A Multivariate Statistical Approach for Groundwater Classification along the Virunga Volcanic Range and the Northern Kivu Rift Area, Rwanda
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The samples from the study area were classified (HCA) as

- Thermal groundwater mixed with surface water (Group 1),
- Young groundwater (Group 2) and
- Old cold groundwater water mixed with surface water (Group 3).

PCA showed that the HCO$_3$ values exhibited high positive correlation with K, EC, Mg, Ca, and SiO$_2$ probably associated with rock-fluid interaction in the region. On the other hand, Na displayed strong positive correlation with, Cl, B and SO$_4$, possibly related to a common natural process such as geothermal activity.

The results of this study clearly demonstrate that multivariate methods offer significant improvement for integrated characterization of groundwater types and mixing trends deciphering for geothermal resource exploration and development.