Geophysical Research Abstracts, Vol. 7, 09493, 2005
SRef-ID: 1607-7962/gra/EGU05-A-09493
© European Geosciences Union 2005

Dolomitisation processes affecting the yellow marker beds in the turbidite systems of the Hecho Group, South Central Pyrenean Basin, Spain

M. A. Caja (1), R. Marfil (2), D. Garcia (3), E. Remacha (4) and G. Gual (4)

(1) Departament de Geoquímica, Petrologia i Prospecció Geològica, Universitat de Barcelona, Spain, (2) Departamento de Petrología y Geoquímica, Universidad Complutense de Madrid, Spain, (3) Centre SPIN, Departement GENERIC, Ecole Nationale Superieure des Mines de St. Etienne, France, (4) Departament de Geología, Universitat Autónoma de Barcelona, Spain.

(miguelangel.caja@ub.edu , marfil@geo.ucm.es , garcia@emse.fr , eduard.remacha@uab.es)

The Eocene turbidite systems of the South-Central Pyrenees, known as the Hecho Group (Mutti *et al.*, 1972) were deposited from the lower Ilerdian to the upper Lutetian. They consist of a stacking of six major unconformity-bounded turbidite wedges (Mutti *et al.*, 1985; Mutti *et al*., 1988; with modifications by Remacha *et al*., 1987; Remacha *et al*., 1998), reaching a maximum thickness close to 4500 m. Within these apparently monotonous wedges, several decimetre scale beds are characterized by a distinctive yellow colour in the Banaston turbidite systems (TSU-4, within the Hecho Group; Mutti *et al.*, 1972) and have been used as correlation levels to reach a very detailed bed-by-bed correlation within overbank deposits (e.g., Rapitán channel-overbank system, which correspond to the last turbidite system, TSU-5, of the Hecho Group, Remacha *et al.*, 1991).

The aim of this research is to characterize petrographic and geochemically the yellow marker beds and study the diagenetic conditions in which these beds were developed. Petrography, cold cathodoluminiscence, X-ray, whole-rock geochemical analyses, electron microprobe analyses, scanning electron microscopy and isotopic analyses were performed in order to understand the meaning of these sedimentary episodes and to determine compositional variations caused by diagenesis. The Banastón turbidite system is one of the few cases in the world in which the relationships between the channel fill, the related overbank deposits and the pass of both elements into the genetically-related frontal splay complex is exposed. Distinctive marker beds in the overbank deposits highlighted in the outcrops by a characteristic yellowish colour in contrast to the light blue or dark grey of the rest of the fine-grained and thin-bedded succession have been selected for analyses in the Banaston-2 and 3 systems.

The yellow marker beds are highly bioturbated micritic limestones with algal lamination and very rich in dark-red concretions, alternating with disturbed fine laminas of carbonatic and siliciclastic sandstones, both partially dolomitised. The average modal composition is dominantly dolomite+ankerite (from 25 to 45%), calcite (29 to 38%), silt size quartz ($<$20%), phyllosilicates ($<$20%, which correspond to illite, kaolin and subordinated chlorite) and albitized feldspars ($<$2%). Terrestrial organic matter and framboidal pyrite are very abundant in the micritic limestone. Some veins of palisade gypsum partially replaced by calcite have been observed. The yellow colour of these beds is related to the oxidation rims of the ankerite crystals and pyrite oxidation. Dolomite appears as scattered euhedral rhombs (10-30 μm), replacing lenticular gypsum? and rarely forming idiotopic cements which show dull luminescence. The dolomites are near stoichiometric and the scarce overgrowths are of highly ferroan varieties (Fe content ranges from 60947 to 84009 ppm. Average chemical composition of the dolomite rhombs analysed is: $Ca_{51.365}Mg_{47.506}Fe_{1.058}$ $Mn_{0.067}$ $Sr_{0.004}$ (CO_3)=100 (n=95). Fe content in dolomite ranges from 490 to 86201 (average= 6153 ppm), Mn up to 1224 ppm (average= 395 ppm), Sr up to 600 ppm (average= 34 ppm) and Ba up to 1406 ppm (average= 283 ppm). Whole-rock Mg, Fe and Mn contents are the highest in comparison with the other beds of the turbidite systems. However, the Sr values are markedly lower than in the turbidite sandstones.

Petrographic and geochemical data suggest that dolomitisation occurred relatively early in the diagenetic history, within a moderately closed diagenetic system during deep burial. This is consistent with the fact that dolomite crystals do not display burial pressure-solution effects. They are pre-mechanical compaction, and dolomitisation predated ankerite overgrowths and followed by low-Mg calcite equant cements in the intercalated sandstones. Replacement dolomitisation did not result in the development of any associated secondary porosity.

Dolomite mineralogy and textures are consistent with a conventional dolomitisation model involving enriched -saline marine-modified fluids (e.g., Morrow, 1990). Micrite and siliciclastic components are only partly dolomitised. The source of Mg could be the evaporated seawater itself, but the presence of calcitised and dolomitised lenticular and other isolated crystals of evaporites can also be interpreted as a precursor.

1 References

Morrow D.W., 1990. Dolomite. Dolomitization models and ancient dolostones. *Geoscience Canada*. *Reprint series* 4, 125- 140.

Mutti, E., Luterbacher, H.P., Ferrer J. and Rosell. J., 1972. Schema estratigrafico e lineamenti di facies del Paleogene marino della zona centrale sudpirenaica tra Tremp (Catalogna) e Pamplona (Navarra). *Società Geológica Italiana, Memoire*, 11, 391-416.

Mutti, E., Remacha, E., Sgavetti, M., Rosell, J., Valloni, R. and Zamorano, M., 1985. Excursion No. 12: Stratigraphy and facies characteristics of the Eocene Hecho Group turbidite systems, south-central Pyrenees. In: Mila, M.D. and Rosell, J. (Eds.), *Excursion Guidebook of the* 6^{th} *European Regional Meeting: IAS.* 6^{th} *European Regional Meeting, Lleida, Spain*, 519-576.

Mutti, E., Séguret, M. and Sgavetti, M., 1988. Sedimentation and deformation in the Tertiary sequences of the Southern Pyrenees: Field Trip 7 guidebook. *AAPG Mediterranean Basins Conference, Nice, France, Special Publication of the Institute of Geology of the University of Parma*, 157.

Remacha, E., Arbués, P. and Carreras, M., 1987. Precisiones sobre los límites de la secuencia deposicional de Jaca, Evolución de las facies desde la base de la secuencia hasta el techo de la Arenisca de Sabiñanigo. *Bol. Geol. y Min.*, T., XCVIII-I, 40-48.

Remacha, E., Picart, J. Oms, O., 1991. The Rapitan turbidite channel. In: Colombo, F., Ramos-Guerrero, E. and Riera, S. (Eds.), *1st congress of the Spanish Group on the Tertiary*, 280-282.

Remacha, E., Fernandez, L.P., Maestro, E., Oms, O., Estrada., R. and Teixell, A., 1998. The upper Hecho Group turbidites and their vertical evolution to deltas. In: *Field Trip Guidebook of the 15th International Sedimentological Congres* (Eds. Meléndez-Hevia, A. and Soria, A.R), Alicante, Spain.