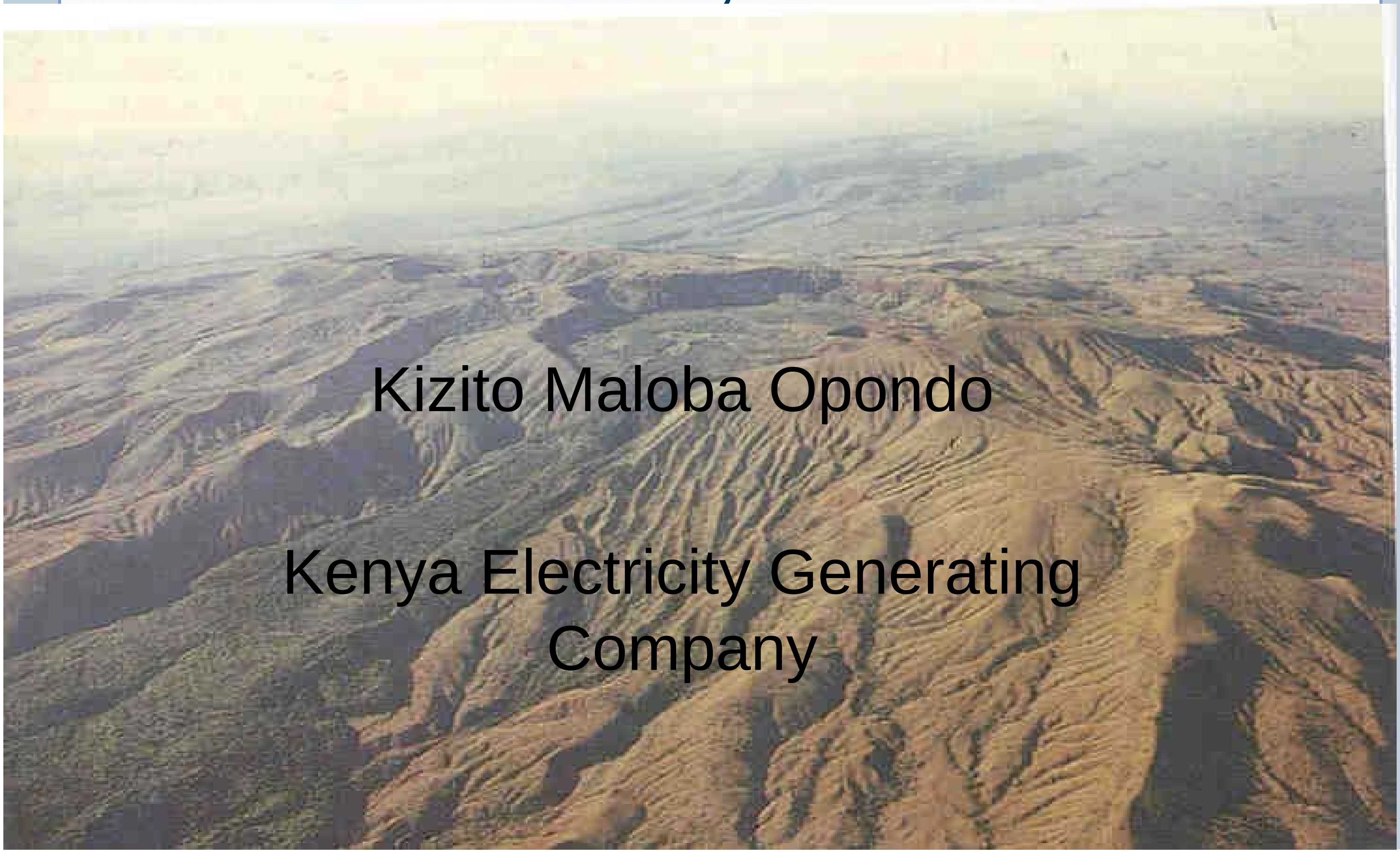
MIXING TRENDS AND SOLUTE GEOTHERMOMETRY OF BOREHOLE WATERS FROM THE PAKA GEOTHERMAL PROSPECT, KENYA.



