.)

Zuramekent Fm.	KOZ
Sulak Fm.	SAK
Assin Fm.	(m)1CA
Alkun Fm.	emCA
Chishkin Fm.	CH—eCA?

256. Middle part of Kura Depr. (SU.)

Shirak Fm.	MAE—PO
Balachan Gr.	KI
Eldar Fm.	CHE

257. Kussaro-Divichin Synclinor. (SU.)

Balachan Gr.	KI

258. Shemako-Kobistan Synklinor. (SU.)

Balachan Gr.	KI

259. Low. part of Kura Depr. (SU.)

Balachan Gr.	KI

261. Apsheron Through (SU.)

Balachan Gr.	KI

265. S. part of Ukrajinian Shield (SU.)

Majatchkov Fm.	KOZ

266. The Donbas (SU.)

Poltav Fm.	-CA—KO

267. NE part Sea of Azov, Lower Don (SU.)

Janov Fm.	MAE
Vedernikov Fm.	VO
Melichov Fm.	KAR—KO
Majkop Gr.	-CA—SAK

268. The Manychs (SU.)

Iudilov Fm.	mPO—AK
Burukshun Fm.	mCHE—MAE
Majkop Gr.	-CA—KOZ
Aradik Fm.	-CA

269. Ergeni (SU.)

Burukshun Fm.	mCHE—MAE
Jashkul Fm.	TCH—KO
Majkop Gr.	-CA—SAK
Varezhnikov Fm.	mlSAK
Aradik Fm.	-CA

270. Oka-Don Lowland (SU.)

Usman Fm.	mPO—KI
Iorelkin Fm.	1BE—eCHE
Lomkon Fm.	TCH—mBE

271. Volga—Khoper Interfluv (SU.)

Ergenin Fm.	mPO—AK
Ilovlin—Gurov Fm.	TCH—ME

272. Middle Povolzhje, S of Samarskaja Luka (SU.)

Kushum Fm.	mlPO

274. South Cisuralia (SU.)

Ushkatlin Fm.	VO—eBE

Voroshilov Fm. KOZ—mTCH
Kujurgazin Fm. SAK
Tjulgan Fm. CA

275. Near Caspian Sea Lowl. (SU.)

Kushum Fm. mPO—mKI

277. Mangyshlak (SU.)

Kashkarotin Fm. SAK
Karagiin Fm. -CA

278. Ustjurt (SU.)

Aral Fm. CA

279. Area NE of the Aral Sea (SU.)

Shansha (low.) Fm. (m) lAK
Kyzyltashmin Fm. mMAE—ePO
Aral Fm. mCA—mSAK

281. Area S of the Aral Sea (SU.)

Sadivar (low.) Fm. mlAK
Zair Fm. emAK
Turan Fm. mPO—eKI
Agitmin Fm. TAR—CHE
Sarbatyr (upp.) Fm. CA

280. West Turkmenistan (SU.)

Cheleken Fm. KI—lAK
Kjurenin Fm. VO—mMAE
Kazgantchay Fm. mVO—eMAE
Majkop Fm. (upp.) CA—mKOZ

283. East Turkmenistan (SU.)

Sajat Fm. KI
Ioktchin Fm. mlAK
Tachtin Fm. e(m)AK
Erbent Fm. KI
Tahtabazar Fm. KI
Zunguz Fm. mCHE—mPO
Kazgentchay Fm. KAR—mMAE
Karagaudan Fm. TAR—TCH
Sagadzhin (upp.) Fm KOZ—TCH
Sagadzhin(low.)Fm. SAK
Darjalyk Fm. (upp.) CA
Merev Fm. (upp.) CA

B. 6. Transitory and boundary Areas between the Eastern Paratethys and the Neogene Indopacific Regions

355. NE Iraq Basin (IRQ)

Bekhtairi Fm. (low.—upp.) ZA—PI (mKI—AK)
Merga „Red Beds" Fm. TO—lME (lBE—eKI)
Govanda Fm. lLA—SE (lTAR-eBE)

