STRATIGRAPHIC CODE OF RUSSIA

ISC

VSEGEI


Alexander I. Zhamoida
SOME KEY PROBLEMS OF THE INTERNATIONAL STRATIGRAPHIC SCALE
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The third edition of the Stratigraphic Code of Russia (2006) follows the fundamentals of the previous editions of 1977 and 1992. Modifications were made to comply with the recent geological practice. The edition includes a less number of supplements and articles; unnecessary recommendations, notes, examples, etc. were abandoned. The chapter dealing with morpholithostratigraphic and seismostratigraphic units where inserted and some definitions were improved.

The Stratigraphic Code was approved by the Interdepartmental Stratigraphic Committee. All geological organizations must carry out works in the Russian territory in accordance with the Code requirements.

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* Appendixes to the real Code not been ihcluded.

PREFACE

Fundamentals of the Stratigraphic Code of Russia (USSR till 1992) were laid down in the 50s of the last century when a booklet "Stratigraphic and Geochronologic Units: Their Principles, Content, Terminology and Application Rules" edited by L. S. Librovich was published (1954).

In 1955, the USSR Interdepartmental Stratigraphic Committee (ISC) was established. The ISC paid special attention to stratigraphic classification and adopted mandatory requirements for conducting stratigraphic work in the booklet "Stratigraphic Classification, Terminology and Nomenclature" (1965).

In the late 60s - early 70s, the ISC organized a discussion of drafts of the USSR Stratigraphic Code, which was supplemented then approved and published in 1977 (16,000 copies). Long-term experience in geological mapping of various scales in the country, the results of special investigations in the field of stratigraphic methods, as well as international experience in preparing national stratigraphic codes were reflected in it.

While preparing the national Code, the contact of compilers with Prof. H. Hedberg, the editor of the "International Stratigraphic Guide" (1976) and Prof. A. Salvador, the editor of the second edition of the "Guide" were very helpful (1994).

The theoretical basis of the Code has been the recognition of stratigraphy as a fundamental branch of geosciences, which from the standpoint of "unified" stratigraphy uses all available information obtained using different methods and provides the differentiation of old structures on the historical-geological and chronostratigraphic base. The fundamentals of the stratigraphic classification laid down in the Stratigraphic Code published in 1977 were retained in two subsequent editions (1992 and 2006). In 2006, the Stratigraphic Code of Russia was created in a new, slightly reduced version.

Datum level (*biohorizon, datum plane*) is a surface (lower or upper) of bed or distinctive, very thin interval of a section, which corresponds to the essential changes in paleontological features (e. g., first appearance, last occurrence, sharp changes in frequency and abundance, etc.). Datum levels may be used for subdivision and correlation purposes and as boundaries of biozones.

Stratigraphic terminology – sum of unit-terms used in stratigraphic classification.

Stratigraphic nomenclature – sum of names of stratigraphic units.

Stratigraphic correlation is a comparison of spatially separated stratons or their parts in geological age and/or stratigraphic position.

Biostratigraphic correlation is a method of stratigraphic correlation, which provides establishing and extending of laterally biostratigraphic units, i. e., zones and/or beds with fauna (flora).

Taxonomic scale in stratigraphic classification is taxonomical units arranged in the hierarchical order, i. e., according to their ranks.

General stratigraphic scale is all general stratigraphic units (taken in full scopes without gaps and overlapping) arranged with respect to their stratigraphic succession and taxonomic subordination. The scale serves to define stratigraphic position of units of all other categories and kinds.

The General stratigraphic scale approved by the Interdepartmental Stratigraphic Committee of Russia has a compulsory application in the Russian territory and aquatory.

Note 1. The General stratigraphic scale may differ in some parts from the International stratigraphic scale approved by the International Commission on Stratigraphy.

Note 2. The International Commission on Stratigraphy published the International Geologic Time Scale (2003) in which the geological systems were marked with untraditional colors. In the Russian Federation, the traditional coloration approved by the Scientific Editorial Board of Rosnedra in 2003 should be used in all geological maps and other related documents.

Standard zonal scale (*Standard biostratigraphic zonal scale*) is a statistically substantiated (for the present time) succession of widely traceable biostratigraphic zones, i. e., a scale, the correlative potential of which exceeds that of zonal schemes of the type areas of stages and which provides more reliable provincial (regional, belt) and potentially global correlations. Standard scales may be built in parallel on the bases of different organic groups and composed of specific stratigraphic intervals of provincial biostratigraphic scales in scopes

of system, series or several stages. In case of several parallel scales, one of them should have priority.

Geochronological scale is a taxonomic succession of geochronological equivalents of general stratigraphic units.

Scale of geological Time (*Geochronometric scale*) is the successive dates for lower boundaries of international (general) stratigraphic units, which are expressed in years and determined by isotope and other methods.

Stratigraphic chart (scheme) is graphically shown temporal and spatial relations of local and/or regional stratons composing a full or partial section (e. g., of one system or erathem) of specific area of the Earth's crust and correlated to the General stratigraphic scale (Table 1).

Chapter I

PURPOSE AND APPLICATION (USE) OF THE STRATIGRAPHIC CODE

Article I.1. The Stratigraphic Code is a synopsis of principles relating to meaning and application of terms and names to stratigraphic practice and to procedures of establishing stratigraphic units.

Purpose of the Stratigraphic Code is:

a) to provide a uniform procedure of establishing stratigraphic units;

b) to reach as uniform and stable application of stratigraphic terms and names as possible.

Article I.2. All stratigraphic units are established in the Russian territory in accordance with the Code principles formulated herein as articles. Recommendations are to supplement the articles or to show possible solution of problems that are not governed by the principles.

All geological organizations must carry out works in the Russian territory with respect to the Code.

Chapter II

CLASSIFICATION OF STRATIGRAPHIC UNITS

Article II.1. There are two groups of stratigraphic units: basic and special. These groups are divided into categories of taxonomic units denoted by rank terms.

Article II.2. Categories and unit-terms in classification:

Basic stratigraphic units

General	Regional	Local
Acrothem	Horizon (Stratohorizon)	Complex
Eonothem	Beds with geographic name	Group (Series)
Erathem		Suite
System		Member
Series (Otdel)		
Stage		
Division * (Razdel)		
Chronozone		
Link (Zveno)		
Step (Stupen)		

Special stratigraphic units

Morpholithostratigraphic units: organogenous massifs, olistostromes (gravitational), clinoforms, stratogens.

Biostratigraphic units: biozones of various kinds, areal zones, auxiliary units (beds with fauna or flora).

Climatostratigraphic units: climatolith, stadial.

Magnetostratigraphic units: magnetozones of various rank.

Seismostratigraphic units: seismocomplexes.

Article II.3. Basic stratigraphic units are main elements of geological maps of different scales.

Categories of basic units reflect their geographic extent: potentially global (subglobal), regional, and local (in the limits of a geological region).

Scopes of all basic units of lower rank should compose a full scope of a higher rank basic unit.

Article II.4. Special stratigraphic units receive a specific substantiation and are distinguished by separate methods. They frequently serve to complete the basic units in subdivision and correlation of sections. Some of special units may be mapped.

Article II.5. A scale of any group and category may include additional units, which are denoted by rank terms of the general units with prefix *super* or *sub.*

A scope of the additional unit with the prefix *super* should comprise full scopes of all constituent units of lower rank. Scopes of

* Division, link, and step are used for the Quaternary deposits and possibly for the Neogene ones.

additional units with the prefix *sub* should compose in sum a full scope of a basic unit.

Boundaries of additional units must coincide with those of lower rank units of the same category.

Article II.6. Stratigraphic units belonging to different groups and categories are independent ones, i. e., units of one category and their scopes can be established with no regard to their relationship with units of other categories. Units of different categories can be correlated in age and stratigraphic scope.

Chapter III

GENERAL STRATIGRAPHIC UNITS

§ 1. Definitions. Taxonomic units

Article III.1. General stratigraphic unit is an assemblage of rock strata (geological bodies) that occupies a specific position in the complete geological section of the Earth's crust and is formed in the geological time interval fixed in the stratotype and/or by limitotypes.

General stratigraphic units are potentially worldwide in extent.

All general units in full scopes compose the General (International) Stratigraphic Scale.

Article III.2. The main method to be used for distinguishing a general unit is chosen with regard to a position of the unit in the geological scale and its rank.

The Precambrian units are distinguished by manifestations of extensive evolutionary cycles of the Earth's crust in stratotype regions as well as by changes in fossil assemblages and their traces. The unit boundaries are defined by manifestations of different geological events in the stratotype regions (large-scale tectonic movements and metamorphic processes, intensification of intrusive activity, sharp change of formations, etc.). Isotope methods are widely used for dating the Precambrian units and their boundaries and promote interregional extending of the units.

The biostratigraphic method is a leading method for distinguishing the Phanerozoic units; as a rule, their boundaries are defined by biotic events and, where possible, must have isotopic dates.

