University of Anbar

College of Science

Department of Applied Geology

Field Geology

Title of the lecture

Recording features of sedimentary rocks

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2022

Recording features of sedimentary rocks

Introduction:

Sedimentary rocks, particularly coarse - grained siliciclastic rocks, are rewarding to study in the field. This is because you can gain a lot of information about their mode of formation directly from field observations and start to make an interpretation (Figure 1). Some carbonate successions and fine - grained mudstones can, however, be tricky to interpret in the field and their study can benefit greatly from follow - up microscope work and/or geochemical analyses. Sedimentary rocks and the fossils they contain should always be considered together because fossils provide vital clues on the processes and environment of deposition of the sedimentary deposits. Fossils, for instance, can provide immediate clues on whether the rocks are marine or non - marine, were deposited over a long or short period of time, what conditions were like on the sea or lake floor, as well as, in many instances, providing an immediate relative dating method. There are a variety of specific reasons for collecting data from sedimentary deposits aside from the general ones of geological mapping or constructing a geological history for an area. These are to:

• Understand sedimentary processes and depositional environments.

• Understand the potential of a sedimentary basin or unit for hydrocarbon recovery or for water resources.

• Reconstruct past periods of environmental change, particularly climate and sea - level change.

• Understand and exploit sedimentary building materials and mineral deposits. Sedimentary rocks form important building materials.

• Refine the geological timescale. The more continuous nature of the sedimentary record compared with that of igneous and metamorphic rocks, together with its fossil content, makes it important for the construction of the geological timescale.

Siliciclastic rocks

For siliciclastic rocks the classification scheme depends on the grain size and the composition of the major grains, except for conglomerates and breccias where the clast shape is also important. The general siliciclastic classification process is illustrated in the following flowchart figure 1.

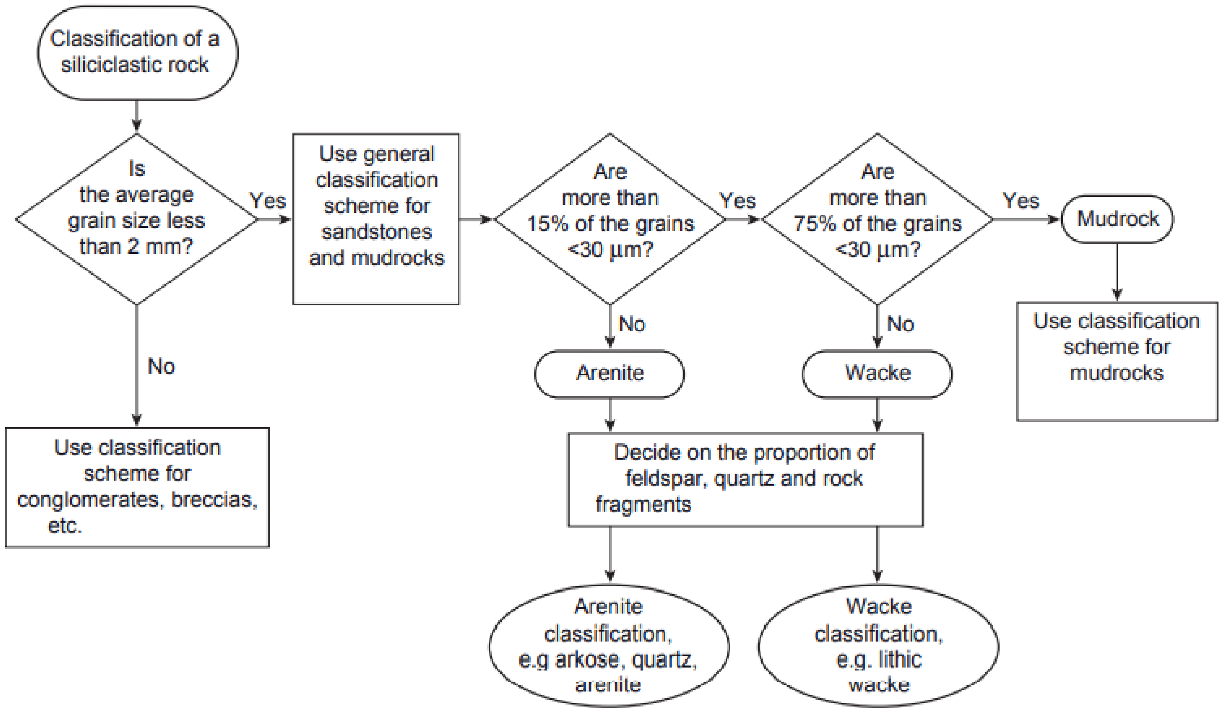

Figure 1 flowchart of siliciclastic rock classification

Mudrock

Fine - grained siliciclastic sedimentary rocks make up over 50% of the sedimentary rock record. The features listed below are particularly useful for mudrocks:

• **Color**: As for other sedimentary rocks this primarily reflects composition. Most marine mudrocks are various shades of grey. Mudrocks with a higher carbonate or silica content, or less organic matter, tend to be paler. Non - marine mudrocks are often red or green depending on the oxidation state of the iron; they can also be white and various yellows.