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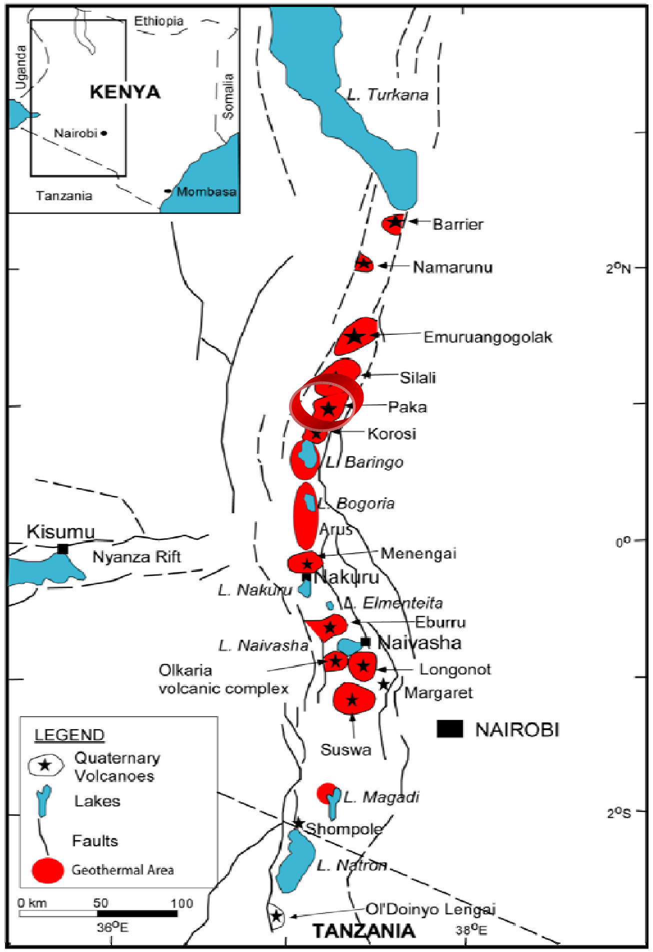
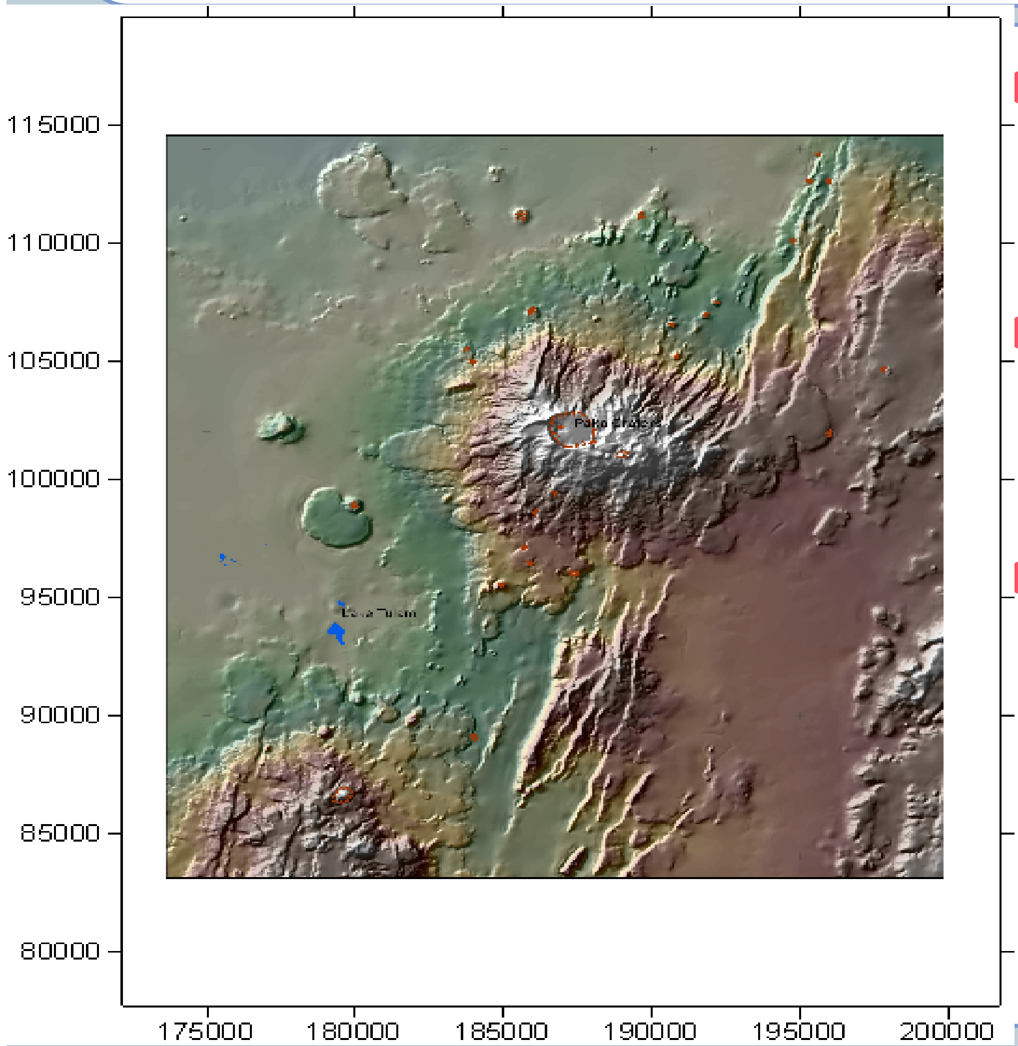
Geothermal Prospects and fields in Kenya

