# The Pan-African reconstruction of NW Angola: Petro-structural and temporal constraints

P. MONIÉ[1], D. BOSCH[1], O. BRUGUIER[1], A. VAUCHEZ[1], P. NSUNGANI[1,2] AND Y. ROLLAND[3]

[1]Géosciences Montpellier, UMR-CNRS-5243, Univ. Montpellier 2, Place E. Bataillon, 34095 Montpellier, Cedex 05, France (bosch@gm.univ-montp2.fr)
[2]Agostinho Neto University, Avenida 4 de Fevereiro 7, Luanda, Angola
[3]Géosciences Azur, UMR 6526 CNRS, Université de Nice Sophia Antipolis, Parc Valrose, 06108 Nice cedex 2 – France

At the end of Neoproterozoic times, assembly of the Gondwana supercontinent resulted in the closure of several oceanic domains and accretion of large cratons. Various tectono-metamorphic belts developed et the margins of these cratons during the Panafrican orogeny. During this work, we developed a study combining petro-structural and geochronological investigations on the West Congolian belt (NW Angola) resulting from the collision between the Congo and Sao Francisco cratons. Two main tectono-metamorphic units have been recognized in the studied area, namely eastern and western internal units, and show a westward increase of deformation and metamorphic grade. The WIU consists of high-grade gneisses and migmatites with intercalation of amphibolites, quartzites and pegmatites. This sub-unit experienced metamorphic conditions that increase upward and westward. Maximum P-T conditions for high-grade gneisses have been estimated at 10-12 Kbar and 600-650°C. One garnet amphibolite intercalated with gneisses has been dated and yields ages of 539±7Ma and 498±5Ma for U-Pb and Ar-Ar methods, respectively. A pegmatitic dyke concordant to the regional foliation provides a concordant U-Pb age of 544±13Ma taken as our best estimate for pegmatite emplacement. Two paragneisses have been also dated with ages ranging from 589±12Ma to 678±48Ma suggesting a detrital origine and indicating that detritus was derived from Neoproterozoic source material. At least monazites from one of this gneiss show a complex U-Pb age distribution (three batches between 560-490Ma) and Ar-Ar biotite age of 487±5Ma. All this age underlines the predominance of the Pan-African deformation and metamorphism in the construction of this belt.

# Characterization of hyperalkaline fluids produced by serpentinization of mantle peridotites in Oman and in Liguria (Northern Italy)

C. MONNIN*, V. CHAVAGNAC, G. CEULENEER, C. BOULART AND G. HOAREAU

Geosciences Environement Toulouse, 14 Avenue Edouard Belin, 31400 Toulouse, France
(*correspondence: monnin@get.obs-mip.fr)

High pH waters and gases produced by serpentinization of mantle peridotites as well as precipitates forming at the springs have been sampled between 2008 and 2011 in the Semail nappe of the Oman Mountains and the Voltri group of the Ligurian Alps (Northern Italy).

Factors influencing the composition of the hyperalkaline waters are: 1) alteration of the ultramafic basement, 2) formation of precipitates at the water discharge, 3) interaction of the waters with the atmosphere, 4) mixing with surface (runoff) waters, 5) concentration by evaporation.

In Oman the springs are located along major geological discontinuities (Moho, basal contact between the ophiolite and the underlying Cretaceous sedimentary formations).

The increase in the Na, K and Ca contents of the Oman waters with chlorinity cannot be explained by evaporation, pointing to the reactivity of these elements (formation of clays and Ca-carbonates).

In Liguria, the alkaline springs are located above the river beds and their waters do not mix with the river waters. In Oman this mixing leads to a continuous range of pH from the normal runoff (6 to 8) and the extreme values (12.1). In this case, the pH change can be very rapid (dropping by two pH units in half a meter at the site 'Grande Ligurie'). Conversely the pH drop of the alkaline waters collected in the irrigation channels (falaj) is very slow, being due to the sole uptake of atmospheric $CO_2$.

Minerals forming at the springs are mainly calcite, aragonite and brucite.

Larger values of the $H_2$ content of the gas phase bubbling at the springs are found in Oman while $CH_4$ is more important in Liguria.

The reaction of the infiltrating surface waters with the ultramafic formation almost entirely removes the Dissolved Inorganic Carbon indicating that the alteration of ophiolites is indeed an efficient sink for carbon.

Our observations ask the question of the hydrologic pathways of the water in ophiolites: percolation through the ultramafic formation or circulation along major geological discontinuities?