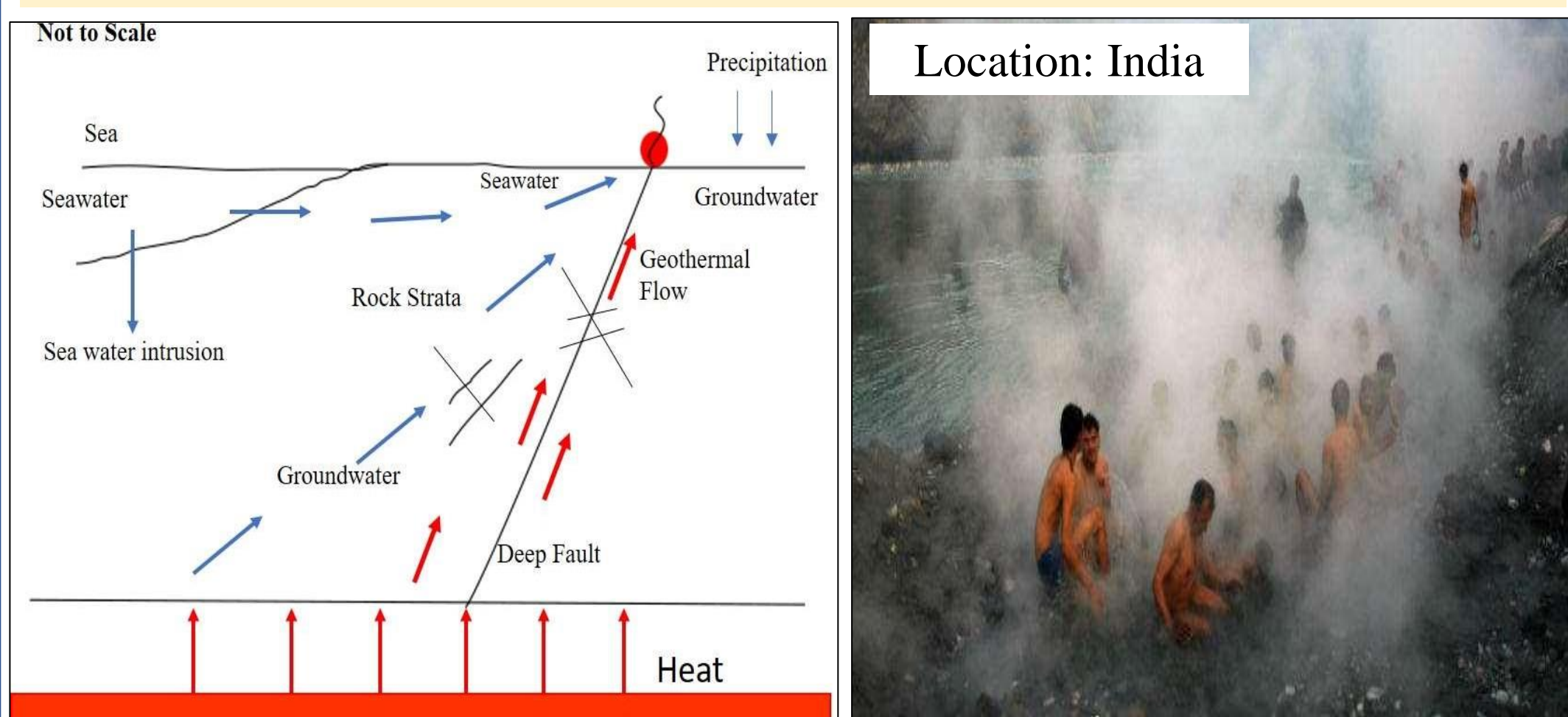