- Paka is situated 25 km north of Lake Baringo and ~20 km east of Chemlingot Village at 00º 25' N and 36º 12' E

- Surface studies carried out in 2006-2007

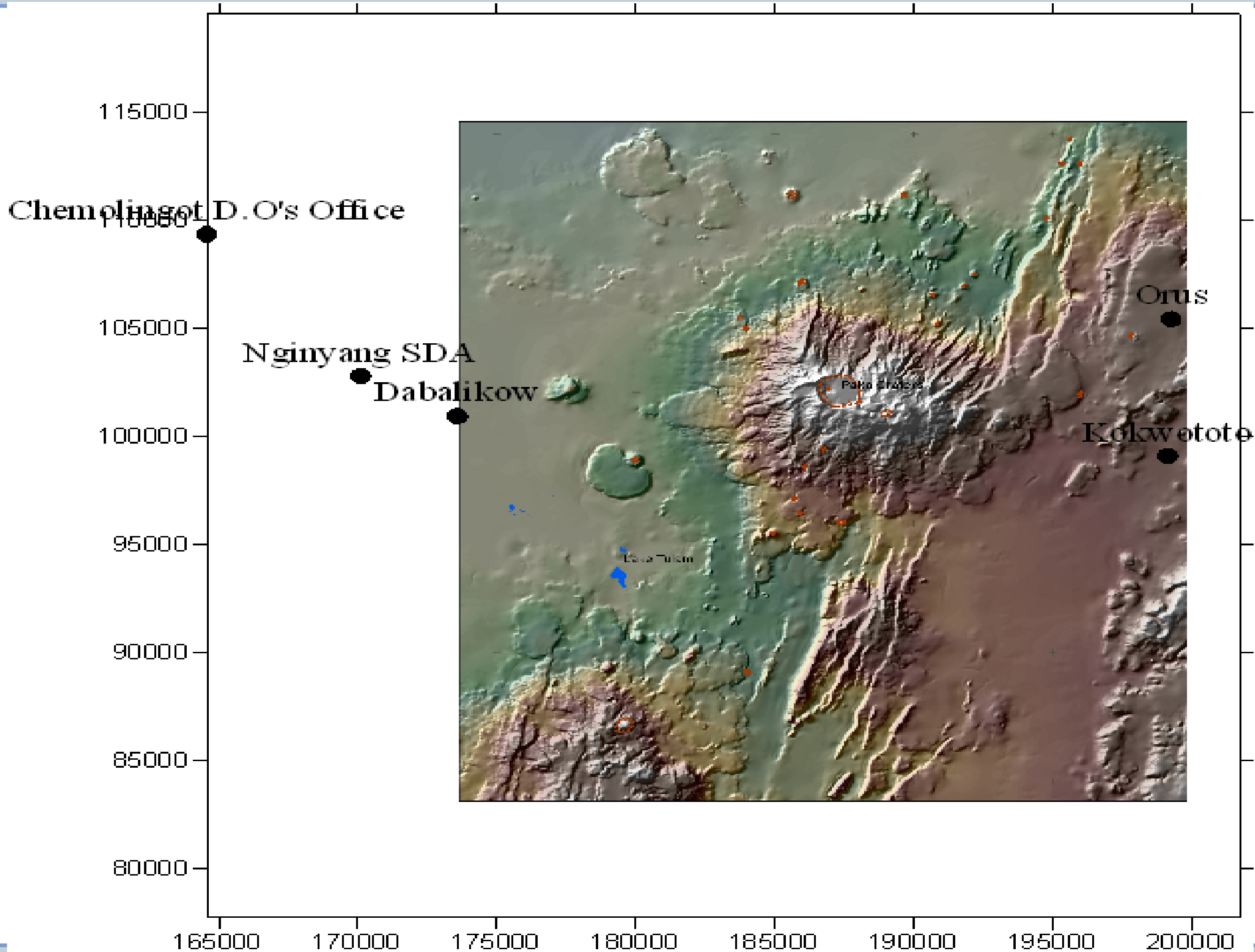


Geological setting of Paka geothermal prospect



- Paka is composed of trachytic , basaltic lavas and pyroclastic deposits
- A shield volcano with craters at the top and the north east.
- It is dominated by a zone of intense normal faulting on the eastern and northeastern flanks and to the south