Beside the biostratigraphic method, a leading role in establishing the Quaternary units belongs to a climatostratigraphic method; occasionally isotope and paleomagnetic methods are used.

Article III.3. The taxonomic scale is a hierarchy of general stratigraphic units, which have corresponding units of the geochronological scale.

General stratigraphic units	Geochronological units *
1. Acrothem	1. Acron
2. Eonothem	2. Eon
3. Erathem	3. Era
4. System	4. Period
5. Series	5. Epoch
6. Stage	6. Age
Division	
7. Chronozone	7. Phase
8. Link	8. Time (Span) (Pora)
9. Step	9. Thermochron-cryochron

Article III.4. A taxonomic rank of a general unit is determined empirically with regard to significance and duration of a corresponding period of the geological history, which manifests itself in evolutionary features of the lithosphere and biosphere.

Article III.5. Lower boundary of a general unit is defined by its base in the unit-stratotype or in the boundary-stratotype (limitotype). Upper boundary is defined by the base of the overlying general unit.

Article III.6. As a rule, stratotypes for the general Phanerozoic units ranked higher than a stage are not designated; their stratigraphic scopes are constituted by scopes of all units of lower rank, usually stages. General Precambrian units of rank higher than a stage have their stratotypes.

Article III.7. Stage is the main taxonomic unit of the General stratigraphic scale ranking below a series. Stage is established on the base of biostratigraphic records reflecting changes and/or phases in the organic evolution and represents a set of chronozones unified by a certain feature. Paleontological characteristics of the stage show occurrences of widespread species (and genera) in the stage stratotype and other coeval deposits.

The stage must have its stratotype and limitotype, i. e., Global stratotype section and point (GSSP). It is desirable that the stage stratotype encloses constituent chronozones.

* Geochronological equivalents of stratigraphic units.

N o t e. Stage may be composed by deposits, which contain either the fossil assemblage characteristic of its stratotype or other assemblage or no organic remains if these deposits are proved to have the same age.

Article III.8. Chronozone is a taxonomic unit of the General stratigraphic scale ranking below a stage. It is established on the base of biostratigraphic records and reflects a certain evolutionary phase of one or several faunal or floral groups. Boundaries are defined by lower and/or upper limits of stratigraphic spreading of zonal fossil assemblage, which includes usually rapidly evolving species of wide distribution.

Chronozone should have its stratotype.

N o t e. Chronozone may be represented by deposits, which contain either the zonal fossil assemblage or other assemblage or no organic remains if the same age of the deposits to be correlated is proved.

Article III.9. Division is a taxonomic unit of the General stratigraphic scale subordinate to a series (superdivision) of the Quaternary System. Division is based on biostratigraphic and climatostratigraphic characteristics. It corresponds to a long period of climatic evolution and embraces several large climatic rhythms.

A stratigraphic scope of division comprises scopes of all stratotypes of constituent links or steps.

Article III.10. Link is a taxonomic unit of the General stratigraphic scale subordinate to a division of the Quaternary (and possibly Neogene) System. Link is based on biostratigraphic and climatostratigraphic characteristics; it embraces rock strata formed during several climatic rhythms, i. e. cooling and warming (glacial and interglacial periods) or humidification and desiccation (pluvial and arid climates).

When a link stratotype is not designated, its scope is defined by scopes of stratotypes of all constituent steps.

Article III.11. Step is a taxonomic unit of the General stratigraphic scale subordinate to a link of the Quaternary (and possibly Neogene) System. Step is based mainly on climatostratigraphic features; it embraces rock strata formed during global (subglobal) cooling or warming. It corresponds to a single glacial or interglacial in the middle latitudes and to a long pluvial or arid period, i. e., climatolith (Article VIII.4) in the tropical zone.

A stratotype of one of the most characteristic climatoliths is taken as a stratotype of the step.

§ 2. Rules of description and naming

Article III.12. Description of a new general stratigraphic unit should include the following data: a) name given in accordance with the Code; b) general property including its main properties; c) proofs of absence of equivalent units in the General stratigraphic scale; d) substantiation of the general position in the General stratigraphic scale and the levels of boundaries; e) location of the stratotype (if it is designated) and a lower boundary stratotype (limitotype); description of stratotype and limitotype or reference to the published description; f) rock composition; g) correlation to regional and local units (or portions of them) of non-stratotype regions.

N o t e. The official approval of a stage requires that its stratigraphic scope and limitotype (Global stratotype section and point, GSSP) receive an adequate substantiation approved by the International Commission on Stratigraphy.

Article III.13. Names of acrothem, eonothem, and erathem reflect relatively old origin of the rocks, correspondence to the most important periods of the Earth and life evolution, or they have other etymological derivation. A system takes its name from a region of its widest development or a location of the stratotype. Abbreviated names of acrothems, eonothems, erathems, and systems can be used.

Article III.14. Series are named according to their relative position within the system as *lower, middle* (at three-member subdivision), and *upper;* abbreviated names can be used. Names of subseries should reflect their position within the series.

N o t e. In some cases, to avoid uncertainty, series may carry proper names.

Epochs are denoted as *early, middle* (in three-member subdivision), and *late.*

Article III.15. Names of stages (superstages) are derived from modern or old names of geographic objects (area, district, river, mountain, settlement, etc.) in or near the region of stratotypes of the stages (superstages). Abbreviated names can be used.

Substages are named according to their relative position within the stage as *lower, middle* (at three-member subdivision), and *upper.*

A geochronologic equivalent of stage is age; that of substage is time.

Article III.16. Name of chronozone or subzone is formed from the name of one or two index-species without indicating the author

and date of species identification. The names of genera and species, comprised in the zone name, are in Roman type.

A phase during which deposits of a chronozone (subzone) were accumulated has the name of the zonal index-species. The names of genus and species are not italicized.

Article III.17. Divisions of the Quaternary system have proper names of their own.

Article III.18. Links are named according to their relative position in a division: *lower, middle* (at three-member subdivision), and *upper.*

Article III.19. Steps are denoted by ordinal numbers according to their relative position (from the base upward) in a section of a corresponding link.

Steps corresponding to warmings are designated by odd numbers and steps corresponding to coolings, by even numbers.

Article III.20. Geochronological equivalents of acrothems, eonothems, erathems, systems, series, and stages (superstages) carry the same proper names as corresponding general stratigraphic units.

Geochronological equivalents of divisions, links, and steps have the names of corresponding stratigraphic units. The informal term "time" (of unspecified rank) may be used instead of the geochronological terms.

The words *lower* or *upper* in the names of stratigraphic units are changed into *early* or *late* in the geochronological equivalents.

Chapter IV

REGIONAL STRATIGRAPHIC UNITS

§ 1. Definitions. Taxonomic units

Article IV.1. Regional stratigraphic unit is an assemblage of rock strata formed in a specific period of geological history of a large region and reflecting type of sedimentation and succession of faunal and floral assemblages characteristic of this region.

Regional units integrate local stratons or their parts, provide correlations between local stratigraphic schemes and their assignment to the General stratigraphic scale (Table 1). They may be shown in maps.

A regional unit is limited in geographic extent by a geological region or subregion, paleobasin of sedimentation, or paleobiogeographic area (province).

Article IV.2. Stratigraphic boundaries of regional units may be defined by changes in regime and structure of a geological region, breaks in sedimentation, essential biotic and climatic changes.

Lateral boundaries are defined by limits of geographic extent of constituent stratigraphic units.

Article IV.3. Taxonomic units of regional stratigraphic schemes are horizon (stratohorizon) and beds with geographic name; additional units are superhorizon and subhorizon, accessory unit is a marker horizon (Article V.14).

Article IV.4. Horizon (stratohorizon) is the main taxonomic unit of regional stratigraphic schemes, which comprises coeval suites and groups or their parts (along the section) as well as usually provincial biostratigraphic subdivisions. It comprises coeval various facies formed in different regions (facial zones) of paleobasin of sedimentation. It performs correlation functions by various methods within its geographic distribution. Horizon is used for assigning regional stratigraphic schemes to the General stratigraphic scale.

Horizons (superhorizons, subhorizons) may be shown in middle- and small-scale geological maps, used in the compiling legends of geological maps, and in reconstructing sedimentational processes in paleobasins.

Horizon should have its stratotype.

In the Precambrian deposits as well as mostly "barren" volcanogenic and other rocks, horizons are established on the base of lithological-facial or petrographic characters of the deposits with regard to isotope and paleontological records.

In the Phanerozoic deposits, horizons are established on the base of lithological-facial characters of the deposits with regard to their paleontological content. In most cases, biostratigraphically based horizons are recognized in paleobiogeographic area (province). Such horizons (superhorizons, subhorizons) may be called regiostages.

In the Quaternary deposits, horizons may be established on the climatostratigraphic base (of climatic changes) (see climatolith, Article VIII.4).

Article IV.5. Subhorizons are established if a horizon can be divided into smaller units traceable along the entire area of the horizon distribution or its larger part. Subhorizons should constitute in sum

a full stratigraphic scope of a horizon. Subhorizons of a single horizon cannot substitute one another along the lateral.

