BOREHOLE GEOLOGY AND HYDROTHERMAL ALTERATION OF WELL ASAL 5

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- Presentation of Asal area
- Lithology and Primary mineral alteration in well Asal 5
- Interpretation of hydrothermal alteration minerals of well Asal 5
- Discussion

Figure 1: Zones of geothermal interest and centres of electric power consumption.

Legend:

A: Thermal manifestation

: Principal centre of consumption

: Zone of geothermal interest

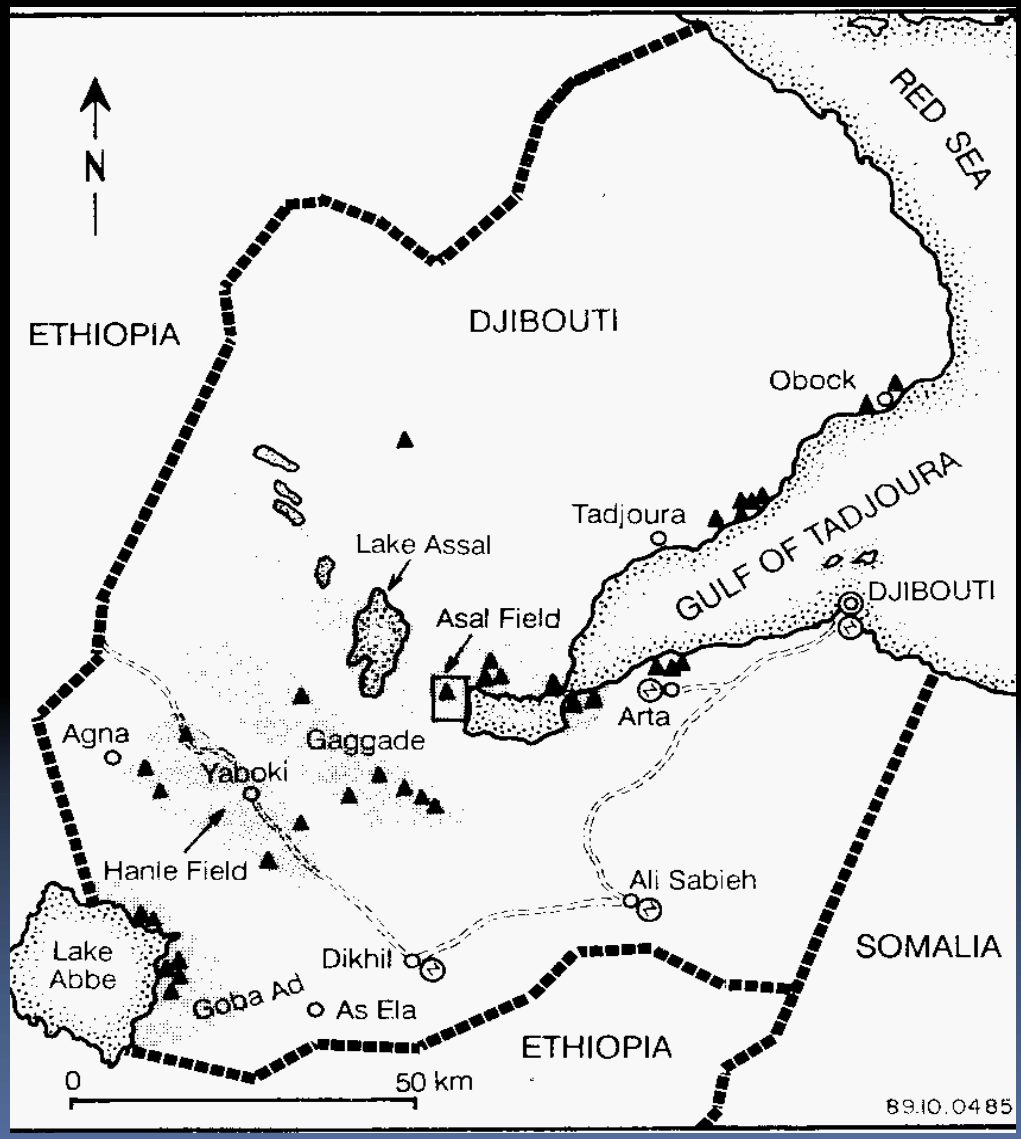


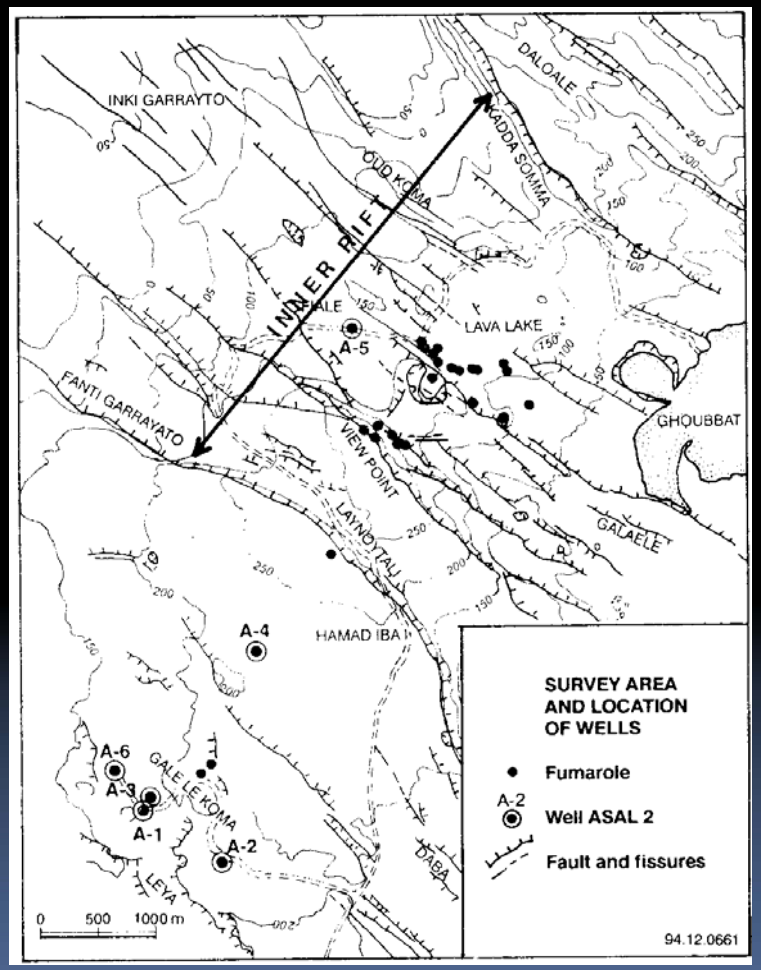
Figure 2: ASAL RIFT PROSPECTS

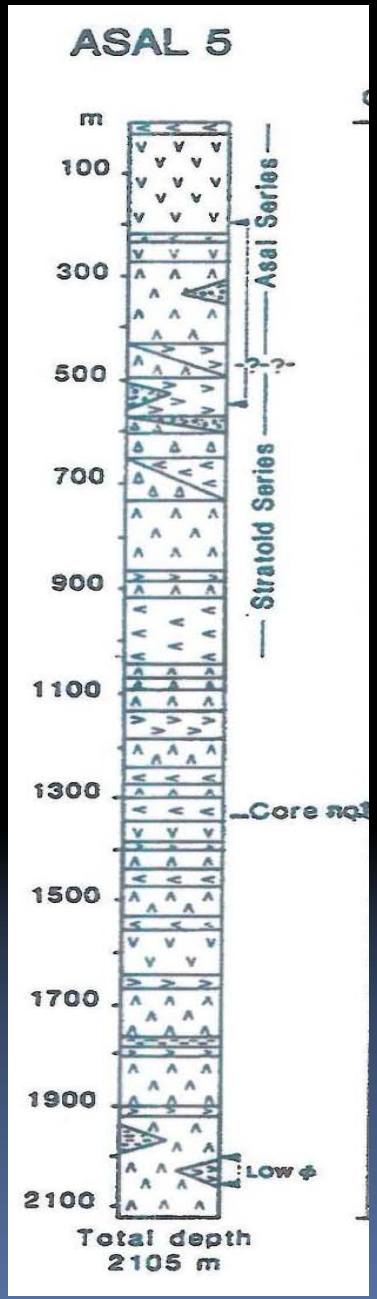
Figure 3: Overview of the central Asal Rift.