Boreholes Location in Paka Geothermal Prospect



CHEMICAL COMPOSITION OF BORE HOLE WATER (in ppm)

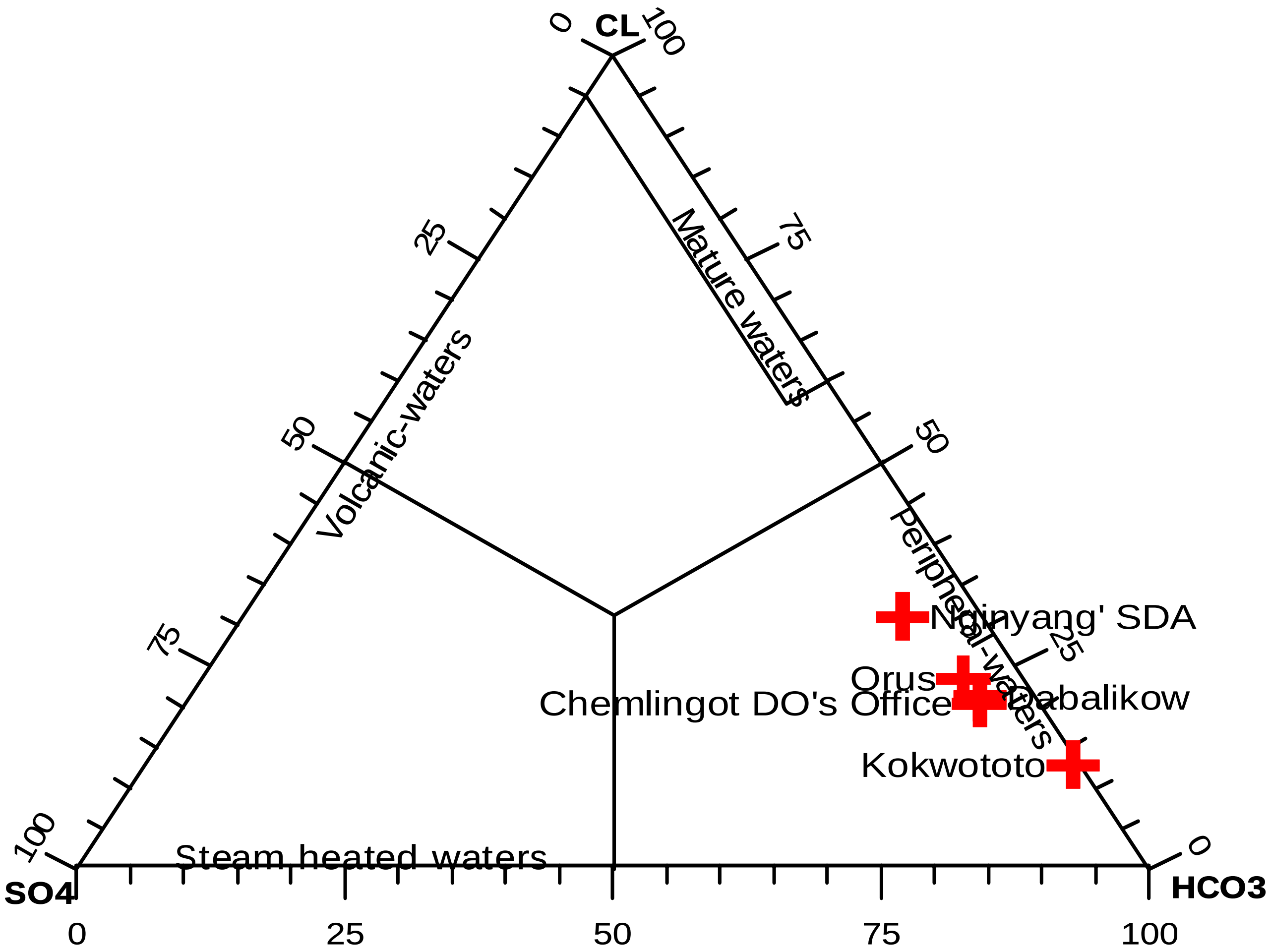
KenGen

SAMPLE SITES	TEMP	pH	Na	K	Ca	Mg	SiO2	CO2	SO4	Cl
Nginyang' SDA	39	7.3	33.2	11.1	1.6	2.1	81.8	146.7	18.3	66
Orus	38	6.7	141	9.1	30.8	7.8	29.6	242	ND	71
Dabalikow	35	7.1	93.1	13.4	5.31	0.65	49.2	251.6	18.3	94
Kokwototo	31	7.6	71.4	12.5	8.16	10.6	44.2	409	4.0	28
Chemlingot	35	8.5	13.1	4.36	2.61	1.08	44.8	304	23.8	97