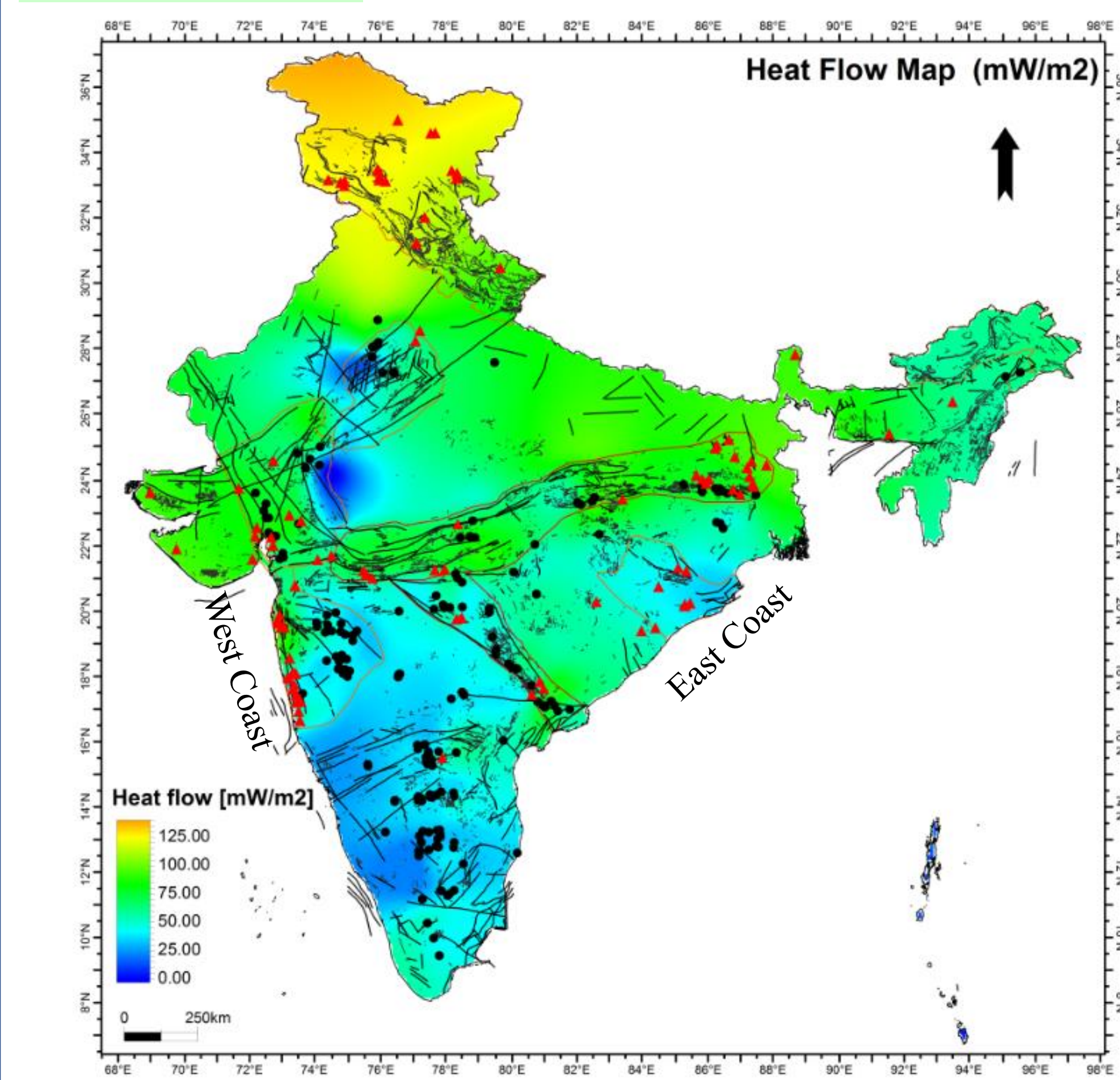