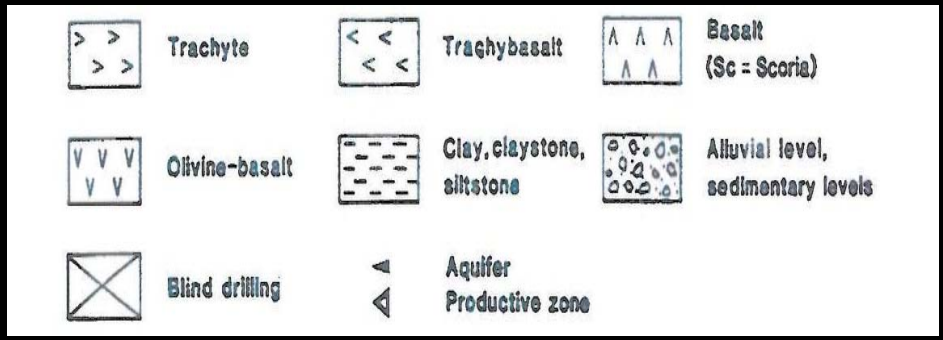
- The Asal rift is the north-westward extension of the gulf of Aden-Tadjura, from the gulf of Ghoubet in the SE and to Lake Asal in the NW**. The Lake Asal** is about 10 km wide and is 155 m below sea level.

- Six deep wells are drilled in the Asal geothermal field, A1 (1554 m) and A2 (1147 m) are drilled in 1975 and A3 (1316 m), A4 (2013 m), A5 (2105 m) and A6 (1761 m) are drilled in 1980

- Well A5 is drilled in the inner Asal rift and precisely in the Lave Lake (fiale). It is a vertical well, reaching a depth of 2105 m.







The stratigraphic colum of well A5 consists primarily of alternating sequences of basalt (ferrobasalt or basalt, trachybasalt and olivine basalt), trachyte and some sediments (sand and claystone).

The series or units are regrouped into two principal geological series: the Stratoides series and the Asal series.

Figure 4: Lithological log of well Asal 5

TABLE : Primary mineral alteration in well Asal 5

Fresh/unaltered	Alteration products
Olivine	clay, calcite, quartz
Plagioclase	Clay, calcite, albite, k-feldspar
Pyroxene	Epidote, wollastonite, phrenite
Magnetite/ilmenite	Sphene, pyrite
Glass	clay, calcite, quartz, chalcedony

- Most rocks in geothermal areas contain some primary minerals which are unstable in a geothermal environment. These have a tendency to be replaced by new minerals that are stable, or at least metastable, under the new conditions.

- The primary minerals in the rocks penetrated by well Asal 5 (Table 1) are characterized by volcanic glass, olivine, plagioclase, pyroxene and magnetite/ilmenite. The replacement of the minerals can best be studied by petrographic thin-section analysis. The primary minerals first began to alter intensively in this well below 892 m depth.

