

Functioning of the Katari-Lago Menor Basin aquifer, Lake Tititica-Bolivia, inferred from geophysical, hydrogeological and geochemical data

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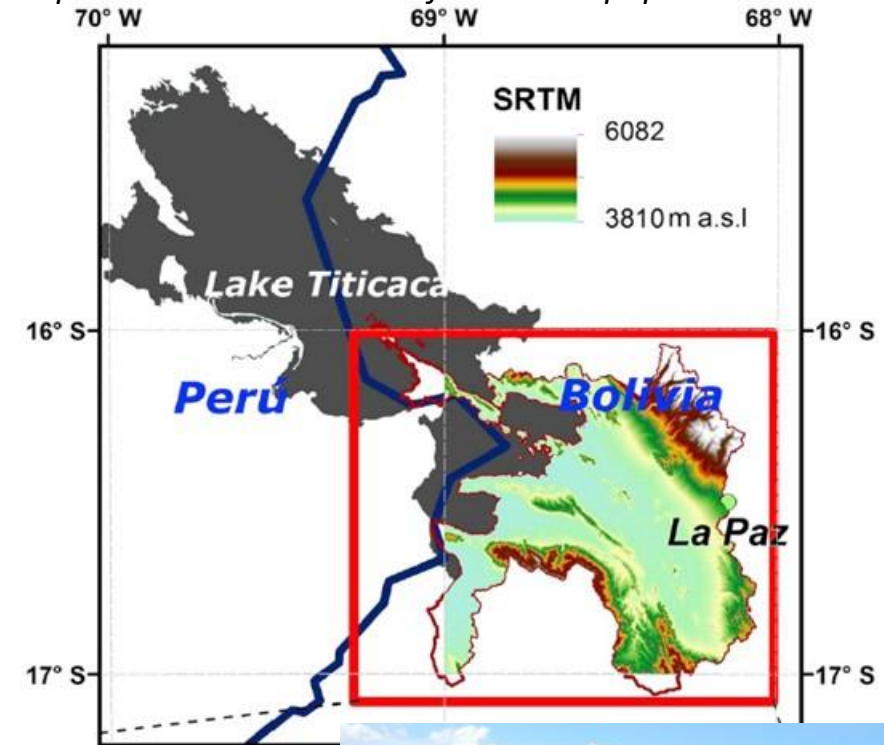
Study region

High altitude: 3800-6000m

Semi arid climate:

Rain \cong 600mm and ETP \cong 1200m

Geology: Tertiary and Devonian Rocks,
Quaternary deposits (Glacial, fluvial and
lacustrine)