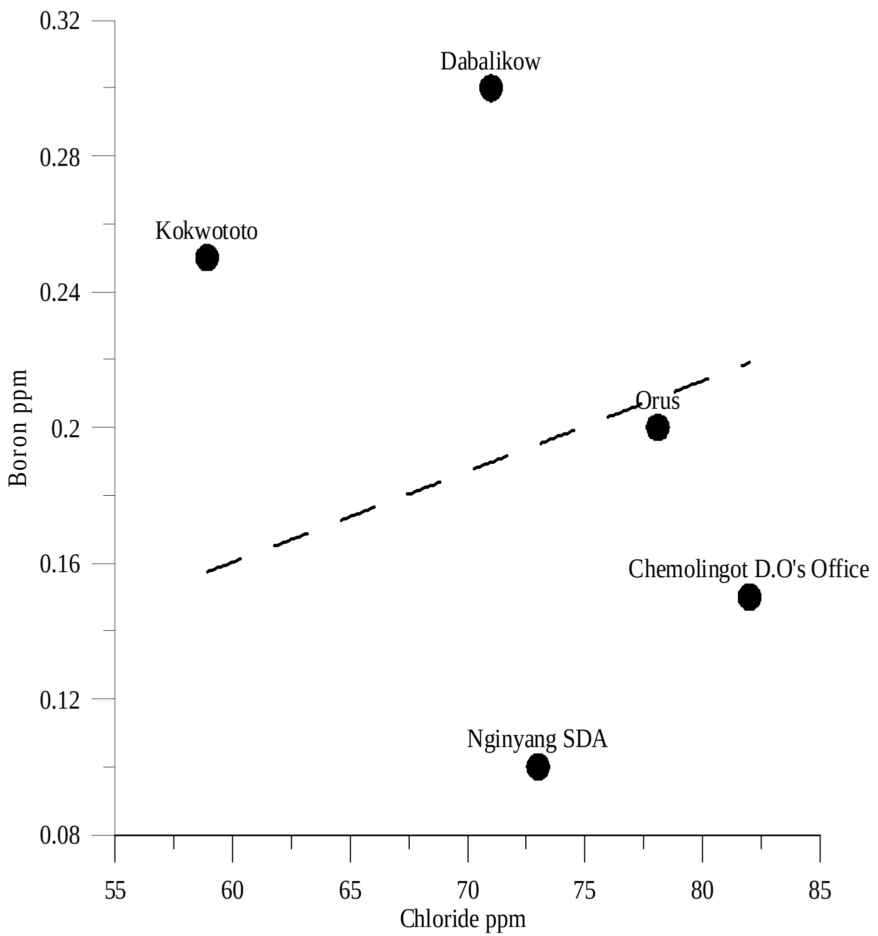
Boreholes fall in Eastern and Western parts of the Paka Geothermal prospects

The bore hole sampled at Nginyang' SDA has relatively high silica content at the measured temperature of the water