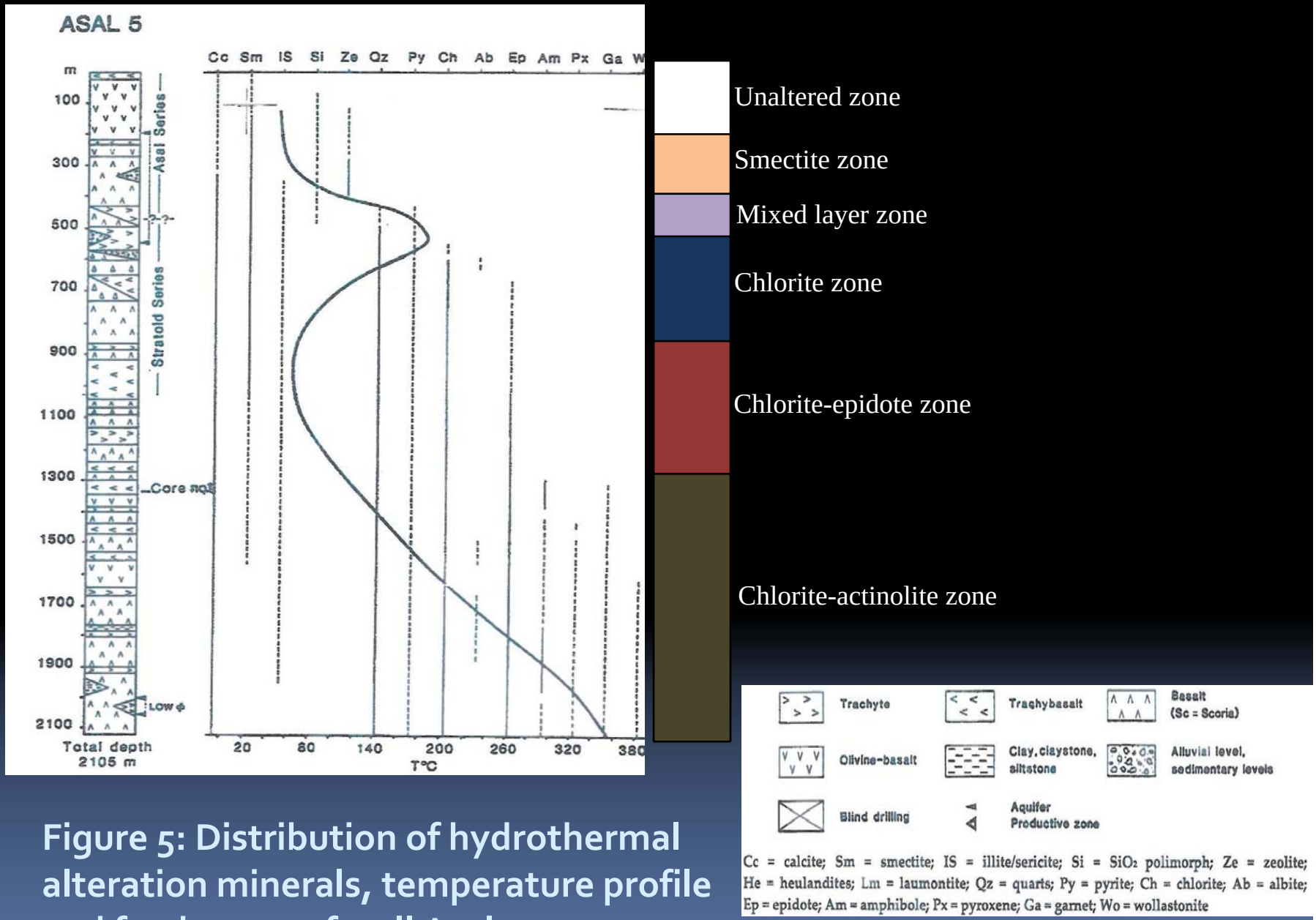


Figure 5: Distribution of hydrothermal alteration minerals, temperature profile and feed zones of well Asal 5

