

M.sc Geology II nd semester paper- GT203- unit I (topic 1.4)

. Lithostratigraphic Units

A. Nature of Lithostratigraphic Units

Lithostratigraphic units are bodies of rocks, bedded or unbedded, that are defined and characterized on the basis of their lithologic properties and their stratigraphic relations. Lithostratigraphic units are the basic units of geologic mapping.

B. Definitions

1. Lithostratigraphy. The element of stratigraphy that deals with the description and nomenclature of the rocks of the Earth based on their lithology and their stratigraphic relations.

2. Lithostratigraphic classification. The organization of rock bodies into units on the basis of their lithologic properties and their stratigraphic relations.

3. Lithostratigraphic unit. A body of rocks that is defined and recognized on the basis of its lithologic properties or combination of lithologic properties and stratigraphic relations.

A lithostratigraphic unit may consist of sedimentary, or igneous, or metamorphic rocks.

Lithostratigraphic units are defined and recognized by observable physical features and not by their inferred age, the time span they represent, inferred geologic history, or manner of formation.

The geographic extent of a lithostratigraphic unit is controlled entirely by the continuity and extent of its diagnostic lithologic features.

C. Kinds of lithostratigraphic Units

1. Formal lithostratigraphic units The conventional hierarchy of formal lithostratigraphic terms is as follows:

Group - two or more formations

Formation - primary unit of lithostratigraphy

Member - named lithologic subdivision of a formation

Bed - named distinctive layer in a member or formation

Flow - smallest distinctive layer in a volcanic sequence

The component units of any higher rank unit in the hierarchy need not be everywhere the same.

2. Formation. The primary formal unit of lithostratigraphic classification.

Formations are the only formal lithostratigraphic units into which the stratigraphic column everywhere should be divided completely on the basis of lithology.

The contrast in lithology between formations required to justify their establishment varies with the complexity of the geology of a region and the detail needed for geologic mapping and to work out its geologic history.

No formation is considered justifiable and useful that cannot be delineated at the scale of geologic mapping practiced in the region. The thickness of formations may range from less than a meter to several thousand meters.

3. Member. The formal lithostratigraphic unit next in rank below a formation.

It possesses lithologic properties distinguishing it from adjacent parts of the formation.

No fixed standard is required for the extent and thickness of a member.

A formation need not be divided into members unless a useful purpose is thus served.

Some formations may be completely divided into members; others may have only certain parts designated as members.

A member may extend from one formation to another.

Specially shaped forms of members (or of formations) are lenses and tongues.

A lens is a lens-shaped body of rock of different lithology than the unit that encloses it.

A tongue is a projecting part of a lithostratigraphic unit extending out beyond its main body.

4. Bed. The smallest formal unit in the hierarchy of sedimentary lithostratigraphic units, e.g. a single stratum lithologically distinguishable from other layers above and below. Customarily only distinctive beds (key beds, marker beds) particularly useful for stratigraphic purposes are given proper names and considered formal lithostratigraphic units.

5. Flow. A discrete extrusive volcanic body distinguishable by texture, composition, or other objective criteria. The designation and naming of flows as formal lithostratigraphic units should be limited to those that are distinctive and widespread.

6. Group. A succession of two or more contiguous or associated formations with significant and diagnostic lithologic properties in common.

Formations need not be aggregated into groups unless doing so provides a useful means of simplifying stratigraphic classification in certain regions or certain intervals. Thickness of a stratigraphic succession is not a valid reason for defining a unit as a group rather than a formation. The component formations of a group need not be everywhere the same

7. Supergroup and subgroup. The term "supergroup" may be used for several associated groups or for associated groups and formations with significant lithologic properties in common

Exceptionally, a group may be divided into subgroups.

8. Complex. A lithostratigraphic unit composed of diverse types of any class or classes of rocks (sedimentary, igneous, metamorphic) and characterized by irregularly mixed lithology or by highly complicated structural relations.

9. Lithostratigraphic horizon (Lithohorizon). A surface of lithostratigraphic change, commonly the boundary of a lithostratigraphic unit, or a lithologically distinctive very thin marker bed within a lithostratigraphic unit.

10. Informal lithostratigraphic units. Lithostratigraphic units recognized in preliminary studies and not fully described and characterized are sometimes given names. Such names should be considered informal and should not be included in published documents.

nit merits a formal name it merits proper formal definition and description.

D. Procedures for Establishing Lithostratigraphic Units

1. Stratotypes and type localities as standard of definition.

Each formal lithostratigraphic unit should have a clear and precise definition or characterization.