CL-SO4-HCO3 Ternary plot

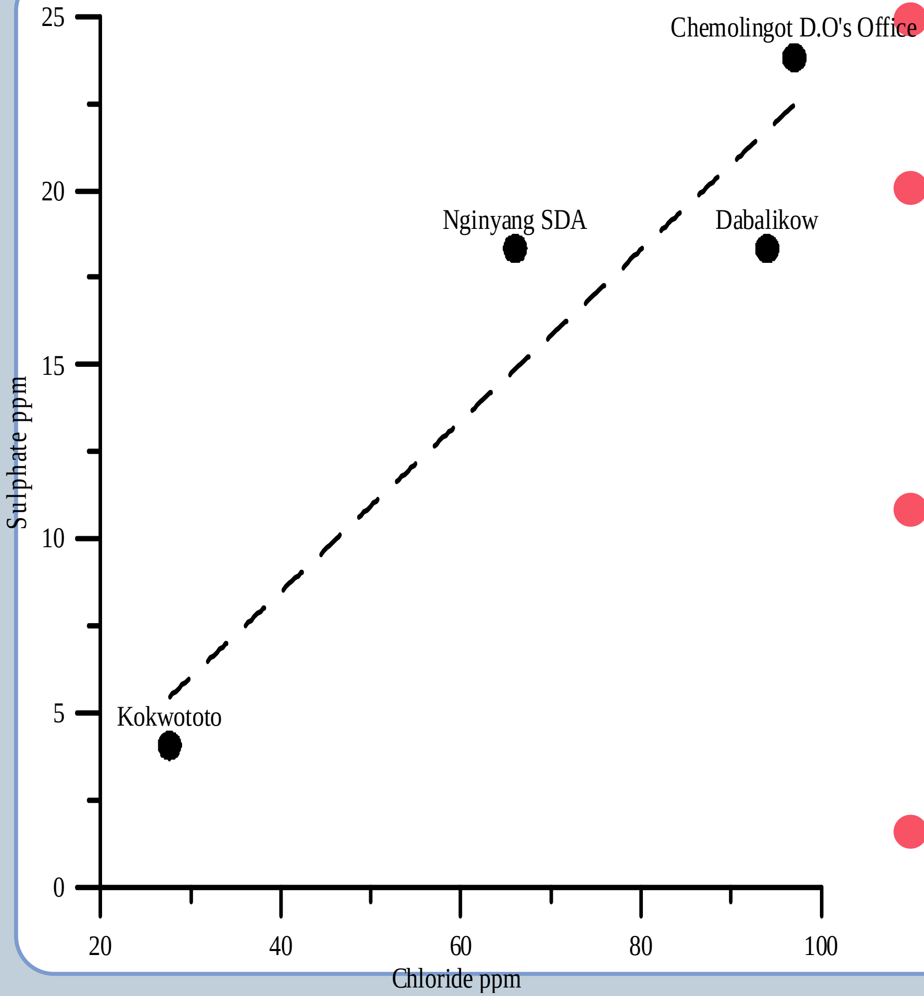


Mixing trends: Chloride- Boron plot



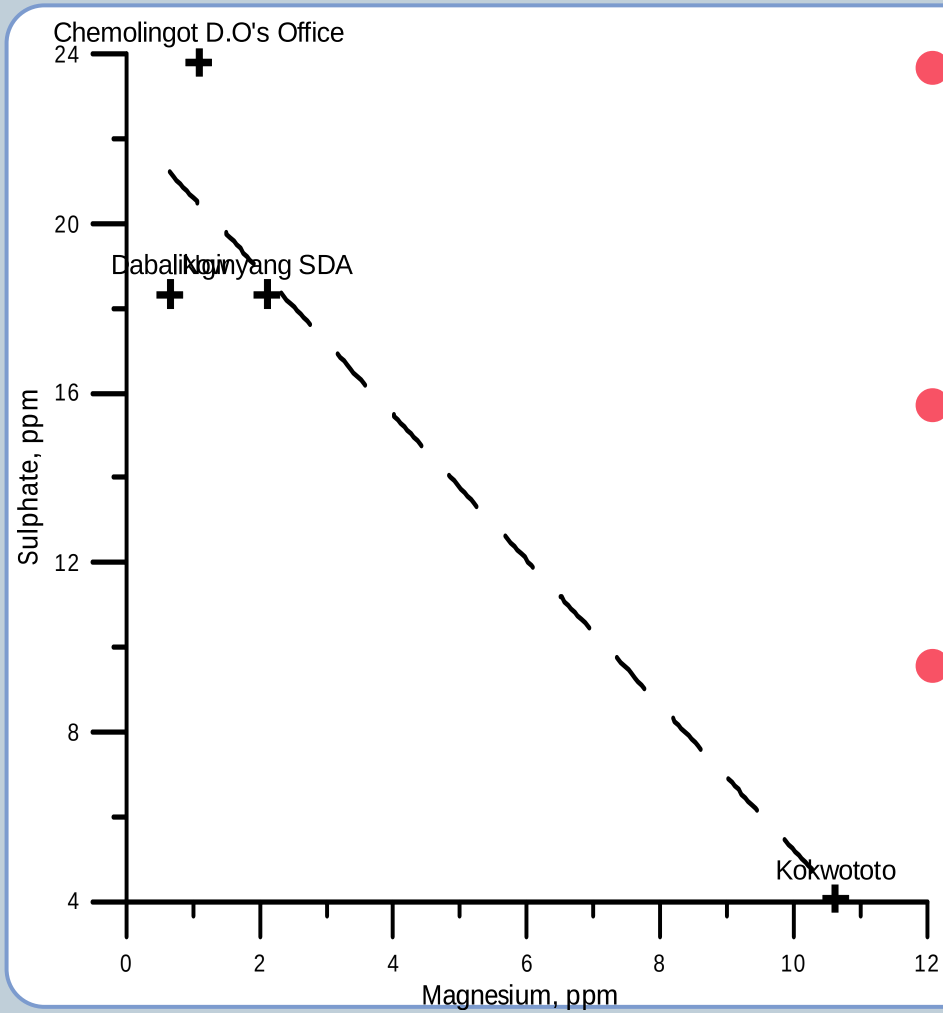
- Chloride and boron concentrations are low in cold water, but higher in geothermal waters.
- Mixing involves simple lowering of ratios without affecting the Cl/B ratio
- High Chloride concentration in Chemlingot water , low in Kokwototo
- Boiling accompanied by mixing