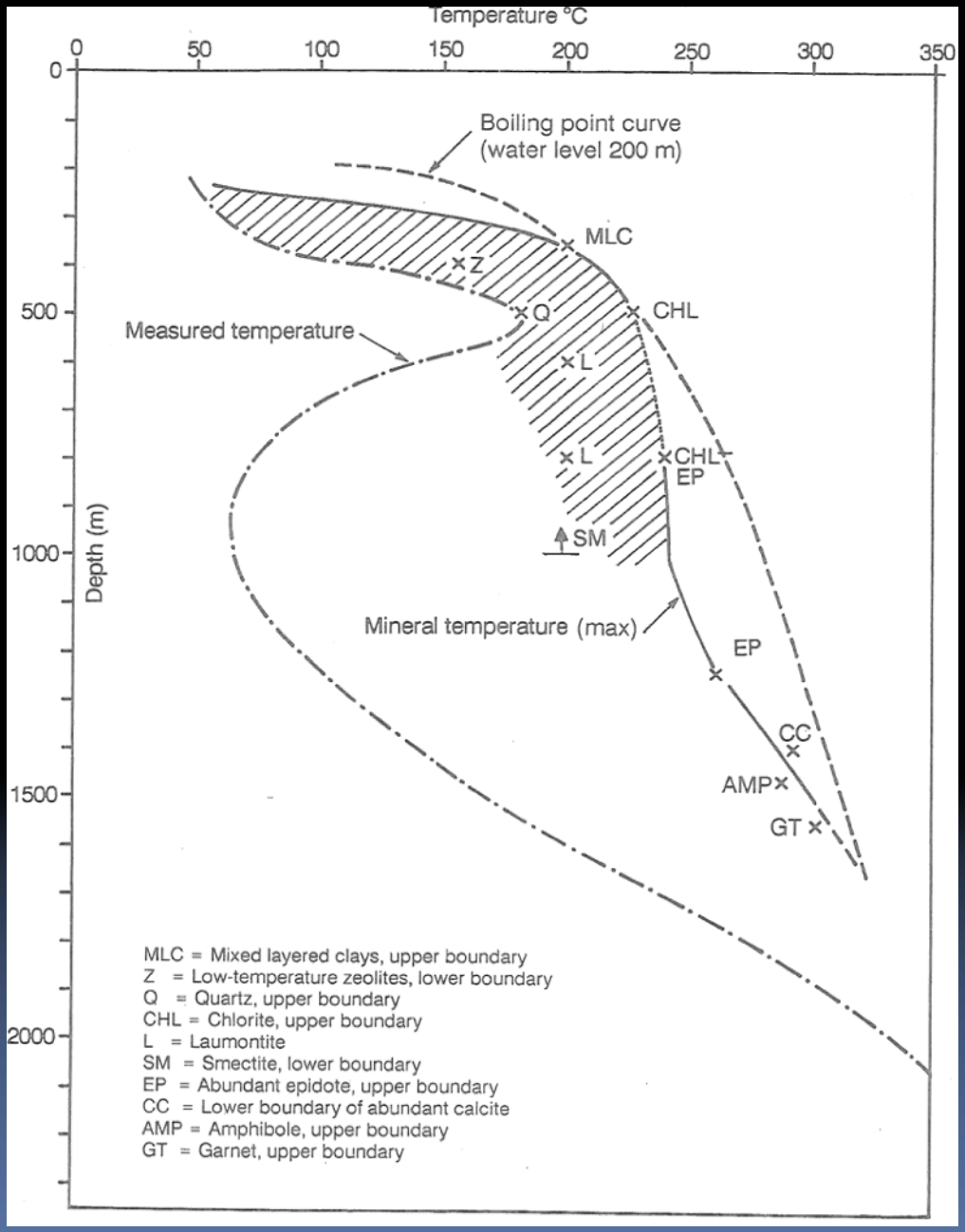


Figure 6 : Measured temperature ; mineral temperature and boiling point curve of the well Asal 5

DISCUSSION

- The temperature inversion of the zone between 600 m to about 1700 m depth, has been interpreted as being due to an intrusion of a cold sea water which effectively cooled this part of the well.

- According to Tomasson and Kristmanndottir (1972), one would a high concentration of anhydrites in rock where cold saline water is heated up during its downward percolation as was distinctly observed in the saline Reykjanes high-temperature field in Iceland.

- The relative abundance of pyrite as veinlets and amygdale infillings can in some cases be correlated with zones of high permeability or aquifers (Franzson, 1983). This may apply to well asal 5; where pyrite is more concentratred in some horizons than others. Theses horizons occur from 460 m to about 1700 m depth which might correlated to the present and the previous permeable zones when the system was active.

THANKS YOU FOR YOUR ATTENTION