• **Fracture**: The fracture pattern also provides a clue to the composition and subtly changes with the composition. Mudrocks mainly composed of clay minerals have an even, blocky fracture. Increasing amounts of carbonate (e.g., marly clays and marlstones) tend to give the rock a conchoidal fracture pattern. Mudrocks with a high silica content are harder.

• **Fissility**: Mudrocks with a fissility (i.e., break into thin (millimetre - sized) layers) are termed shales. They can develop a fissility for two reasons: (1) laminae scale variation in composition; (2) compaction and weathering. Shales with compositional lamination often have a higher overall organic - carbon content and/or some coarser - grained material. Not all compositionally laminated mudrocks are fissile.

Conglomerates and breccias

Conglomerates and breccias can be classified according to clast type and matrix properties. In complete contrast to mudrocks a 'wide angle' view of these coarse - grained sedimentary deposits is required to obtain representative data because of the potential large - scale variation.

Carbonates

It is useful to look at both a weathered and a fresh surface of carbonate rocks. The carbonate grains tend to weather out making them easier to identify on weathered surfaces. There are two commonly used classification schemes for carbonates Folk and Dunham. In both cases it is necessary to decide first of all whether the grains are bound together organically (i.e., whether it is a bioherm (reef)) or not). The Folk classification scheme (Figure 2) is easier to use; it is based on the nature of the grains and whether these are within matrix or cement. The use of this classification scheme is illustrated by the following flowchart figure 3.

principal grain type	**limestone type**	
	cemented by sparite	micritic matrix
bioclasts	biosparite	biomicrite
ooids	oosparite	oomicrite
peloids	pelsparite	pelmicrite
intraclasts	intrasparite	intramicrite
limestone formed *in situ* (e.g. reef or stromatolite)= biolithite		
fenestral limestone (micrite with cavities) = dismicrite		

Figure 2 Folk scheme for the classification of limestones. (Modified after Folk 1962)

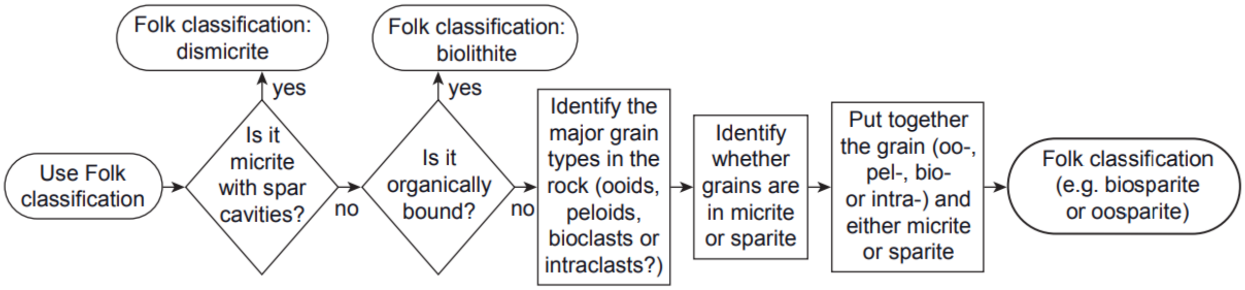

Figure 3 flowchart of Folk classification of carbonate

The other common types of carbonates are:

• **Dolomite**:

Dolomite has three fi eld characteristics that distinguish it from other carbonates: (1) it tends to be a pale yellowy - brown color; (2) it reacts only slowly with dilute hydrochloric acid; and (3) if ground between the teeth its texture is softer than that of limestone and similar to that of royal icing.

• **Siderite**: This is most easily distinguished by its distinctive yellow - red color (terracotta); it forms both bands and nodules, particularly in mudrock successions.

References

Angela L. Coe Tom W. Argles David A. Rothery Robert A. Spicer. 2010 GEOLOGICAL FIELD TECHNIQUES, Department of Earth and Environmental Sciences, The Open University, Walton Hall, Milton Keynes, UK