Mixing trends- Chloride- sulphate



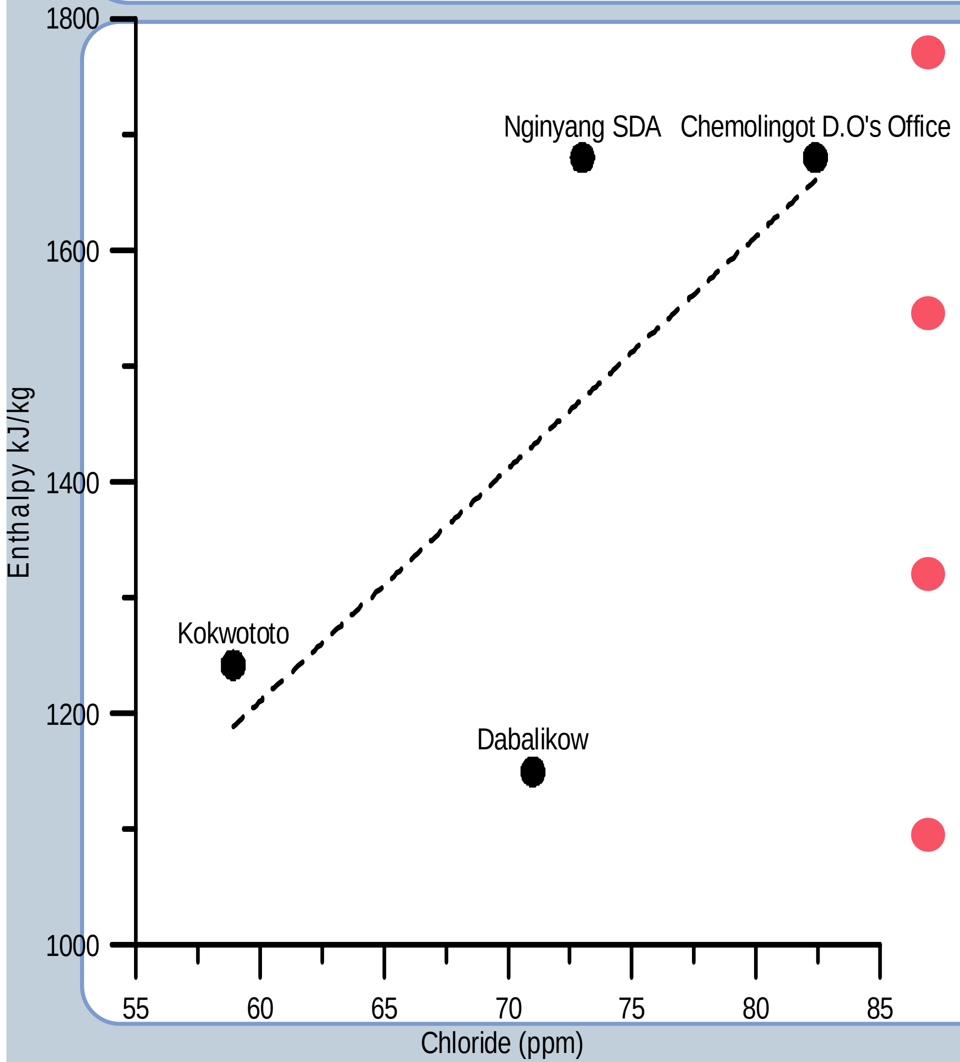
- High chloride and high sulphate contents
- High sulphate could result from oxidation of hydrogen sulphide by atmospheric oxygen
- This occurs during mixing of shallower ground waters e.g Kokwototo and hotter waters e.g Chemlingot
- The borehole waters are mixed waters

Mixing trends; Magnesium - sulphate



- High magnesium contents is a good indicator of ground or surface waters
- Kokwototo water highest in Magnesium contents
- Waters from Kokwototo could be the diluting waters