Superhorizons are established in need to organize horizons into larger regional units.

Article IV.6. Beds with geographic name are a taxonomic unit established on the base of their lithological composition and/or biostratigraphic characteristics. In sum, they may not fill up the stratigraphic scope of a horizon (subhorizon).

A stratotype of the beds may be chosen in the stratotype of a horizon (subhorizon) or some other section.

§ 2. Rules of description and naming

Article IV.7. The description of a new regional stratigraphic unit should include the following data: a) name given in accordance with the Code; b) geographic extent and composition of its sections over the region; c) main features that allow to correlate geological bodies composing the unit and to substantiate its boundaries; d) location of the stratotype, its description or reference to the published description; e) position in the regional stratigraphic chart; f) additional subdivisions of a horizon; g) relations to previously established regional units of the same age; h) relations to regional units of the adjacent regions; i) geological age (correlation to subdivisions of the General stratigraphic scale).

Article IV.8. Name of a horizon may be formed in the following ways:

a) in case a horizon corresponds in stratigraphic scope to a well studied suite (subsuite with a proper name, group) widespread in the region, this suite is recognized as the typical one and the horizon takes its name. Analogously, superhorizon takes a name of the typical group or complex.

N o t e. If the name of a horizon (as a regional unit) different from that of later established well studied suite has been long used in literature, it should retain its validity.

If a regional unit is established in the stratotype area of a stage (substage), name of the stage is preferable to use as a name of this unit.

b) in case a horizon corresponds in stratigraphic scope to an unnamed subsuite, parts of adjacent suites, or to deposits, which do not constitute an independent suite (group, body), name of the horizon is derived from the location of its stratotype.

Article IV.9. Subhorizons are named according to their relative position in a horizon as *lower, middle* (at three-member subdivision), and *upper*. If the horizon is divided into four or more subhorizons, the latter should have proper names.

Article IV.10. Name of beds is derived from the geographic name of their stratotype area or from the area where their distinguishable features are best pronounced.

Article IV.11. Geochronological equivalents of a horizon (superhorizon, subhorizon) and beds are denoted by a term "time" after the name of a corresponding unit.

Chapter V

LOCAL STRATIGRAPHIC UNITS

§ 1. Definitions. Taxonomic units

Article V.1. Local stratigraphic unit is an assemblage of rock strata distinguishable in a local section by a complex of features, predominantly facial-lithological or petrological ones, both stratigraphically and spatially distinct, recognizable in the field (and boreholes), and mappable (Table 1).

Local stratigraphic unit has multiple characteristics that cover lithological composition, paleontological content (when fossils are present), structure of bedded body (breaks and rhythms of sedimentation), boundaries, and geographic extent.

Paleontological records are one of the features to establish a local stratigraphic unit; they provide geological dating, correlation with other local units, and detection of gaps. Geographic extent may vary from a part of structural-facial zone up to a part of geological region or some other area.

Article V.2. Local stratigraphic units should not be regarded as provisional ones to be replaced by general stratigraphic units according to the results of further investigations.

Article V.3. Stratigraphic boundaries are placed at positions of lithological changes, stratigraphic hiatuses and unconformities, changes in fossil assemblages as well as significant alterations of geophysical parameters if such are known.

In case of gradual lithological changes, the boundary between units may be defined by changes in faunal (floral) assemblages, in geophysical and other parameters or it may be tentative, but its position should be precisely fixed in the stratotype.

Lateral boundaries may be fixed with spatial variations in lithological composition (types of sedimentation), tectonic contacts, and essential changes in fossil associations (marine and continental biotas, etc.).

Article V.4. A rank of a local unit is determined empirically, proceeding from the relative importance of these deposits in a given regional sequence.

Thickness of the deposits and duration of their accumulation are not decisive factors of ranking, but they should be taken into account.

A local unit retains its rank regardless of a scale of geological mapping or other works.

Article V.5. Stratotype of a local unit may serve as a stratotype of a general or regional unit but the local unit retains its category and rank for a specific area of the Earth's crust.

Article V.6. The taxonomic scale of local units consists of the following subdivisions: complex, group, suite, and member.

Additional local units are body (tolshcha) and bed (layer) with its modifications, such as marker horizon, lens and others. All these terms are informal.

Article V.7. Complex is a major local unit consisting of two or more groups. Commonly, it is an assemblage of geological bodies, which has a great thickness and complicated lithological composition and structure. It corresponds to a large period in the geological evolution of area.

Complex is usually used in the Precambrian stratigraphy where it is established by means of isotopic dating and metamorphism character and separated from adjacent complexes by structural or noticeable disconformities, or infrequently by intrusive magmatic rocks.

If a stratotype of a complex has not been designated, the complex is defined by all constituent groups or suites.

Complex may be divided into subcomplexes and groups.

Article V.8. Group unites two or more suites that form a large cycle of sedimentation and/or have common features, such as depositional environments (marine, continental, volcanic), dominant rocks (sedimentary, volcanogenic, metamorphic) or trend of their changes, specific structure (rhythmicity, etc.).

Stratigraphic relations between constituent suites may vary: they may be separated by gaps, minor disconformities and unconformities or pass gradually into each other, or have laterally substituted portions.

If a stratotype of a group has not been designated, the group is defined by all constituent suites (bodies).

Article V.9. Suite is the main taxonomic unit of local stratigraphic subdivisions. It is predominantly shown in middle- and large-scale geological maps and distinguished in primary division of borehole sections. Suite is an assemblage of deposits distinguishable from under- and overlying deposits by composition and structural features stemming from their genesis (marine, continental, volcanogenic-sedimentary deposition), by fossil assemblage, character of metamorphism, isotope age (if such data are available), and in some cases geochemical or petrophysical properties, logging data, climatic indicators, etc.

Geographic extent of a suite is a territory within which its main features can be identified and lower and upper boundaries can be traced. The territory may be a structural-facial zone or a paleobasin of sedimentation, or their parts, or any other area.

Note. Suite may be entirely constituted by homogenous rocks or some dominating deposits may associate with members, interlayers, and lenses of other rocks. The suite may be composed of regularly alternating rocks of specific types or may have variable composition. In rhythmically structured sections, a large sedimentary cycle may be recognized as a suite.

It is not recommended to establish suites that cannot be shown in middle or large scale maps because of small thickness.

Within its geographic extent, suite may embrace coeval deposits that bear their diagnostic lithological-facies characters although differ from its stratotype in details. However, a combination of sharply different facies (marine, lagoonal, continental, etc.) in a single suite is not recommended.

A stratigraphic scope of a suite should be determined from its complete section, i. e., it should correspond to the entire time interval of deposition. Locally, the suite may not be completely represented and some parts of its section (e. g., its lower or upper part) may be missing.

Suite should have its stratotype.

Recommendation 9A. If in the facies transition zones, some portions (subsuites, members, beds-wedges) laterally adjacent suites can be recognized, they should be used there without establishing new suites. If the facies transitions are gradual, traceable for

tens or hundreds kilometers and a section there is sharply different from those of adjacent suites, a new suite may be established in the transitional zone.

Suite may be divided into subsuites and members.

Article V.10. Subsuite is a subdivision of a suite, which bears most of its distinguishable features but differs from other subsuites in some other features, which are usually lithological-facial and less frequently paleontological ones. Subsuites are denoted in middle and large scale maps.

Scopes of all subsuites form a full stratigraphic scope of a suite.

Note. The suite that is divided into subsuites in one area may remain undivided in another area.

Article V.11. Member is a relatively thin assemblage of beds (layers), which is distinguishable by one or several features from the adjacent members of a suite (subsuite) or a body. Members are usually restricted in extent; therefore, their number may vary in different areas. Members are denoted in middle and large scale maps.

Article V.12. Body (tolshcha) is an accessory local stratigraphic unit. Bases for referring these deposits to a group, suite, or subsuite are insufficient because their relationships with under- and/or overlying deposits are unclear, geographic extent is not determined exactly, and they do not comply with some other requirements on the mentioned stratons. Sequences are local subdivisions established on the base of incomplete fragmental sections, sections of single boreholes or insufficient core output as well as alluvium in watersheds where contacts with under- and overlying deposits are exposed.

Sequence is not defined in a stratotype but the most representative section (sections) should be designated.

Article V.13. Bed (layer) is thin lithologically homogenous deposits distinguishable by rock composition or fossil content and having distinct boundaries with under- and overlying deposits. Morphological modifications of a bed are lenticular layer, lens, wedge, lava flow (cover) and other bodies.

Note. Relatively thin lava flows (covers) and similar geological bodies may be recognized as beds or members depending on their structure and thickness.

Article V.14. Marker horizon is a thin widespread body (member, bed) occurring at a specific stratigraphic level. As a rule, it is established in the field on the base of rock properties, presence of fossils and their assemblages (as characteristics of the rock) and other fea-

tures, which distinguish it from under- and overlying deposits. Marker horizons may reflect geologically short-time events manifested in rock composition (e. g., volcanic ash fall-out).