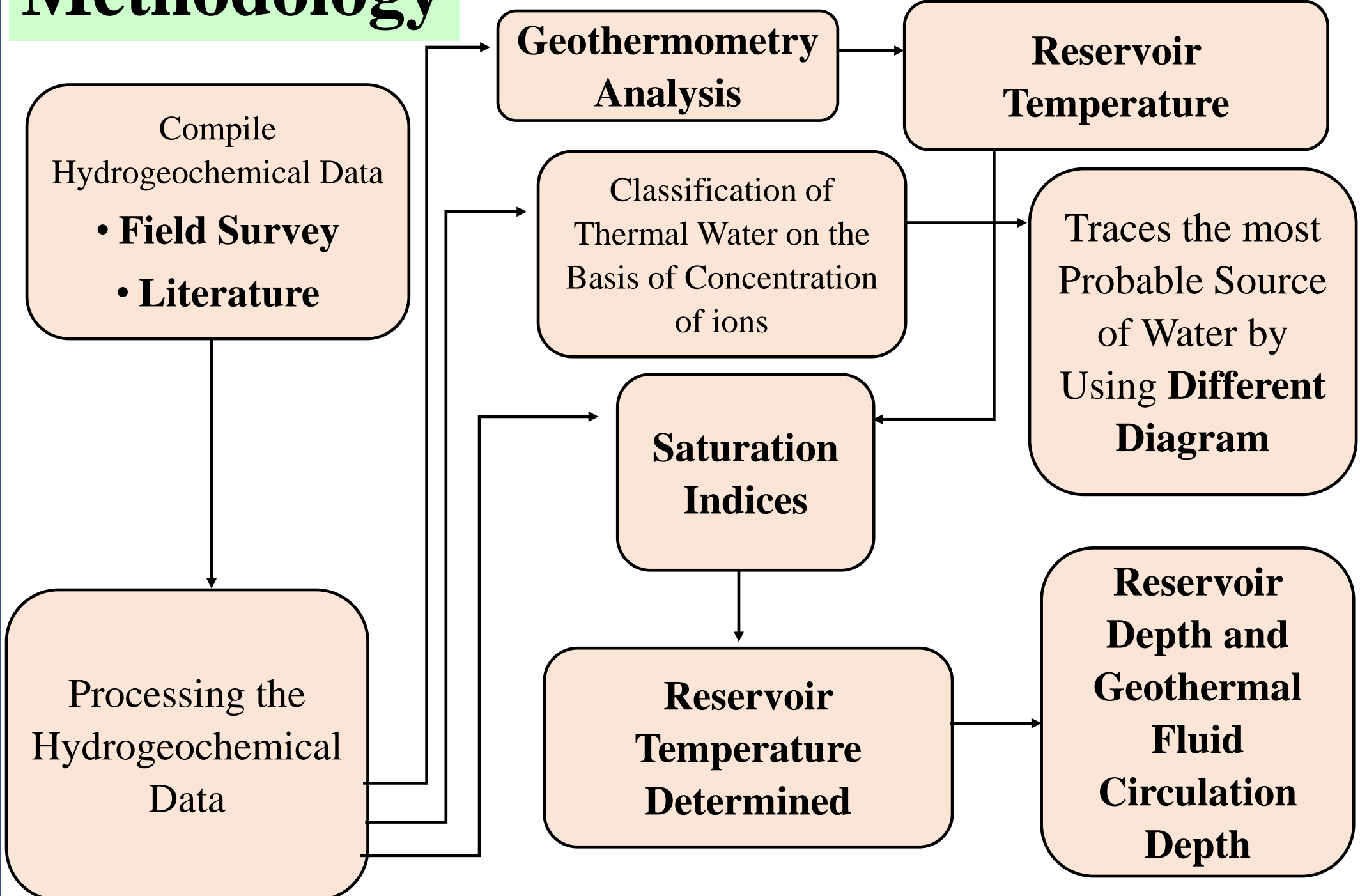
**Introduction:** The Geological Survey of India (GSI) (Oldham, 1882), has identified more than 400 hot-springs in India. In this study, we estimate reservoir depth, temperature and geothermal fluid circulation depth of the hot springs located in the East Coast and West Coast of India.



