Unravelling the time-space distribution of diagenetic events modifying the pore network of reservoir rocks is a classical task of hydrocarbon research. Nevertheless, it is not always easy to reach that picture, as it needs to constraint a number of variables driving that distribution along the geological history of sedimentary basins.

Here we present the results of an integrated study performed on 15 samples of Palaeozoic reservoir sandstones coming from 3 hydrocarbon wells in the Illizi Basin. In particular, the topic of debate that promoted this study is the possible thermal effect on the Illizi Basin reservoir rocks of the Cenozoic magmatic activity occurred in Hoggar dome, south of the studied region, and in other sector of the basin as pointed out by several magmatic intrusions.

The study was performed by combining: i) the reconstruction of the relative diagenetic timing obtained by petrographic observations; ii) microthermometric analyses of fluid inclusions trapped in diagenetic minerals; iii) low-T thermochronology (both Fission tracks and U-Th/H analyses) on clastic apatite grains; iv) vitrinite reflectance analysis; v) geohistory analysis of sampled wells. These data were used to constrain different thermal models, focusing in particular to the possible evidence of a Tertiary thermal overprint.

The results of the study can be summarized as follows:

- Several diagenetic minerals precipitated in the pore network of the studied rocks; among these, precipitation conditions for quartz, calcite, ankerite and to a minor degree feldspars were constrained through fluid inclusion microthermometric analyses;
- All these phases precipitated in a relatively narrow range of temperatures nicely correlated with burial depth of samples, from fluids with quite homogenous salinity (78-113 °C and 9.2-14.5 NaCl eq. %) suggesting a relatively limited time in which most of cements precipitated;
- The data on the thermal maturity of organic matter (vitrinite reflectance along the Mesozoic sequence, and vitrinite reflectance equivalent, mainly from chitinozoans, for the Silurian-Devonian sequence) seem to suggest a heating higher than the one currently observed. This may be compatible both with an episode of magmatic activity or with a late Cretaceous-Tertiary
burial now eroded (in the wells studied, no more than 500-700m);

- Thermochronology shows a continuous burial until temperatures compatible with those observed by vitrinite reflectance although a minor thermal episode (i.e. with a temperature variation of the order of 10°C) is allowed.

Based on this integrated data set, different thermal scenarios have been tested, excluding or including a Cenozoic additional heating, in order to estimate the effect of the adopted thermal model on the age of cement precipitation in the pore system of studied reservoir rocks.