Marker horizons are used in large- and middle-scale geological mapping and correlation of local sections and stratons.

§ 2. Rules of description and naming

Article V.15. The description of a new local stratigraphic unit is as follows: a) name in accordance with the present Code; b) geographic extent; c) integrated lithological, paleontological (if there are fossils), and other characteristics; d) thickness and its variations; e) relationships with under- and overlying deposits and peculiarity of the boundaries; f) relationships with coeval local units established previously in the region; g) location and description of stratotype or indications of stratotypes of constituent units; h) geological age (correlation subdivisions of the General stratigraphic scale), isotope age or proved correlation with regional and local units of neighboring regions.

Article V.16. Name of a complex is derived from geographic name; the geographic name may be supplemented by indication to the main distinctive property (e. g., Yudoma Complex, Glushikhino Volcanogenic Complex).

Article V.17. Names of groups and suites are derived from geographic names of areas, regions, rivers, mountains, settlements, etc. at or within which stratotypes of corresponding groups and suites are located.

Note. Series cannot carry a name of a constituent suite.

Suite that was established on the base of previously distinguished sequence (with geographic name) takes its name.

Recommendation 17A. Name of a suite established in the facies transition zone may consist of names of two relatively coeval adjacent suites, if the new suite bears characteristics of the both.

Article V.18. Name of a body (tolshcha) is recommended to derive from a dominating rock. It is admitted to form a name of a sequence from the geographic name and the word "sequence" (similarly to suite or group) or from the geographic name and rock type without the word "sequence" (e. g., calcareous sequence, volcanogenous-sedimentary sequence, Sandagous Sequence, Kiev Marl, Petrov Sandstone).

Article V.19. Subsuites and subbodies are named according to their position in a suite (and sequence) as *lower, middle* (at three-member subdivision), and *upper* with the name of the suite. In case the suite is divided into four or more subsuites, the latter may have their own geographic names or numerical indices; the lowest subsuite being the first.

If a subsuite was established on the base of previously distinguished straton with geographic name, the subsuite may retain this name.

Article V.20. Members, beds (layers), and marker horizons are named from type or lithological features (color, density, etc.) of rock, or characteristic fossils. Members and beds (layers) may be also numbered with the Arabian figures (from the base upward the section) added by a rock name in parentheses. Geographic names of members are not recommended.

N o t e. Members with geographic names have a priority, if they have been long used in geological practice.

Article V.21. Names of geochronological equivalents of a complex, a group, and a suite are composed of names of corresponding units with the informal term "time".

To indicate the time of formation of subcomplex, subsuite and other accessory units, the words *early, middle* (at three-member subdivision) and *late* are added to their names (e. g., Karelia Complex – Karelian time; Lower Molchanovka Subsuite – Early Molchanovka time; Middle Molchanovka Subsuite – Middle Molchanovka time; Upper Molchanovka Subsuite – Late Molchanovka time).

To indicate the time of formation of sequence, member, bed and its modifications, marker horizons, the following phase is used: "time of deposition... sequence (member, beds, etc.).

Chapter VI

MORPHOLITHOSTRATIGRAPHIC UNITS

Article VI.1. Morpholithostratigraphic unit is an assemblage of rocks united by lithologic or facies-morphologic features that allow determining stratigraphic and spatial position of the unit. It is denoted by informal term.

Morpholithostratigraphic units are used as additional ones to local stratons.

Article VI.2. The following morpholithostratigraphic units are recognized: organogenic massif, olistostrome (gravitational), wedge form, and stratogen. The recommended definitions of the units are based on practice of their usage and names by traditions.

Article VI.3. Organogenic massifs are long evolving organogenic buildings characterized by a complicated structure and great thickness (hundreds of meters), such as reefs, reefoids, biohermal and biostromal massifs. They are isometrically convex or lenticular in form, composed by massive carbonate rocks lacking sedimentational bedding, and occur among stratified deposits as isolated discrete bodies or are laterally grouped into extended ridges, chains, and belts. They may noticeably exceed in thickness the adjacent coeval stratified deposits. Surfaces of boundaries with enclosing deposits are sharp and steeply inclined, the boundaries are sharply diachronous. Relative age of organogenic massif is defined by its full stratigraphic scope. Large organogenic massifs are shown in maps as independent stratons.

Note. Small and thin organogenic buildings (bioherms, biostromes), which do not disturb the stratigraphic succession of enclosing bedded deposits and occur within their stratigraphic scope, are included into local stratons.

Article VI.4. Olistostromes (gravitational) are chaotic associations of rocks (mixtites) consisting of heteroclastic and frequently different-aged materials (olistoliths) sunken into relatively finely clastic, structureless, weakly or non-stratified mass (matrix) of different composition than olistoliths. They have commonly bed- or lens-like shape and sharp boundaries both stratigraphically and laterally.

Olistostromes may be referred to local stratons or, if mappable, established as independent stratigraphic units.

Relative age of olistostrome is defined by paleontological content and/or isotope date for the matrix with regard to ages of the olistoliths and enclosing deposits.

Article VI.5. Wedge form is a wedge-shaped (lenticular) body with distinct primarily inclined beds, composed of clastic rocks and accumulated on slopes of paleobasin during a single cycle of sea level fluctuations (sequence). Wedge forms change successively each other and have younger ages as they recede from source areas toward the basin center. Stratigraphic scope of a wedge form is determined by the entire time interval of its deposition.

Article VI.6. Stratogen is an assemblage of the Quaternary (and, probably, Neogene) deposits distinguished by belonging to a particular genetic type (alluvial, glacial, eolian, and other) or combination of types and occupying specific stratigraphic position (in a section). The formation features are lithological composition, regime of occurrence, and geomorphologic peculiarities.

Note. Landscape-climate dependence of the genesis of the Quaternary deposits allows correlation of local stratogen sequence to regional climatostratigraphic subdivisions (Ch. VIII).

Article VI.7. Organogenic massifs and their groups as well as extended biostromes constituting continuous marker horizons are given the geographic names.

Article VI.8. Olistostorme taken as an independent unit is named after the geographic object near which its typical section is located. Olistostrome incorporated into a local straton is given its name. Several olistostromes within a local straton are numbered from the base upward the section.

Article VI.9. Name of wedge form is recommended to derive from the geographic object in the territory where the wedge form is most fully represented (is most complete) with addition of the WF index. Numerical and literal symbols may be used as well.

Article VI.10. Name of a stratogen is formed from the genetic type (types) of the deposits and enclosing local or climatostratigraphic subdivision, or geomorphological unit.

Recommendation 9A. Names after geomorphological units are recommended to change into geographic names where possible.

Article VI.11. To indicate the time of formation of organogenic massif, olistostrome, wedge form, and stratogen, the following phrase is used "time of deposition... organogenic massif (olistostrome, etc.)".

Chapter VII

BIOSTRATIGRAPHIC UNITS

§ 1. Definitions. Kinds of biostratigraphic zones

Article VII.1. Biostratigraphic units are bodies of rock strata that are characterized by contained fossils. Their boundaries are defined by evolutionary changes of individual taxa, changes in faunal (floral) assemblages or ecological associations. Their stratigraphic boundaries are placed at levels of changes of characteristic taxa or faunal (floral) assemblages as well as at datum planes.

Article VII.2. The main biostratigraphic unit is biostratigraphic zone, which may be divided into subzones constituting all together a full stratigraphic scope of the zone. Additional biostratigraphic units are beds with fauna (flora) and datum planes.

Article VII.3. Biostratigraphic zone is an assemblage of beds characterized by a single taxon or an assemblage of fossils (zonal assemblage) that are different from those of the overlying and underlying beds. Its lower and upper boundaries are established by the biostratigraphic method.

Zonal assemblages of adjacent biostratigraphic zones in a section should be contiguous and/or contain successive paleontological taxa or reflect ecological changes.

The contiguity means the absence of breaks in the succession of biozones, i. e., the absence of stratigraphic interval without given group of fossils and interruption of (continuous) sedimentation. Succession takes place where there is a continuous succession of phylozones in the continuous section.

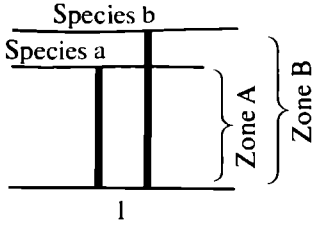
Geographic extent of biostratigraphic zone is determined by distribution of the zonal fossil assemblage.

