Mixed Siliciclastic-Carbonate Deposits: Scales and Heterogeneities*

D. Chiarella[1], S.G. Longhitano[2], and M. Tropeano[3]

Search and Discovery Article #51477 (2018)**
Posted April 9, 2017

*Adapted from extended abstract based on poster presentation given at AAPG/SEG International Conference and Exhibition, London, England, October 15-18, 2017

[1]Department of Earth Sciences, Royal Holloway University of London, UK (domenico.chiarella@rhul.ac.uk)
[2]Department of Sciences, University of Basilicata, Italy
[3]Dipartimento di Scienze della Terra e GeoAmbientali, University of Bari, Italy

Abstract

Mixed siliciclastic-carbonate deposits represent the result of the interaction between a siliciclastic sediments source and a carbonate factory. Mixing between the two heterolithic siliciclastic and carbonate fractions can occur at different scales, from bed (core-plug) to stratigraphic (seismic) scales, producing a high vertical and lateral lithological variability (Figure 1) (Chiarella et al., 2017).

In this study, we characterise mixed deposits according to the main geological factor typifying different types of mixing (allocyclic *versus* autocyclic). In particular, allocyclic and autocyclic factors operate at different scale of observations producing a (i) particles mixing where the two heterolithic fractions accumulate contemporaneously, and (ii) strata mixing resulting from the alternation of the two heterolithic fractions in time (e.g. Chiarella and Longhitano, 2012; Longhitano et al., 2014).

Characterisation of the type of mixing is important to better understand (i) the interaction between siliciclastic and carbonate particles and the sedimentary processes, (ii) birth and demise of the carbonate factory with respect to the siliciclastic dispersal mechanisms, and (iii) the distribution in space and time of the two heterolithic fractions. Furthermore, the petroleum geologists are interested to unravel new insights about the internal properties (e.g., porosity and permeability) of such complex systems and to reconstruct predictive 3D models. This is because they can have an important impact on hydrocarbon exploration and exploitation phases.

However, proper understanding of mixed deposits is challenging because they provide more sensitive records and complex sedimentation patterns than pure siliciclastic or carbonate systems.

References Cited

Chiarella, D., S.G. Longhitano, 2012, Distinguishing depositional environments in shallow-water mixed bio-siliciclastic deposits on the base of the degree of heterolithic segregation (Gelasian, Southern Italy): Journal of Sedimentary Research, v. 82, p. 962-990.

Chiarella D., S.G. Longhitano, and M. Tropeano, 2017, Types of mixing and heterogeneities in siliciclastic-carbonate sediments: Marine and Petroleum Geology, v. 88, p. 617-627.

Longhitano, S.G., D. Chiarella, and F. Muto, 2014, Three-dimensional to two-dimensional cross-strata transition in the lower Pleistocene Catanzaro tidal strait transgressive succession (southern Italy): Sedimentology, v. 61, p. 2136-2171.

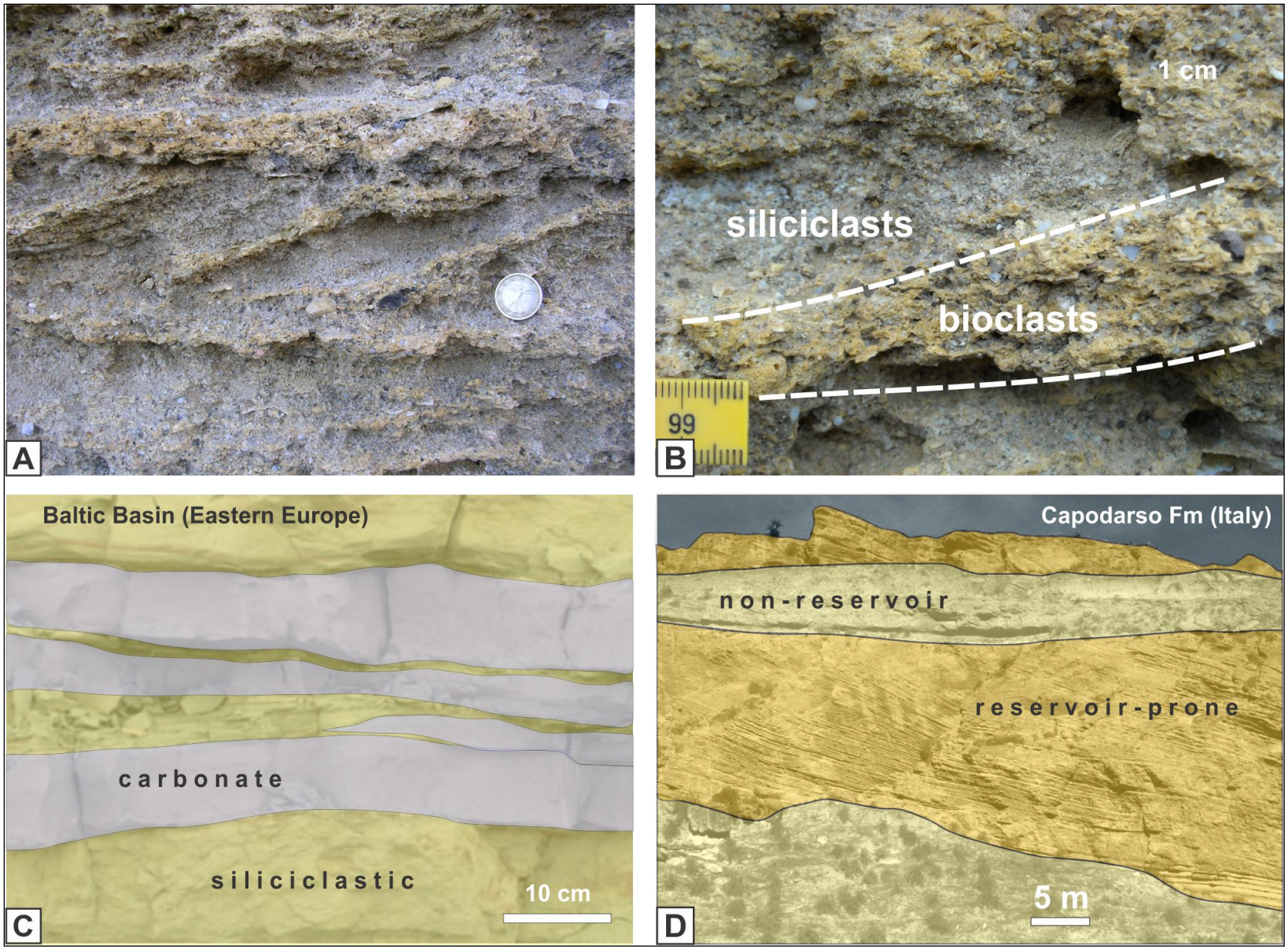

Figure 1. Different scales of mixing in siliciclastic-carbonate deposits. (A) Mixed siliciclastic-carbonate ripples (Acerenza Basin, Southern Italy). (B) Close-up view from the previous photograph showing the siliciclastic-carbonate segregation among lamina-sets. (C) Alternation between siliciclastic and carbonate beds (Baltic Basin, Eastern Europe). (D) Stratigraphic scale alternation between reservoir-prone and non-reservoir units (Enna-Caltanissetta Basin, Italy).