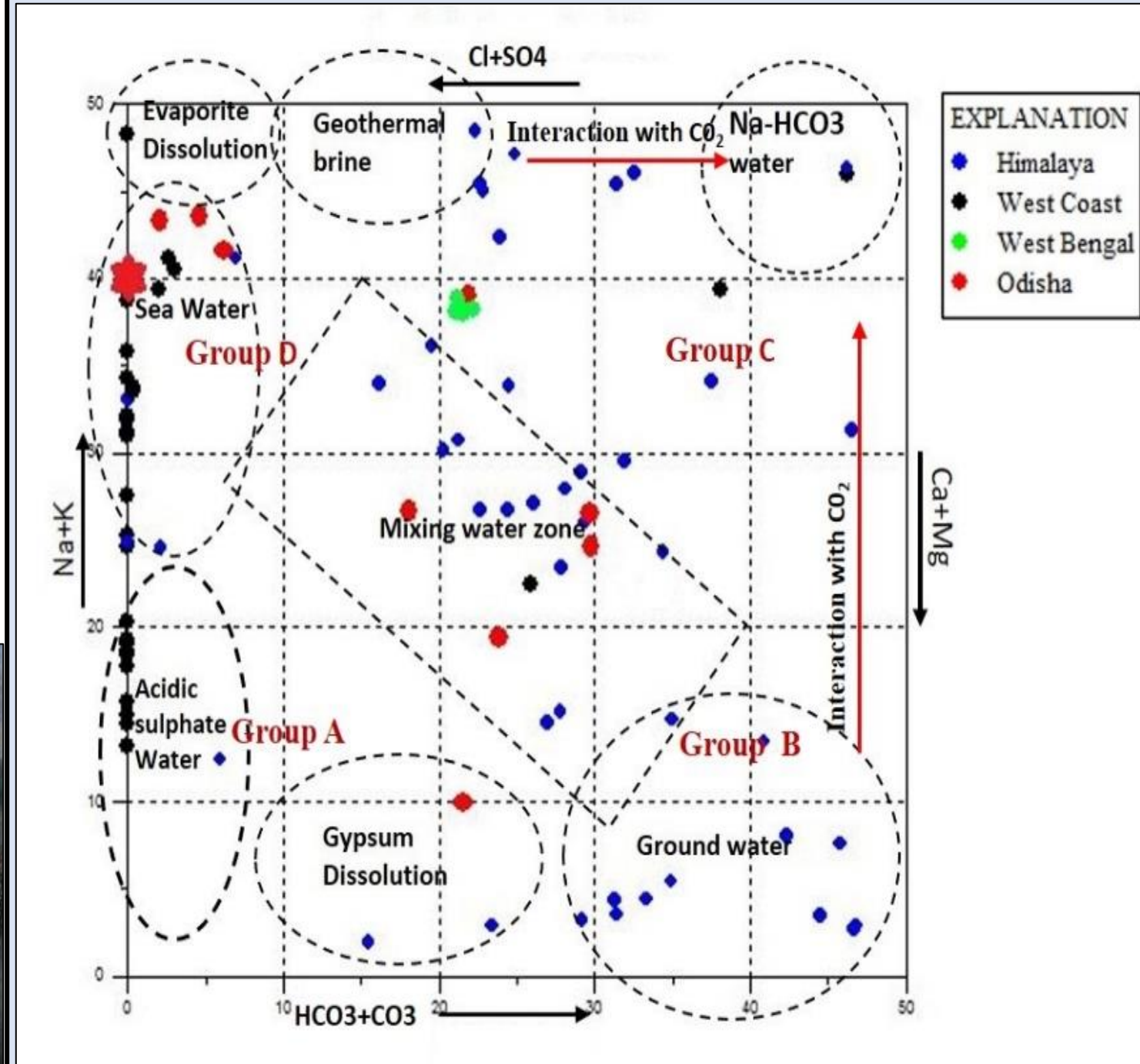
**Study Area**



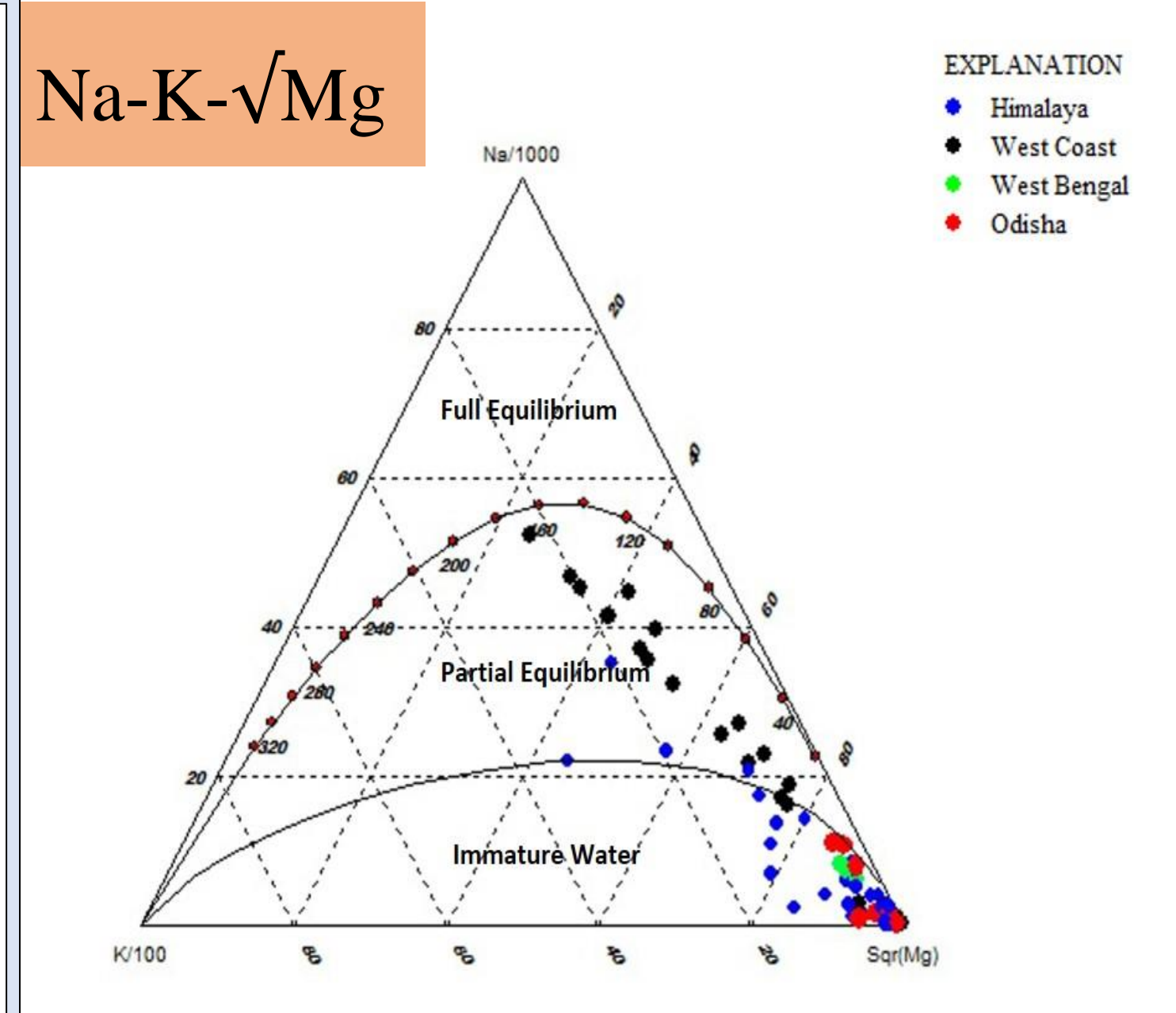
**Methodology**



**Geochemical Analysis**



Langelier & Ludwig (1942)



Thermal water are of immature water type.