Article VII.4. Different kinds of biostratigraphic zones (see the figure *1–6*) may be distinguished by paleontological and stratigraphic criteria. The following kinds of zones are in common use:

a) taxon-range zone (biozone) is an assemblage of beds representing the total stratigraphic spreading of a paleontological taxon, most frequently species. Biozone corresponding to the total stratigraphic extent of a genus is genozone (*1*);

Biostratigraphic zones

1. Taxon-range zone; *2.* Variants of concurrent-range zone; *3.* Variants of phylozone (*a* – phylozones of successive species, *b* – phylozones based on species divergence); *4.* Variants of interval-zone (*a* – beds between the levels of the first occurrences of two taxa, *b* – beds between the levels of the last occurrences of two taxa); *5.* Acmezone (epibole); *6.* Assemblage-zone and its variation – ecozone



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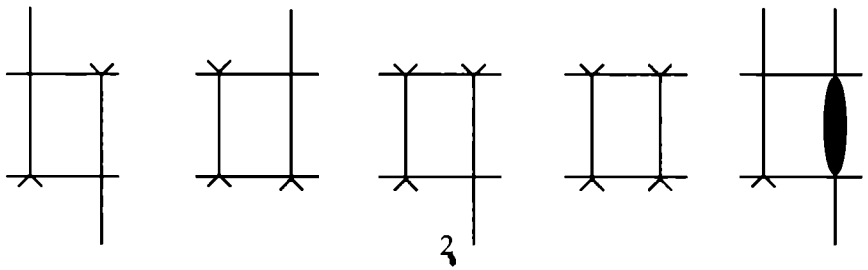
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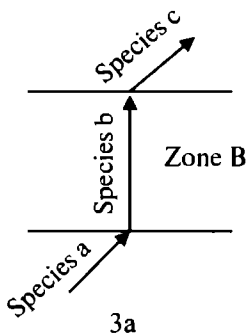

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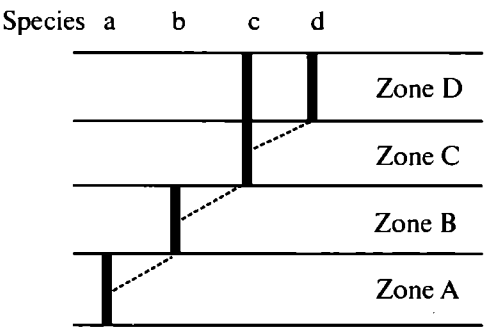

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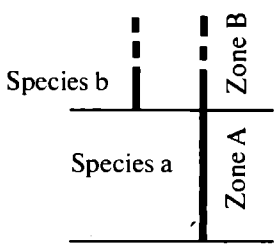

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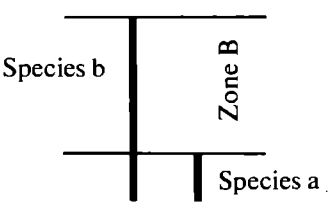

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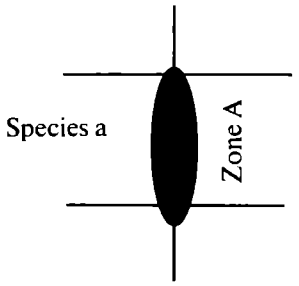

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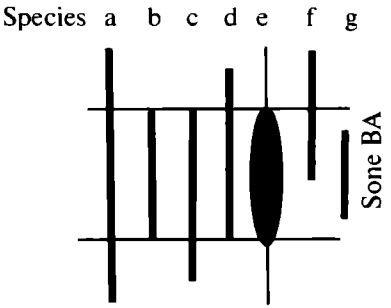

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b) concurrent-range zone represents beds corresponding to coincident parts of the range zones of two specified taxa the biozones of which may be different (*2*);

c) phylozone are beds containing a taxon (taxa) representing a segment of a specific phylogenetic lineage or of an evolutionary trend (*3a, 3b*), defined above and below by changes in features of the trend;

d) interval-zone is beds between levels of the first occurrences of characteristic taxa (usually index-species) of the given and overlying zones (*4a*). Within the continuous succession of strata, the interval zones may be also represented by beds bounded by levels of the last occurrences of characteristic taxa of the underlying and given zones (*4b*).

e) acme-zone (epibole) are beds characterized by maximum abundance or frequency of occurrence of a taxon (*5*);

f) assemblage-zone is a group of beds characterized by an assemblage of three or more taxa, which is different from assemblages of underlying and overlying beds (6). The assemblage may include fossils belonging to different groups of a single taxonomic rank or to different ranks;

g) ecozone is a variation of assemblage-zone. It represents beds containing an assemblage of fossils reflecting their lifetime ecological association or taphonomic character of oryctocoenosis. Quantitative ratio of taxa in the assemblage should be indicated.

Article VII.5. In geographic extent, biostratigraphic zones are classified as local and provincial assemblage-zones.

Article VII.6. Local zone is a biostratigraphic zone the lateral extent of which determines boundaries of a paleobiogeographic region or its part. It is based on zonal faunal (floral) assemblage or a taxon

characteristic, as a rule, of specific facies-ecological setting of the corresponding part of the sedimentation basin.

Article VII.7. Provincial zone (lone) is a biostratigraphic zone the lateral extent of which determines boundaries of a paleobiogeographic province or area, which frequently corresponds to a sedimentation basin.

In case paleobiogeographic regions (and other smaller units) with local zones were distinguished in a paleobiographic province (area) the provincial zonal assemblage is constituted by the species of local assemblages occurring throughout the given province (area) or its larger part.

Provincial zones (lones) are used for correlation of local stratigraphic units and establishment (substantiation) of regional units, i. e., horizons. They may form the total stratigraphic scope of a horizon (stratohorizon) (Table 1).

Article VII.8. Assemblage-zone, ecozone, and concurrent zone should be defined in stratotypes. For other kinds of zones, it is desirable to indicate either the section where a zone was established or collection of zonal biofossils with index-species stored in a museum or monographically described.

Article VII.9. Biostratigraphic zones based on different groups of organisms are independent. A coincidence of stratigraphic scopes of the zones based on different groups (taxa) cannot be a reason for abandoning any of the zones.

Article VII.10. Beds with fauna (flora) are an additional biostratigraphic unit. They are strata containing or composed by fossils but have insufficient characteristics for biostratigraphic zones. Scarce or absent fossils of these beds occur in the underlying and overlying deposits.

§ 2. Rules of description and naming

Article VII.11. When describing a new biostratigraphic unit, the following data should be included: a) name given in accordance with the Code and the zone type; b) synonyms (if present); c) composition of a fossil complex with specification of characteristic species and genera (zonal assemblage); d) place of storage and number of collection of fossils constituting the zonal assemblage, and (or) reference to the publication, in which this assemblage is described; e) stratotype location, its description or a reference to the description publication;

f) boundaries substantiation; g) position in the stratigraphic scheme of the district; h) possible correlation with biostratigraphic zones of the adjacent territories; i) geological age (correlation with units of the General stratigraphic scale, preferably with chronozones).

Article VII.12. Name of biostratigraphic zone is formed from the name of one or two-three index-species (index-genera) without indicating the author and date of taxon identification. Subzone name is formed in the same way. Interval-zone name is formed from the name of species, the occurrence of which establishes the lower boundary of the zone (Figure 4), or from the name of genus, the extinction of which determines its upper boundary (Figure 6). Names of genera and species are printed in Italics.

Note. Species (genera) non valid in interpretation of rules of the International Code of Zoological Nomenclature (1999) and International Code of Botanic Nomenclature (2000) should not be used when naming a biostratigraphic zone.

Terms relating to classification of zones after paleobiogeographic criterion (local and provincial) are usually included into the zone name, replacing the term "biostratigraphic".

Recommendation 12A. Terms determining the of kind biostratigraphic zone (Art. VII.4) are not included into its name, however, it is recommended to mention the zone type when characterizing it.

Recommendation 12B. Using of the specific name only is admissible if biostratigraphic zone is numerously mentioned in the text.

Article VII.13. Beds with fauna (flora) are named after the characteristic fossils represented by the Latin name of the corresponding taxon. Names of genera and species are printed in Italics.

Article VII.14. Geochronological equivalent of a biostratigraphic zone and subzone is denoted by the term "time" with addition of the zone (subzone) name.

To indicate the time, during which accumulation of sediments corresponding to the beds with fauna (flora) took place, following phrase is used "time of beds formation with...".

Chapter VIII

CLIMATOSTRATIGRAPHIC UNITS

§ 1. Definitions. Taxonomic units

Article VIII.1. Climatostratigraphic units are bodies of rocks the features of which (lithologic composition and fossil assemblages) are determined by periodic climate changes.

Climatostratigraphic units are established in the Quaternary and Neogene deposits and, possibly, in the older ones.

Article VIII.2. Boundaries of climatostratigraphic units are levels of paleoclimatic changes, which are manifested as alterations of lithologic composition, fossil associations (climatic indicators), geochemical parameters, sedimentational or diagenetic structures, etc.

Article VIII.3. Climatostratigraphic criteria are applied to establish the finest units of the General stratigraphic scale, i. e., division, link, and step (steps are based only on these criteria) and regional climatostratigraphic units.

Taxonomic terms for regional units are climatolith and stadial.

