IAS POSTGRADUATE GRANT

Report by <u>Howri Mansurbeg</u>

Financial support obtained from the IAS was spent in the field trip to Grès d'Annot southeast France in June 2006. This project is part of my PhD research: **Linking diagenesis to sequence stratigraphy in deep-marine turbiditic deposits**; under the supervision of Prof. Dr. Sadoon Morad (Uppsala University).

Introduction

The impact of diagenetic alterations on reservoir quality (enhancement versus deterioration) of deep-water, marine siliciclastic turbidites is strongly controlled by two major parameters, which are the detrital composition of the sediments and burial-thermal history of the basin (Morad et al., 2000). Detrital composition of the sand determines the mechanical and chemical properties, and thus ultimately reservoir-quality evolution pathways of the sandstones. Mechanical compaction of sandstones enriched in ductile sand grains (e.g., mud/carbonate intraclasts, glaucony, and low-grade metamorphic rocks) induces rapid loss of porosity and permeability. Conversely, sandstones enriched in quartz and feldspars usually preserve a high portion of their depositional porosity and permeability during burial to considerable depths, unless they are extensively cemented by, e.g., carbonates and quartz overgrowths. Extensive carbonate (calcite and dolomite) cementation of turbiditic sandstones occurs at shallow depths below the seafloor when carbonate intraclasts are abundant. The main/only porosity and permeability in such well-lithified, turbiditic sandstones are related to rock fracturing. Pervasive cementation of turbiditic sandstones by clay minerals, silica (opal and chalcedony), and zeolite is anticipated in turbiditic sandstones that contain large amounts of chemically reactive, volcanic rock fragments. Cementation by quartz overgrowths typically occurs when porous, quartzitic sandstones are buried to depth greater than 3 km below the seafloor, and is, together with chemical compaction (i.e., intergranular pressure dissolution of quartz grains), the main reservoir-destroying processes during deep-burial diagenesis.

Outcrops located in Grès d'Annot southeast France provide excellent opportunity to investigate the role of facies on diagenetic alteration as these turbiditic succession can be mapped out as three dimensional units.

Preliminary Results

The four days of fieldwork was undertaken in Grès d'Annot southeast France in 2006. The work included facies studies and selective sampling along sequence boundaries and within two main depositional facies: coarse-grained channel complexes and fine-grained crevasse splay sandstones (Fig. 1). The diagenetic alterations and related reservoir-quality evolution pathways are closely linked to depositional facies, and burial depth reached by the sandstones. Dissolution and kaolinitization of detrital silicates in the turbiditic sandstones is attributed to flux of considerable volumes of meteoric waters, which was facilitated by significant falls in the relative sea level and probably connectivity to porous (proximal) formations. More samples have been sent for thin section preparations and pieces of representative sandstones have been send for isotopic analysis. It is expected that this study will shed more light on the processes that are involved in diagenetic alterations in deep-sea turbiditic sandstones, which are the few remaining exploration frontiers through out the world. IAS will be greatly acknowledged in the PhD thesis, which is going to be concluded in 2007.

.

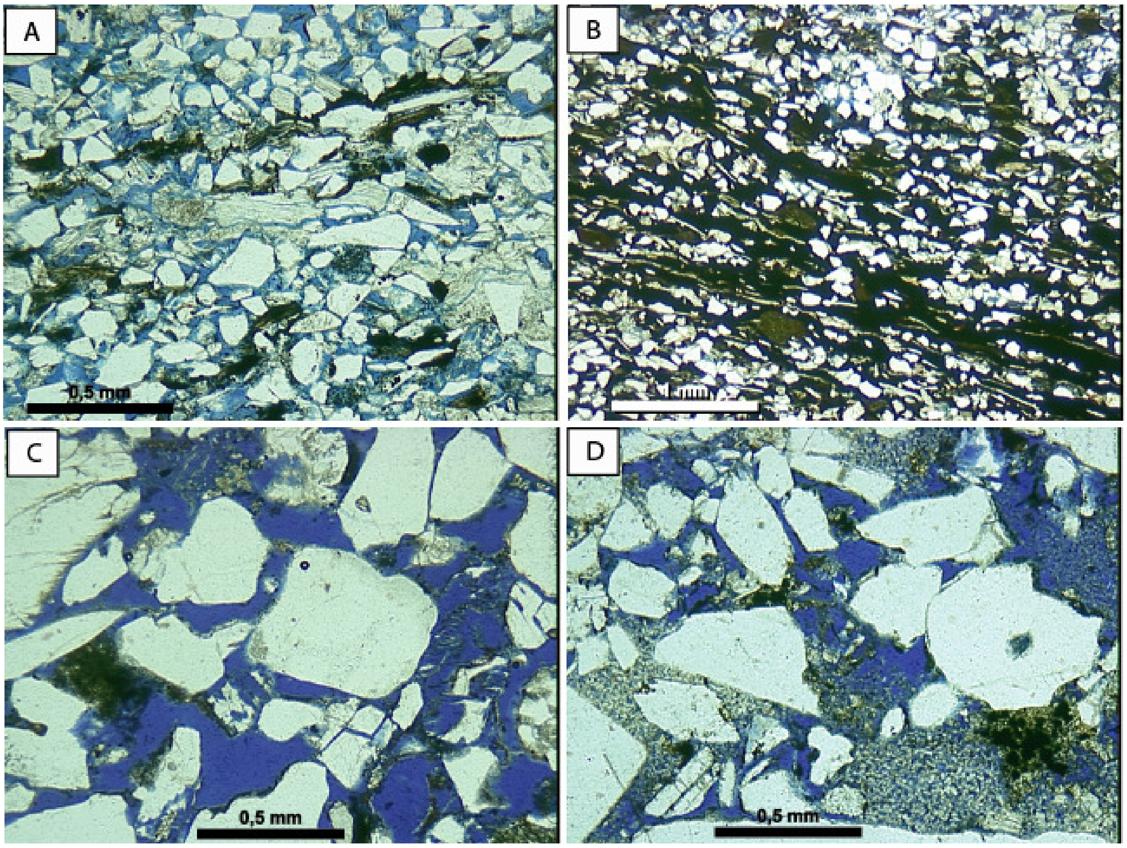

Figure 1. (A) and (B) Photomicrograph (plane polarized light view) of the typical fine-grained crevasse splay sandstones. The sandstones fine grained and typically rich in mica flakes (A) and in some cases even coal fragments (B). (C) and (D) plane polarized light view of the typical coarse-grained channel complex sandstones showing the abundance of detital grains such as quartz and feldspar.