Reconstructing fluid circulation pathways in volcanically influenced settings: a case study from the Namibe Basin (Angola)

Fiordalisi Eduardo¹, do Couto Ramos Pereira, G.¹, Rochelle-Bates, N.¹, Marchegiano, M.², John, C.², Dixon, R.₃, Sharp, I.₄, Schröder, S.⁵

1: University of Manchester; 2: Imperial College London; 3: BP Exploration; 4: Equinor, Exploration Research and Technology
E-mail: eduardo.fiordalisi@manchester.ac.uk

1. Objectives and implications

Creating a depositional and diagenetic model for the continental spring carbonates in the Namibe Basin in order to provide a better understanding of plumbing system geometries, fluid sources, fluid interaction with surrounding sediments and mechanisms leading to carbonate precipitation in volcanically influenced settings.

2. Geological setting of the Namibe Basin

- Developed as part of the South Atlantic rifting (Fig. 1).
- Overall syn-rift to sag continental/lacustrine setting vs. post-rift marine setting (Fig. 2).
- Non-marine carbonate setting temporarily re-established in the post-rift after renewed tectonism and magmatism (study interval).

3. Facies and depositional model

- Carbonate spring mound systems mostly occurring along faults, characterised by distinctive travertine vent & slope facies and lacustrine deposits (Fig. 3).
- Mixed subaerial/lacustrine environment, possibly evolving into a fully lacustrine setting (Fig. 4).

4. Fluid sources and fluid evolution

- Pervasive matrix dolomitisation (fabric preserving) and dolomite cement overgrowths (Fig. 5).
- $\delta^{13}$C_PDB (Fig. 6A) reflect infiltrated groundwater undergoing degassing at surface.
- $\delta^{18}$O_PDB (Fig. 6A) reflect temperature decrease away from vent facies and meteoric/slightly saline waters ($A_{K}$ temperatures between 55 and 32 °C and $A_{K}^{18}$O between -1.4 and 2.6).
- $^{87}$Sr/$^{86}$Sr suggest fluid circulation through surrounding magmatic deposits, which could have acted as Mg source for dolomitisation (Fig. 6B).
- Intense fracturing and silicification postdating dolomitisation (Fig. 7). FI on silica suggest temperatures between 70 and 260 °C, which might relate to a later stronger magmatic pulse.

5. Conclusions

- Plumbing system mostly fed by infiltrated and heated groundwater.
- Faults represent the main conduits for upward fluid circulation.
- Depositional and diagenetic fluids probably exploited the same plumbing system.
- Fluid circulation was probably fairly local.

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