§ 2. Regional climatostratigraphic units

Article VIII.4. Climatolith is the main regional climatostratigraphic unit. It is a body of rocks formed during one climatic semirhythm, i. e., intensive cooling (cryomer) or warming (thermomer), in a region. It corresponds to glacial and interglacial periods in the middle latitudes and to periods of humid (pluvial) or arid climate in the tropical belt.

As a rule, climatolith corresponds to a step of the General stratigraphic scale and to a regional horizon of the upper part of the section of the Quaternary system.

Two adjacent climatoliths embracing a climatic rhythm (warming + cooling; arid + pluvial) may be established as an additional unit, i. e., superhorizon in the regional scheme or climatorhythm.

Climatolith should be defined in stratotype which may represent an areal stratotype.

Geochronological equivalents of climatolith are cryochron and thermochron.

Article VIII.5. Stadial is a regional climatostratigraphic unit next in rank below a climatolith. It is a body of rocks formed during short-time climatic fluctuations in the region: stages of glaciation and interstadials within cryomers, climatic optima, intermediate cooling within thermomers, and so on. Terms "cryostadial" and "thermostadial" are used to indicate specific climatic regimes. As a rule, stadial corresponds to regional subhorizon of the Quaternary deposits.

Stadial should be defined in a stratotype, which may represent an areal stratotype.

Geochronologic equivalent of stadial is stadija.

§ 3. Rules of description and naming

Article VIII.6. Description of a new regional climatostratigraphic unit should include the data provided for the main regional units (Art. IV.7).

Article VIII.7. Climatolith and stadial are named after geological objects in the stratotype area. In this case, denotation of the climatic mode character is added to the stadial name.

Article VIII.8. To indicate the geochronological equivalents of regional climatostratigraphic units, names of corresponding climatoliths and stadials are used.

Chapter IX

MAGNETOSTRATIGRAPHIC UNITS

§ 1. Definitions

Article IX.1. Magnetostratigraphic units are assemblages of rocks in their original succession, which are unified by magnetic properties distinctive from overlying and underlying beds.

Magnetostratigraphic units are classified into magnetostratigraphic polarity units and magnetic units according to what they are based on.

Article IX.2. Magnetopolarity (paleomagnetic) units are based on magnetic parameters of rocks indicating changes in the geomagnetic

field in time: reversals in the polarity (inversions, excursions), field intensity, coordinates of paleomagnetic poles, etc. The most significant property, which serves as a base for establishment, is polarity of the geomagnetic field. Magnetopolarity units are divided into general, regional and local.

Magnetic units are not based on alterations in the geomagnetic field. They are established by a combination of measurable magnetic properties (magnetic susceptibility, remnant magnetization, saturation and others). Magnetic units are regional and local ones.

§ 2. Magnetopolarity units

Article IX.3. Magnetopolarity units is a magnetopolarity zone (magnetozone, polarity zone) that is a body of rocks in their original (ancient) succession, which are unified by magnetic polarity which allows them to be differentiated from overlying and underlying beds.

Magnetic polarity of geological bodies is defined by the original component of their natural remnant magnetization coincident with the magnetic field polarity.

Article IX.4. Polarity zones are established proceeding from the dipole-field-pole position.

N o t e. Polarity coinciding with the polarity of the present geomagnetic field is *normal* and denoted by the Latin N or n; polarity opposing the present geomagnetic filed is *reversed* and denoted by the Latin R or r. *Varying* (mixed, alternating in the sequence) polarity is denoted by a combination of letters with regard to the equivalence of polarities or domination of any of them (NR, Nr, Rn). *Abnormal* polarity (corresponding to a noticeable inclination of the field direction from the field direction of normal and reversed polarity) is denoted by the mentioned letters with the letter *a* before them.

Article IX.5. Magnetostratigraphic polarity scale is built by means of correlation of the key magnetostratigraphic sections to subdivisions of the General stratigraphic scale (Table 1).

Article IX.6. Polarity-based identification of a general stratigraphic unit is a succession of magnetozones (magnetopolarity column) in the stratotype section of the unit. The standard column should reflect every successive change of magnetic polarity within the scope of a stratigraphic unit and at its boundaries. If the stratotype does not provide enough paleomegnetic information, the standard column should be built by using other representative sections of the unit.

Article IX.7. On the base of the standard magnetic-polarity column for the general stratigraphic unit, stratotypes of constituent

magnetozones are designated. Magnetozone stratotype should also include boundary stratotypes, i. e., stratotypes of inversion levels.

Article IX.8. The lower and upper boundaries of magnetozones are defined by inversion transitions (reversals), which are represented by thin beds marking levels of field polarity changes (geomagnetic inversions) in the stratigraphic section. These boundaries are called inversion (reversal) (marker) levels. If the inversion transition (reversal) embraces a substantial interval of section, the term "polarity-transition zone" ("transition zone") should be used. The inversion levels and levels corresponding to finer elements of temporal structure of the geomagnetic field (inversions, excursions, episodes, abnormal inclinations, etc.) may be used as reference levels within magnetozones.

Article IX.9. Magnetostratigraphic unit (magnetozone) is ranked according to duration and significance of a corresponding interval of the history of the geomagnetic field. Empirically, the rank is defined by stratigraphic scope of deposits forming the unit or by isotope-geochronometric data.

Article IX.10. Magnetopolarity units are isochronous worldwide by nature but showing slight individuality. Therefore, their identification requires obtaining data by any other stratigraphic and isotope methods as well as characteristics of the magnetic units (Art. IX.2).

§ 3. General magnetopolarity units. Taxonomic units. Rules of description and naming

Article IX.11. The taxonomic scale of general magnetopolarity units (magnetozones) consists of the following units corresponding to the taxonomic units of the magnetochronological scale.

Magnetopolarity units	Magnetochronological polarity units and their approximate duration, Ma	
Megazone	Megachron	>100
Hyperzone	Hyperchron	100–30
Superzone	Superchron	30–5
Orthozone	Orthochron	5–0.5
Subzone	Subchron	0.5–0.01
Microzone	Microchron	< 0.01

Rank of the general magnetostratigraphic polarity units is defined conventionally with regard to scopes of the corresponding general stratigraphic units.

N o t e. At present, these terms may be applied to the magnetostratigraphic polarity units of the Phanerozoic and Vendian only. Larger-rank taxa, megazone and hyperzone, may be used for the Riphean and Vendian.

Because of a specific evolution of the geomagnetic field, some disturbance of succession and subordination of magnetostratigraphic polarity units may occur. Particularly, there are hyperzones without subordinate superzones and orthozones; some subzones and orthozones may be parts of hyperzones and superzones without intermediate subdivisions.

The use of the terms "epoch", "episode", "event", and "interval" applied previously to geochronological equivalents of the magnetostratigraphic polarity units is not recommended.

Article IX.12. Megazone is a magnetostratigraphic polarity unit that fixes the most substantial stages of evolution of the geomagnetic field. It is comparable in scope with erathem of the Phanerozoic.

Article IX.13. Hyperzone is a magnetostratigraphic polarity unit which is characterized by a specific distribution of magnetic polarity in large intervals of the section. It is comparable with system. Hyperzone is given a geographic name with indication of polarity and stratigraphic position.

Article IX.14. Superzone is a magnetostratigraphic polarity unit which is established on the same base as hyperzone. It has a less stratigraphic scope comparable with several stages or single series. Superzone is given a geographic name with indication of polarity and stratigraphic position.

Article IX.15. Orthozone is the main unit of the magnetostratigraphic polarity scale. It represents a monopolar interval or a combination of different-polarity subzones. Most frequently, it is an interval of dominating polarity with some reference subzones of opposite polarity. In scope, it is comparable with the entire stage or its part. Orthozones are numbered separately after polarity types. Well established names for the worldwide recognized orthozones should not be replaced.

N o t e. If the orthozone embraces parts of the adjacent stages, it is given a double stratigraphic index and number of the lower stage.

Article IX.16. Subzone is an elementary unit of the magnetostratigraphic polarity scale. It represents a relatively thin monopolar interval. Subzones are numbered from the lower to the upper one within the orthozone and given a polarity index. Well established geographic names may be retained.

Double and triple letter indices are used to designate subzones. The first letter (n, r, a) indicates the subzone polarity, and

the rest letters (N, NR, R, Rn, Nr, etc.) indicate the enclosing orthozone.

Article IX.17. Microzone is the smallest unit of the magnetostratigraphic polarity scale. It fixes elements of the fine temporal structure of the geomagnetic field, such as excursions, abnormal inclinations and others. Microzones may serve as reference levels inside higher rank units. They are numbered from the lower to the upper ones within the subzone or orthozone with indication of polarity. Well established geographic names may be retained. Similarly to subzones, microzones are given indices.

Article IX.18. Description of a magnetozone should include the following data: rank; name (usually geographic) or number (from the bottom upwards); general characteristics (dominating polarity, specific inversion regime); stratigraphic scope and subordinate magnetostratigraphic polarity subdivisions; relations to the general and regional stratigraphic units.