Group-A: CaSO<sub>4</sub> Group-B: Ca-HCO<sub>3</sub> Group-C: Na-HCO<sub>3</sub> Group-D: Na-Cl

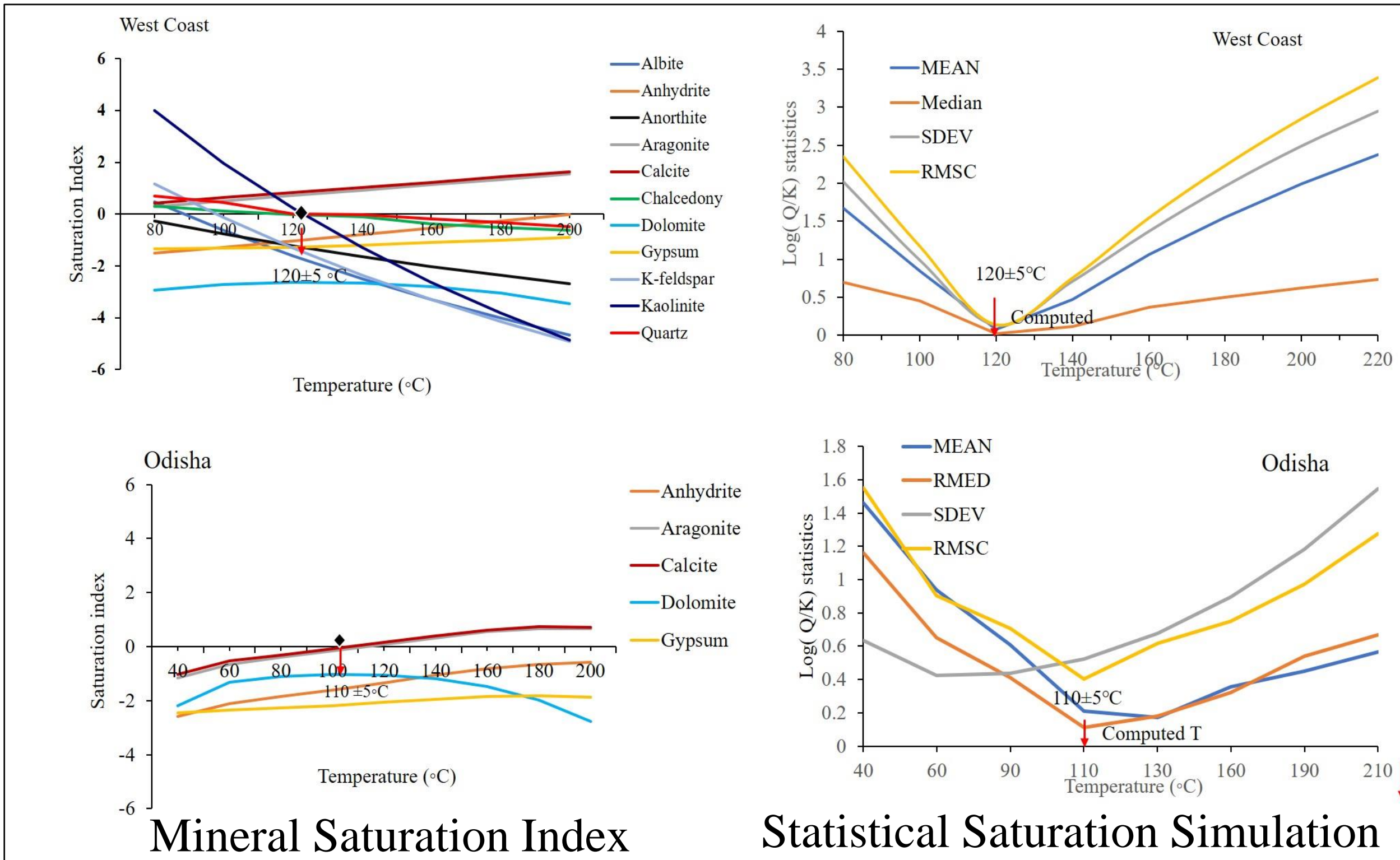
**Geothermometry Methods**

- ❖ Quartz Geothermometer (Fournier and Potter, 1982)  
 $T (^{\circ}C) = -42.198 + 0.29S - 3.668 \times 10^{-4} - 4S^2 + 3.167 \times 10^{-7}S^3 + 77.034 \log S$
- ❖ Na-K-Ca Geothermometer (Fournier and Truesdell, 1973)  
 $T (^{\circ}C) = \frac{1647}{\left[ \left( \log \frac{Na}{K} + \beta \log \frac{Ca^{0.5}}{Na} + 2.06 \right) + 2.47 \right]} - 273$
- ❖ Na-K Geothermometers (Truesdell, 1976)  
 $T (^{\circ}C) = \frac{856}{\left\{ 0.857 + \log \frac{Na}{K} \right\}} - 273$
- ❖ Na-K Geothermometers (Giggenbach, 1988)  
 $T (^{\circ}C) = \frac{1390}{1.75 + \log \frac{Na}{K}} - 273$

**Note:** S(Si<sub>2</sub>O<sub>2</sub>), Na, K, and Ca concentrations are in ppm).

Place	Estimated	Na-K-Ca	Na/K (T)	Na/K (G)	Si <sub>2</sub> O <sub>2</sub>
West Coast	Reservoir temp	93.2	117.7	177	133.3
	S. D	13.7	33.2	25.6	13.1
	Reservoir Depth	1.16	1.81	3.39	2.23
Odisha	Reservoir temp	107.1	154.4	204	-
	S. D	31.59	78.16	59.37	-
	Reservoir Depth	1.39	2.29	3.16	-
	S. D	0.344	0.57	0.81	-