Mixing Trends: Chloride-Enthalpy



- Takes into account of both boiling and mixing
- Relates analysed chloride and water enthalpy
- Enthalpy was derived from NaK temperatures
- Hotter water represented by samples at Chemlingot mix with colder waters in kokwototo

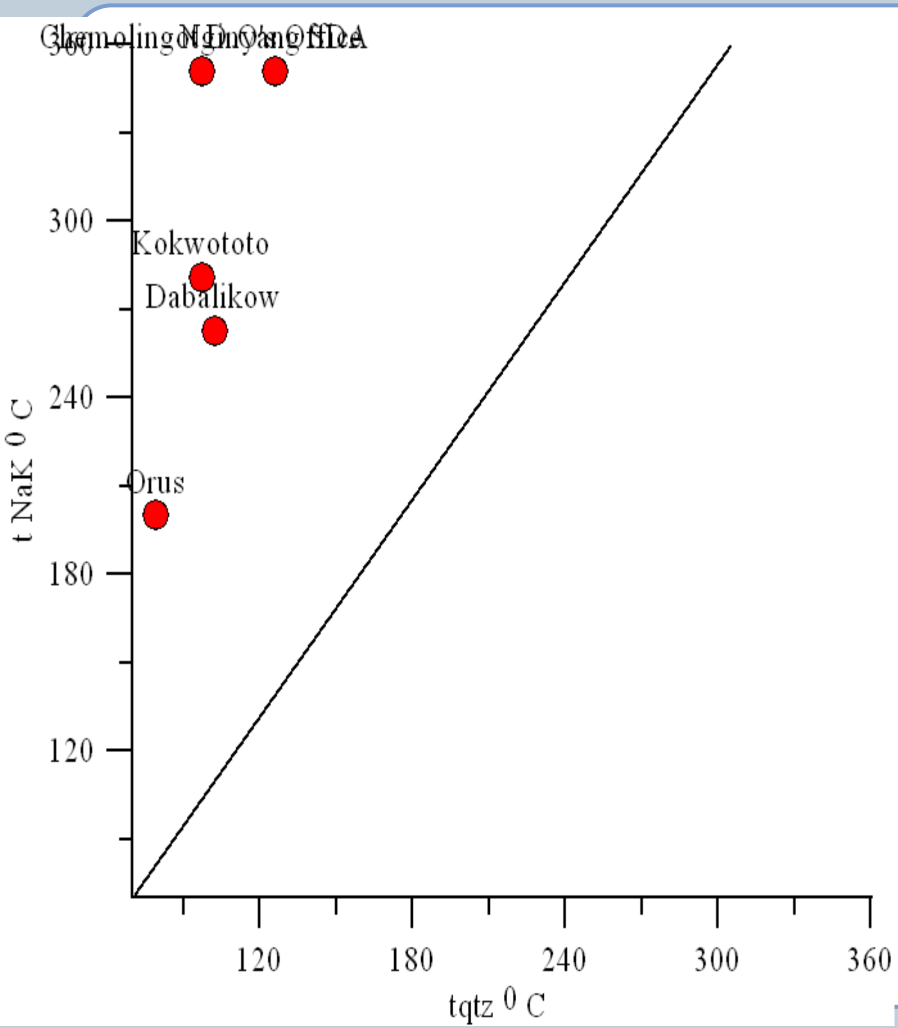
Solute geothermometry temperatures

KenGen

Borehole site	TNaK (G,1988)	TNaK (F, 1979)	TNa-K-Ca (F&T, 1973	Tqtz F&P 1982a
Nginyang' SDA	348	351	266	126
Orus	148	200	164	79
Dabalikow	250	263	209	101
Kokwototo	270	281	221	97
Chemlingot	348	351	265	97

- NaK yields very high temperatures except samples from Orus
- Na-K-Ca temperatures lower than Na-K temperatures
- Quartz temperatures much lower.
- Probably due to lack of attainment of equilibrium between water and rock minerals

Relationship between TNaK & Tqtz temperatures



- Chemical thermometry for warm springs and boiling springs differs
- TNa-K temperatures much higher than Tqtz temperatures.
- Major cation concentration in warm mixed waters are interpretated to be due to leaching.
- Assuming fluid mineral equilibrium may not be correct and this gives unrealistic geothermometry temperatures.

CONCLUSIONS

- The borehole waters in Paka are mixed bicarbonate-chloride type which could have derived from sediment deposits and evaporate processes.

- The solute geothermometry temperatures of NaK, Na-Ca-K and quartz show high discrepancy. Assumptions of equilibrium between mineral and water may not be correct.

- Mixing trends suggest the borehole waters mix from waters in Chemlingot to waters in Kokwototo.

THANK YOU