§ 4. Regional and local magnetostratigraphic units

Article IX.19. Regional and local magnetostratigraphic units are magnetopolarity and magnetic units that are recognizable within specific regions or structural-facies zones. Regardless of principle of substantiation, regional and local units are established on the base of stratotypes of regional and local stratons.

Article IX.20. Regional and local zones of magnetic polarity are ranked according to their relations to the units of the General stratigraphic scale. In case these relations have not been specified, the term "polarity zone" ("polarity subzone") with the name (proper or geographic) of orthozone or subzone is used.

Article IX.21. Name of regional and local magnetic polarity zone consists of an age index, indication of polarity, and abridged geographic name of the main straton. The units are numbered from the bottom upwards.

Article IX.22. Magnetic units, i. e., magnetozones, which were established by measurable magnetic properties of rocks unrelated to the original (ancient) geomagnetic field, are not named but briefly characterized.

Article IX.23. Identification and correlation of regional and local magnetostratigraphic units allow compilation of magnetistratigraphic charts, which are usually incorporated into regional stratigraphic charts (Table 1).

Chapter X

SEISMOSTRATIGRAPHIC UNITS

§ 1. Definitions. Main units

Article X.1. Seismostratigraphic units are geological bodies separated in a section by seismometric boundaries. The latter are represented by two types, i. e., seismohorizons and substantive boundaries.

Article X.2. Seismohorizon is a surface of formation of laterally persistent (coherent) seismic signal corresponding to a wave of certain type (reflected, refracted, changed). Seismohorizons may correspond (coincide with) to boundaries of stratigraphic units (changes in depositional environments) and transgressive, regressive or erosional unconformity surfaces. Lateral alterations of wave-forming (?) interval of a geological section (changes in lithological composition, inner structure, and thickness) may cause branching or jointing of coherent seismic signals and corresponding seismohorizons.

Article X.3. Seismometric boundaries are defined by substantional (matter-structure) characters of geological bodies. The boundaries correspond to sharp and/or gradient discontinuities in the field of acoustic parameters, such as middle-interval velocity of progradation of elastic waves of different types and their relation, absorption properties of rocks, peculiarities of seismic records in some intervals of seismic section.

Substantional seismometric boundaries may coincide or may not coincide with seismohorizons.

Article X.4. Seismostratigraphic units may have seismometric boundaries of the same type (e. g., between reflecting seismohorizons) or every unit boundary (top or base) may be controlled laterally by one-type seismometric boundary (for example, top is defined by reflecting seismohorizon, whereas base, by refracting seismohorizon).

Important characters of a seismostratigraphic unit are its spatial form and configuration of seismic records which reflects certain depositional environments. The form of seismostratigraphic units may vary from flat-parallel to relatively steep lenticular (clineformed).

Identification of seismostratigraphic units as stratigraphic units (but not tectonic or others) should be made by direct geological methods.

Article X.5. Seismostratigraphic units may be regional (extending over a whole depositional paleobasin or its part) and local.

§ 2. Regional seismostratigraphic units

Article X.6. Main regional seismostratigraphic unit is seismocomplex.

Article X.7. Seismocomplex is a body of rocks demonstrating uniform inner structure (predominantly conformable deposition, one-type dislocations, etc.) and bounded by regionally persistant horizons, which commonly correspond to the surfaces of regional disconformities.

Seismocomplex may be subdivided into subcomplex by persistent intermediate seismohorizons (Table 2).

Article X.8. Seismohorizons bounding a seismocomplex (subcomplex) are denoted by literal or numerical indices.

If seismohorizon branches due to increased thickness of the section interval or some other factor, the index of seismohorizon is preserved at its upper or lower branch.

If main (most persistent) seismohorizon branches regularly along the lateral, which reflects transgressive-regressive or erosional processes, the branches should be denoted by the same literal index as the main seismohorison with numerical index increasing upward the section.

Article X.9. Seismocomplex is denoted by a literal or numerical index that distinguish it from the main seismohorizon. If the seismosequence coincides (in scope and extension) with certain stratigraphic unit, it may be given its name.

§ 3. Local seismostratigraphic units

Article X.10. Local seismostratigraphic units are bodies of rocks characterized by a certain seismic (acoustic) feature or a combination of features. They may have seismostratigraphic boundaries of any type (reflection surface, changes in seismic records, etc.) which can be extended in separate structural-facial zone or depositional paleobasin.

Local seismostratigraphic units may be also represented by geological bodies that are pronounced in seismic sections as anomalies of seismic impulses corresponding to seismohorizons (dull spot, bright spot, etc.).

Local seismostratigraphic units may not necessarily form a continuous section.

Article X.11. Names of local seismostratigraphic units are informal stratigraphic terms with addition of *seismo* (seismobody, seismomember etc.). Names of seismounits may include indexes of bounding seismohorzions, indicators of depth (or time) interval of registration in the seismic section, seismic characteristics of bodies and name of local straton corresponding to this seismounit in structural-facial zone or areas of works (Table 2).

Article X.12. Regional and local seismostratigraphic units serve as a base for a regional seismostratigraphic chart (Table 2); some parts of the chart may be incorporated into the corresponding division of a regional stratigraphic chart.

Chapter XI

GENERAL RULES OF ESTABLISHMENT AND NOMENCLATURE OF VALID STRATIGRAPHIC UNITS

§ 1. Validity of stratigraphic units

Article XI.1. Newly established general stratigraphic and biostratigraphic units (including those based on data from underground works and drilling) are valid only if their establishment and description are made in accordance with the present Code.

Article XI.2. Formal approval should be received:

a) for the general stratigraphic units, from the International Commission on Stratigraphy (ICS) of the International Union of Geological Sciences (IUGS) and its subcommissions. In Russia, they should be approved by the plenary session or enlarged Bureau of the Interdepartmental Stratigraphic Committee (ISC) on presentation of its corresponding commissions on systems and Commission on Stratigraphic Classification, Terminology and Nomenclature;

b) for the regional stratigraphic units, from the plenary session or enlarged Bureau of the Interdepartmental Stratigraphic Committee on presentation of Regional Interdepartmental Stratigraphic Commission (RISC) supported by corresponding commissions on systems and Commission on Stratigraphic Classification, Terminology and Nomenclature;

c) for the local stratigraphic units used in regional stratigraphic chart, from the Regional Interdepartmental Stratigraphic Commission.

The stratons approved by the ICS are binding for all legends of the State Geological Maps, other geological maps, correlation charts to be considered by the ICS and its commission and reference-books.

Article XI.3. Previously established stratigraphic unit is valid if its published description met the following requirements:

– before 1966: it included name, rank, geological age or position in the section of the region, geographic extent, general character;

– after 1966: it complied with the brochure "Stratigraphic Classification, Terminology and Nomenclature" (1965);

– after 1977: it complied with the Stratigraphic Code of the USSR (1977, 1992);

– after 2006: it complies with the present Code.

§ 2. General rules of stratigraphic nomenclature

Article XI.4. Stratigraphic nomenclature is independent of other nomenclatures in term of unit names. A name of stratigraphic unit cannot be rejected for being identical to the name of a non-stratigraphic unit (rock, mineral, animal, plant and so on).

Article XI.5. Every stratigraphic unit of any category and rank may have only one valid name.

Article XI.6. Full stratigraphic name should consist of two parts: (1) stratigraphic term (a word to be defined) designating its taxonomic rank and category of the stratigraphic unit and (2) proper name (a word defining the term).

Article XI.7. Name of a new stratigraphic unit should be other than names of other stratigraphic units of the same category regardless rank, geological age, and geographic extent.

N o t e. Articles XI.8–XI.11 is strice off.

§ 3. Rules of publication and authorship

Article XI.12. Description and the name of a newly established stratigraphic unit should be published in accordance with the present Code. The first publication of the name should be accompanied by explanation of its origin.

Description and the name are published if they are used in theses of dissertations, legends of sets of sheets of the State Geological Maps and explanatory notes, which were approved by the Scientific Editorial Board * as well as in deposited manuscripts providing that the abstract of the manuscript is published in the referatic journal "Geologiya".

N o t e. Names and descriptions of a stratigraphic unit cannot be taken as published if they are used in manuscripts, oral communications and reports at conferences as well as in geological maps, stratigraphic schemes, columns, profiles which are not accompanied by the text with necessary explanations.

Article XI.13. Establishment of a stratigraphic unit is dated by a year when the edition with its name and description was issued, no matter whether the name or/and description were previously contained in the manuscript. The date is indicated in the title-page of the edition.

Article XI.14. The author of a stratigraphic unit is a person or a group who was the first to publish its valid name and description in accordance with the present Code.

Article XI.15. In case the author of a new stratigraphic unit cannot publish its name and description for some reasons, his authorship should be indicated when these data are published for the first time by other persons.

Article XI.16. The author's name is not a part of the name of the stratigraphic unit. It is indicated in stratigraphic monographs, glossaries, and reference-books at the first mentioning of the unit.

Article XI.17. The authorship is retained when the unit is lowered or elevated in rank or the additional unit becomes the main one under the same name. However, if the category of the unit is changed, the unit is considered to be newly established and a person who has well substantiated the change becomes its author.