**Reservoir Temp. from Mineral Saturation Index**



**Reservoir Depth**

where, "h" is the reservoir depth (km), "t<sub>1</sub>" is the estimated reservoir temperature (°C) using SI, "t<sub>0</sub>" is the average temperature, "γ" is the average geothermal gradient (°C/km); "G" is the reciprocal of the geothermal degree, and "H<sub>0</sub>" is the geothermal atmospheric temperature zone depth

Location	Av. Discharge Temp (°C) (±0.5°C)	Av. Reservoir Temp (°C)	Av. Gradient (°C/Km)	Reservoir Depth (Km)	H (Km)
West Coast	49.68	120±5	44±20	1.71±0.38	1.74±0.38
Odisha	48.38	110±2	45±20	1.37±0.32	1.41±0.32

**Conclusions**

- The reservoir temperatures for the west and east coast springs, are found to be 120±5°C and 110±5°C.
- The reservoir depths and geothermal fluid circulation depths are estimated to be 1.71 ±0.17km and 1.37±0.32km, respectively.

**Reference**

- Goswami, Susmita, Abhishek K. Rai, and S. Tripathy. "Re-visiting geothermal fluid circulation, reservoir depth and temperature of geothermal springs of India." *Journal of Hydrology* 612 (2022): 128131.
- Goswami, S. and Rai, A.K., 2022. Estimating suitability of groundwater for drinking and irrigation, in Odisha (India) by statistical and WQI methods. *Environmental Monitoring and Assessment*, 194(7), p.502.