356. Qum, B., Central Iran (IR)

Hezerdarreh Fm. ZA—PI (mKI—AK)
Upper Red Fm. mLA—mME (TAR?—lPO)
Qum Fm. CH—mLA (-eCA—lTAR?)
a—f Z. CH—mLA (—eCA—lTAR?)
M—1 Z. (m)lLA—mTO (lTAR?—MAE)
M—2 Z. mTO—eME (MAE—mlPO)
M—3 Z. m(l)ME (-lPO—eKI)

357. Pentacaspian, Gorgan-Resht B. (IR.)

Cheleken Gr. mZA—PI (-KI—AK)
Continental Gr. mTQ—ME (-MAE—eKI)
Vindabon—Sarmat Gr. mBU—mTO (KOZ—CHE)

358. Central Alborz (IR.)

Hazardarreh Fm. mME—PI (KI—AK)
Red Fm. CH—mME (-CA— lPO)

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Revidovaná chronostratigrafická hodnota lito- a biostratigrafických jednotiek neogénu tetýdnej a paratetýdnej oblasti; aplikácia výsledkov projektu IGCP č. 25; časť 1.

V r. 1983 sa úspešne ukončil medzinárodný projekt, ktorý navrhol, organizoval a viedol autor tohto príspevku, a započalo sa obdobie praktického využitia výsledkov desaťročnej práce, na ktorej sa pri stratigrafickej revízii a korelácii temer 400 neogénnych panví v interkontinentálnom areáli medzi Atlantikom a Indopacifikom v Európe, severnej Afrike a v západnej Ázii zúčastnilo 310 vedeckých pracovníkov z 27 krajín.

Na základe biozón planktónu rôznych zemepisných šírok a na základe rádiometrických a paleomagnetických meraní sa v rámci projektu zrevidovala chronostratigrafická hodnota všetkých neogénnych panví uvedenej oblasti. Revízia priniesla prevratné poznatky, ktoré sa odrzkadľujú v úplne nových paleogeografických a geodynamických koncepciách neogénu tohto teritoriálne veľmi rozsiahleho územia.

Výsledky revízie a novej stratigrafickej korelácie obsahu-

júce paleobiologické, rádiometrické, paleomagnetické, vulkanologické a geodynamické poznatky včítane znázornenia litostratigrafického vývoja na 540 komplexne spracovaných stratigrafických tabuliach boli zverejnené v dvoch záverečných správach projektu (Seneš, 1985; Steininger et al., 1985). Slúžia ako moderný základ nielen na poznanie vývoja neogénu medzi Atlantikom a Indopacifikom, ale prispejú v mnohých smeroch k poznávaniu príčin a zákonitostí výskytu hlavne sedimentárnych nerastných surovín v čase a priestore.

V tomto príspevku oboznamujeme geologickú verejnosť s výsledkami revízie (zatiaľ nezverejnené v žiadnom vydaní medzinárodných Lexique Stratigraphic), a tým samozrejme aj s prehodnotením chronostratigrafickej (teda časovej) príslušnosti lito- a biostratigrafických jednotiek z celej cirkummediteránnej oblasti. Tento úvodný príspevok pomôže pochopiť nasledujúce články, týkajúce sa príčin časového a priestorového rozšírenia uhľonosných a evaporitových sedimentov, neovulkanickej činnosti, rýchlosti subsidencie a mocnosti sedimentov v jednotlivých oblastiach v areáli najmenej 5 × 2 tisíc kilometrov, období a oblastí nesporne veľmi rôznej intenzity mladých horotvorných pochodov a iných geologických fenoménov na tomto rozsiahlom interkontinentálnom území.