* Scientific Editorial Board at VSEGEI of the Federal Agency on Mineral Resources of the Russian Federation on acceptance for publication of maps of geological content.

Chapter XII

RIGHT OF PRIORITY

Article XII.1. Right of priority ensures that the original name and stratigraphic scope of valid stratigraphic units should be retained as determined by the author but is only a subject of refining in future.

Article XII.2. The right of priority spreads to (covers) the basic stratigraphic units.

Article XII.3. The right of priority has been extended to the general stratigraphic units since 1881 when the taxonomic systems of stratigraphic and geochronological units were approved at the second session of the International Geological Congress. In the Russian Federation, the priority has been extended to other categories of the general stratigraphic units since 1956 when the "Stratigraphic Glossary of the USSR" and the provisional code "Stratigraphic classification and terminology" were published.

Article XII.4. The original name of a valid stratigraphic unit is the first published one.

N o t e. The original spelling of the name should not be changed excluding misprints and orthographic errors.

The original name of incorrect spelling should not be replaced but improved. When the improved name is published for the first time, the original name and reasons of improving (misprint or orthographic error) should be indicated.

Article XII.5. The original name of a valid stratigraphic unit should not be abandoned or replaced even by its author only if another name is more preferable or better known. The names of biostratigraphic units are changed after obtaining new data on stratigraphic extent of a zonal assemblage (essential change of the original scope of a zone), alteration of name of the index-species, ascertaining of the fact that the index-species is invalid or unfit because of its inherence in (it is uncharacteristic of) particular beds.

Article XII.6. The stratigraphic name derived from the geographic object should not be replaced if the object in or outside the Russian Federation was given another name. In this case the change is made only by a special decision of the plenary session or enlarged Bureau of the ISC.

Article XII.7. The original stratigraphic name is retained if age of the whole unit was altered as a result of further investigations.

Article XII.8. In case of changing the rank or category of the stratigraphic unit, the original name was retained if it complies with the taxonomic nomenclature for the new rank or category.

Article XII.9. If further investigations change a scope of the stratigraphic unit to such an extent that two or more new units of the same rank are established on its base, the original name should not be used for any of new units.

Article XII.10. The original name of the stratigraphic unit (except for biostratigraphic one) is retained if the unit was changed in no more than one third of its stratigraphic scope.

Article XII.11. In case of synonymy, the preference is given to the valid name that was published first.

Article XII.12. In case of homonymy, in accordance with requirements of Article XI.5, the name is reserved for one unit recognized as valid. For other stratigraphic units it is necessary to choose a new name in case of the lack of appropriate arguments for retaining previous name as an exception.

Recommendation 12A. In case of finding a homonym to be replaced, it is necessary, observing the rules of professional ethics, to notify the author and give him an opportunity to propose a new name.

Article XII.13. In case of finding any inconsistency of some common name to the requirements of this Code, it is necessary to notify about this fact the ISC commission responsible for the relevant system and to follow its resolution in the future.

Article XII.14. Names that do not quite meet the rules of stratigraphic nomenclature but widely used in geological practice are retained as an exception.

Article XII.15. Non-valid stratigraphic names should be abandoned if they are retained as exceptions.

Lists of the names of general stratigraphic units, which were abandoned or retained as exceptions, are approved by the ISC Bureau, those of regional and local units are approved by resolutions of interdepartmental regional stratigraphic conferences or the corresponding RISC and subsequently published.

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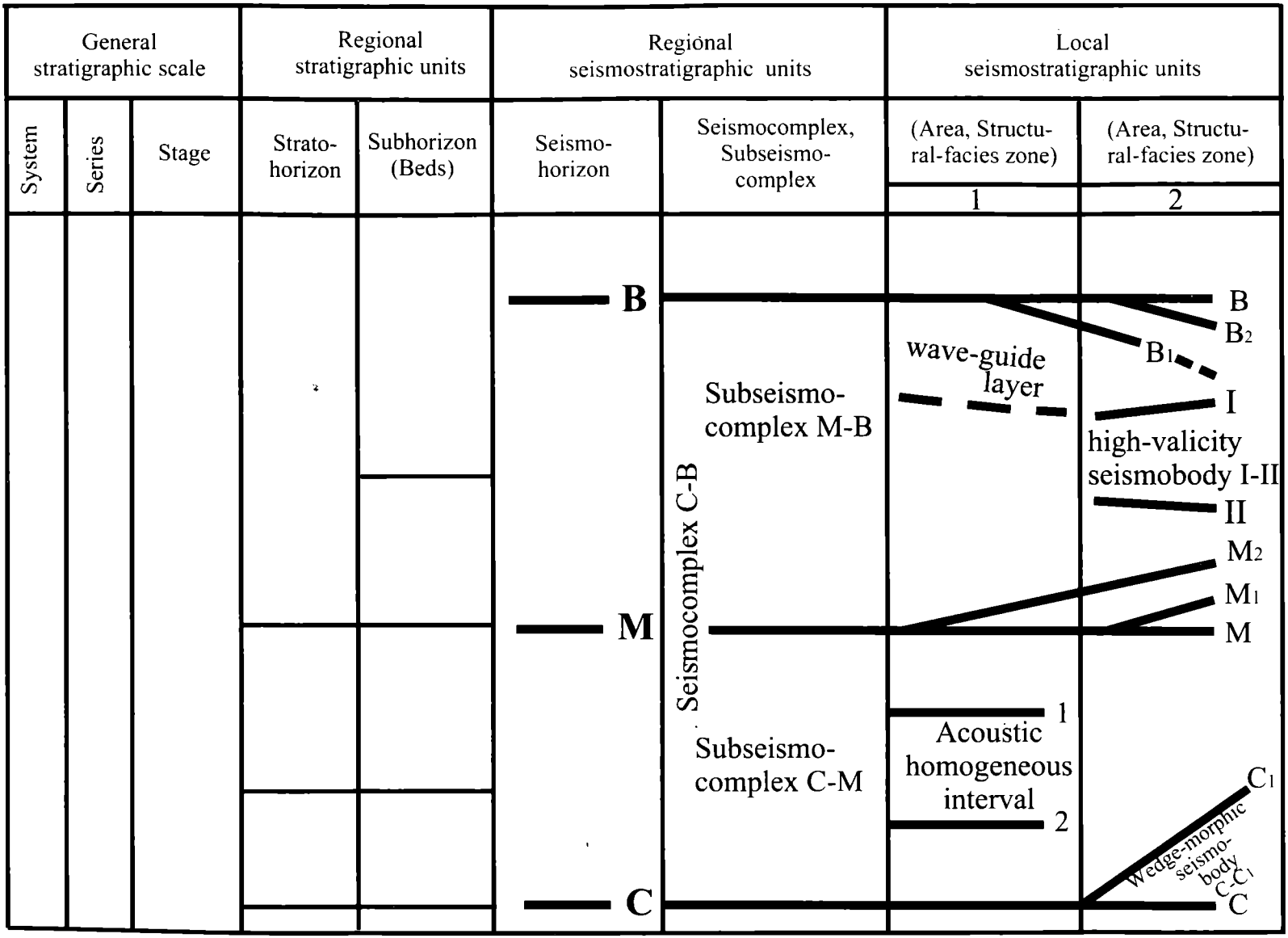
Regional seismostratigraphic chart of ..... (age) deposits of ..... (region)



(Date of the statement of chart from Interdepartmental Stratigraphic Committee of Russia)

Table 1

Regional Stratigraphic chart of …….. (age) deposits of ……. (region)

(Date of preparation of chart)

General stratigraphic scale				Magnetostratigraphic scale					Regional stratigraphic units		Fossil assemblages of regional units			Regional magnetozones (MZ)	Correlation of local stratigraphic sections								Stratigraphic charts of adjacent regions	
System	Sreies	Stage (Substage)	Chronozone	Hiperzone	Superzone	Orthozone	Subzone	Magnetopolarity units	Strato-horizon	Beds with geo-graphical name	Provin-cial zone (lone)	Typical fossil assemblages, beds with fauna (flora)			(Area, Structural--facies zone)		(Area, Structural--facies zone)		(Area, Structural--facies zone)		(Area, Structural--facies zone)		(Region, author of charts, year)	
															Stratons	MZ	Stra-tons	MZ	Stratons		Stratons	MZ	Regional stratigraphic units	Regional MZ
															1		2		3		4			
														N_{12}				N_3				N_{12}		$N10$
														R_{10}		R_7		R_3				R_{11}		$R10$
														N_{11}		N_7		N_2				N_{11}		$N9$
																						R_{10}		$R9$
														R_9		R_6						N_{10}		$N8$

(Local stratigraphic units, integrated lithological and paleontological characteristics, thickness, radioisotopic age, if there are measurings)

Underlying deposits

(Systems or Series or Stages)

(Date of the statement of the chart from the Interdepartmental Stratigraphic Committee of Russia)