The designation of a stratotype for a layered unit or a type locality for a non layered unit is essential.

Designation of auxiliary reference sections or additional type localities may be used to supplement the definition of a lithostratigraphic unit. Where a complete section of a unit does not crop out in an area, the lower and upper boundary-stratotypes at specific sections are designated.

2. Boundaries. Boundaries of lithostratigraphic units are placed at positions of lithologic change or arbitrarily within zones of vertical or lateral lithologic gradation or intertonguing. In subsurface work, because of caving in drill holes, it is best to define lithostratigraphic boundaries at the highest occurrence of a particular rock type rather than at the lowest.

Boundaries of lithostratigraphic units commonly cut across time surfaces, across the limits of fossil ranges, and across the boundaries of any other kind of stratigraphic units.

3. Unconformities and hiatuses. Stratigraphic sequences of similar lithologic composition but separated by regional unconformities or major hiatuses should be mapped as separate lithostratigraphic units.

Local or minor hiatuses, disconformities or unconformities within a sequence of similar lithologic composition should not be considered reason for recognition of more than one lithostratigraphic unit.

E. Procedures for Extending Lithostratigraphic Units-Lithostratigraphic Correlation

A lithostratigraphic unit and its boundaries are extended away from the type section or type locality only as far as the diagnostic lithologic properties on which the unit is based may be identified.

1. Use of indirect evidence for identification of units and their boundaries. Where lithologic identity is difficult to determine because of poor or no outcrops, a lithostratigraphic unit and its boundaries may be identified and correlated on the basis of indirect evidence: geomorphic expression, wire-line logs, seismic reflections, distinctive vegetation, etc.

2. Marker beds used as boundaries. The top or the base of a marker bed may be used as a boundary for a formal lithostratigraphic unit where the marker bed occurs at or near a recognizable vertical change in lithology.

F. Naming of Lithostratigraphic Units.

1. General. The name of lithostratigraphic units follows the general rules for naming stratigraphic units

In the case of lithostratigraphic units, a simple lithologic term indicating its dominant rock type may be used instead of the unit-term indicating its rank (group, formation, member, bed).

However, the use of the unit-term is preferable; and the use of both the lithologic term and the unit-term should be discouraged.

The terms "lower", "middle", and "upper" should not be used for formal subdivisions of lithostratigraphic units

2. Geographic component of name.

In the case of lateral changes in lithologic composition, change in the geographic term is desirable for important regional changes, but the indiscriminate proposal of new names for minor lithologic variations is undesirable.

3. Lithologic component of name. If a lithologic term is used in the name of a lithostratigraphic unit it should be a simple, generally accepted term that indicates the predominant lithology of the unit.

Compound, combined or lithogenetic terms should not be used.

4. Some special aspects of igneous and metamorphic rocks. Stratified volcanic rocks and bodies of metamorphic rocks that can be recognized as of sedimentary and/or extrusive volcanic origin can be treated as sedimentary lithostratigraphic units.

Nonlayered intrusive rocks and bodies of metamorphic rocks that are deformed and/or recrystallized so that their original layering and stratigraphic succession can no longer be ascertained require a somewhat different treatment.

As lithostratigraphic units, their name should be composed of an appropriate local geographic term combined with either a unit-term or a simple field lithologic term. However, since most geologists may agree that unit-terms such as "group", "formation", or "member" imply stratification and position within a stratified sequence, it is more appropriate to use simple field lithologic terms such as "granite", "gneiss", or "schist" for these nonlayered units.

Also appropriate is the use of the terms "complex", "melange", and "ophiolite".

On the other hand, the use of the term "suite" seems inadvisable. The term has been commonly used for associations of comagmatic intrusive igneous rock bodies of similar or related lithologies and close association in time, space, and origin.

The use of adjectival qualifiers such as "plutonic", "igneous", or "volcanic", though preferably minimized in the formal nomenclature of lithostratigraphic units, may be used when they help to clarify the nature of a unit, as for instance a complex, e.g., "igneous complex", "volcanic complex".

Adjectives used as nouns, such as "volcanics" or "metamorphics", preferably should be avoided even though they have been used widely.

The lithostratigraphic names of igneous and metamorphic rock bodies should not include terms that express form or structure such as "dike", "sill", "pluton", and "neck", or the more general term "intrusion". These terms do not indicate lithology, are not unit-terms in the lithostratigraphic hierarchy, and are not, therefore, lithostratigraphic terms.