Kvôli orientácii čitateľa pripájame k tomuto príspevku tabuľku o našich súčasných vedomostiach a názoroch na koreláciu regionálnych stupňov (teda chronologicky vyjadriteľných časových odsekov) neogénu západo-centrálnej a východnej Paratetýdy so stupňami mediterránneho reliktu tetýdnej oblasti. Pripájame tiež mapu s prehľadom rozlohy tzv. cirkummediteránnej oblasti (neogén), s kontúrami a číslovaním jednotlivých panví. (Podotýkame, že číselné označenie oblastí uvedené na mape nadobudlo medzičasom medzinárodnú platnosť.) V nasledujúcich kolónkach jednotlivých sedimentačných oblastí uvádzame len tie litostratigrafické jednotky, ktoré spoluautori označili podľa návodu International Stratigraphic Guide (Hedberg, 1976) ako Group alebo Formation. Výnimku robíme len v oblastiach, kde sa terminológia jazykovo podstatne líši, napr. v ZSSR, kde sa formácia označuje väčšinou ako „Svita" a Group ako „Serija". V anglickom texte pôvodnej záverečnej správy projektu sme miestami museli zmeniť poradie jednotlivých panví, zohľadňujúc tak genetickú spolupatričnosť alebo paleogeografické aspekty.

Domnievame sa, že uvedené skratky, tabuľka stratigrafickej korelácie a mapka rozmiestenia neogénnych sedimentačných priestorov nevyžaduje ani preklad, ani ďalší komentár.

ZO ŽIVOTA SGS

V. Bezák: **Vzťah metamorfózy a tektoniky** (Bratislava 12. 1. 1989)

Prednáška bola zameraná na niekoľko okruhov problémov — všeobecné otázky funkcie metamorfózy vo vývoji zemskej kôry, ďalej tie aspekty vzťahu metamorfózy a tektoniky, ktoré sú významné pri tektonickej analýze regiónov, dôsledok tohto vzťahu na systematiku metamorfovaných hornín, konkrétne príklady prejavov tohto vzťahu vo vývoji niektorých oblastí kryštalinika vo svete a porovnanie s vývojom v Západných Karpatoch (hlavne vo veporiku).

Metamorfné procesy tvoria dôležitý článok v geologických cykloch, prostredníctvom ktorých sa uplatňuje geologická evolúcia a ktoré smerujú k diferenciácii zemského telesa. Výsledkom je aj tvorba novej kontinentálnej kôry, čo je proces viacdejový, s viacnásobným prepracovaním horninových komplexov. Preto v mladších orogénoch možno pozorovať fragmenty starších metamorfovaných komplexov začlenené do nových orogenetických cyklov, kde sa znovu podrobujú metamorfóze spolu so sedimentárnym obalom a pri tektogenéze sú zhrňované do jednej sústavy (príkladom takejto stavby môžu byť Alpy alebo Karpaty). Na týchto orogénnych sústavách možno najlepšie dokumentovať úzky vzťah metamorfózy a tektoniky.

Funkcia procesov metamorfózy sa posudzovala aj z hľadiska novej koncepcie tektoniky platní. Bola predložená tektonická klasifikácia metamorfných pásov, ktoré vznikajú na okraji kontinentov, pod ostrovnými oblúkmi a pri kolízii kontinentov. V zónach kolízie kontinentov je vývoj metamorfných pruhov najzložitejší. Medzi tektonikou a metamorfózou sa prejavujú úzke vzťahy v priestore a v čase, je tu jasná závislosť štruktúrneho režimu na metamorfných fáciách. Pritom fundament (hlavne príkrovy fundamentu peninského štýlu) hrá zrejme významnú rolu pri vzniku relatívnych a tepelných a metamorfných anomálií. Maximálna metamorfóza prebieha pri výzdvihu spojenom s deformáciami a prenikaním tepelného toku. Tým rastie vplyv usmerneného tlaku na metamorfné procesy, čo sa musí prejaviť aj v náhľadoch na ich klasifikáciu, ktorá bola doteraz ponímaná príliš staticky.

Pri porovnávaní vývoja rôznych oblastí kryštalinika, hlavne však hercýnskych sústav (napr. v Pyrenejach, hercýnskom pruhu Južnej Ameriky, v Alpách a i.), na tektogenézu ktorých bolo vyslovených viacero názorov, hercýnsky vývoj kryštalinika Západných Karpát, podľa doterajších údajov, najlepšie zodpovedá typu intrakratonického orogénu založeného na kontinentálnej kôre.