... and Data

Previous information on
geology and hydrogeology

Time Domain Electromagnetic
(TDEM) : 190 Soundings

Groundwater level
measurements: 97

Groundwater analysis (52):
major ions



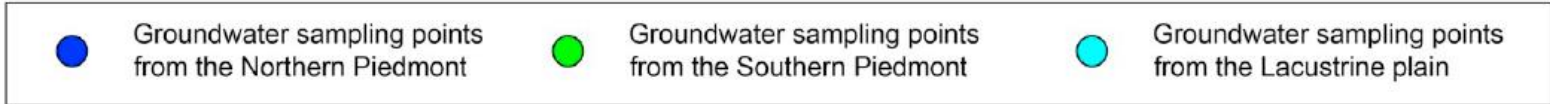
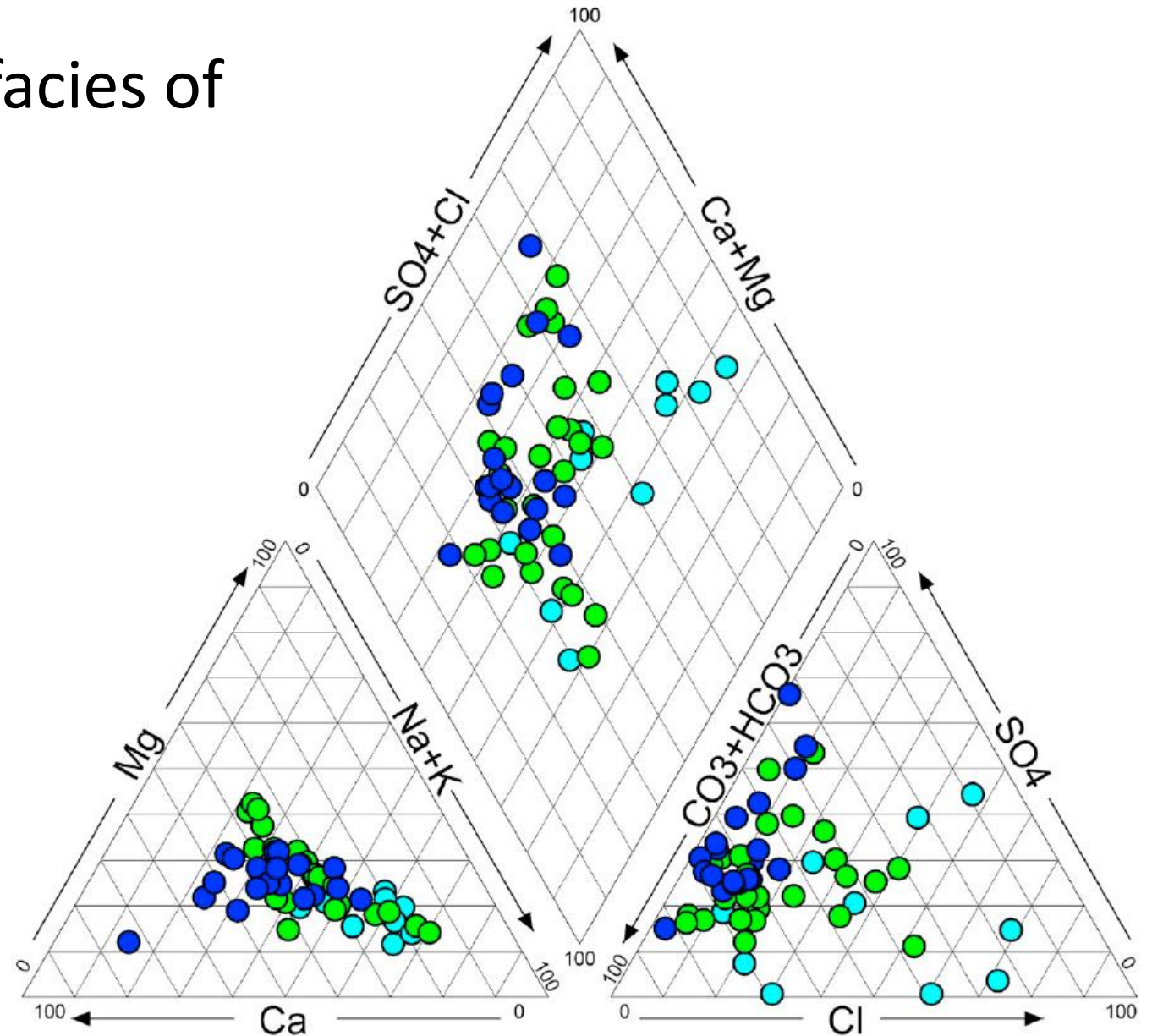
Piper diagram : geochemical facies of groundwater

Piedmont subsystem:

Groundwater circulating in the Piedmont layers (Qg, Qfg, Qaa) show bicarbonate dominance with an enrichment of: i) *Ca(Mg)* facies relative to *Na(K)* facies with EC ~63-250 μ S/cm, and ii) *Na(K)* relative to *Ca(Mg)* facies with EC~251-500 μ S/cm (groundwater mixing).

Lacustrine plain:

The groundwater flow mixes the evaporite enriched water of lacustrine origin, *Na(K)* is released. Relatively high HCO_3 and SO_4 concentrations nearby the outcropping bedrock



Groundwater flow map

Main groundwater flow system:

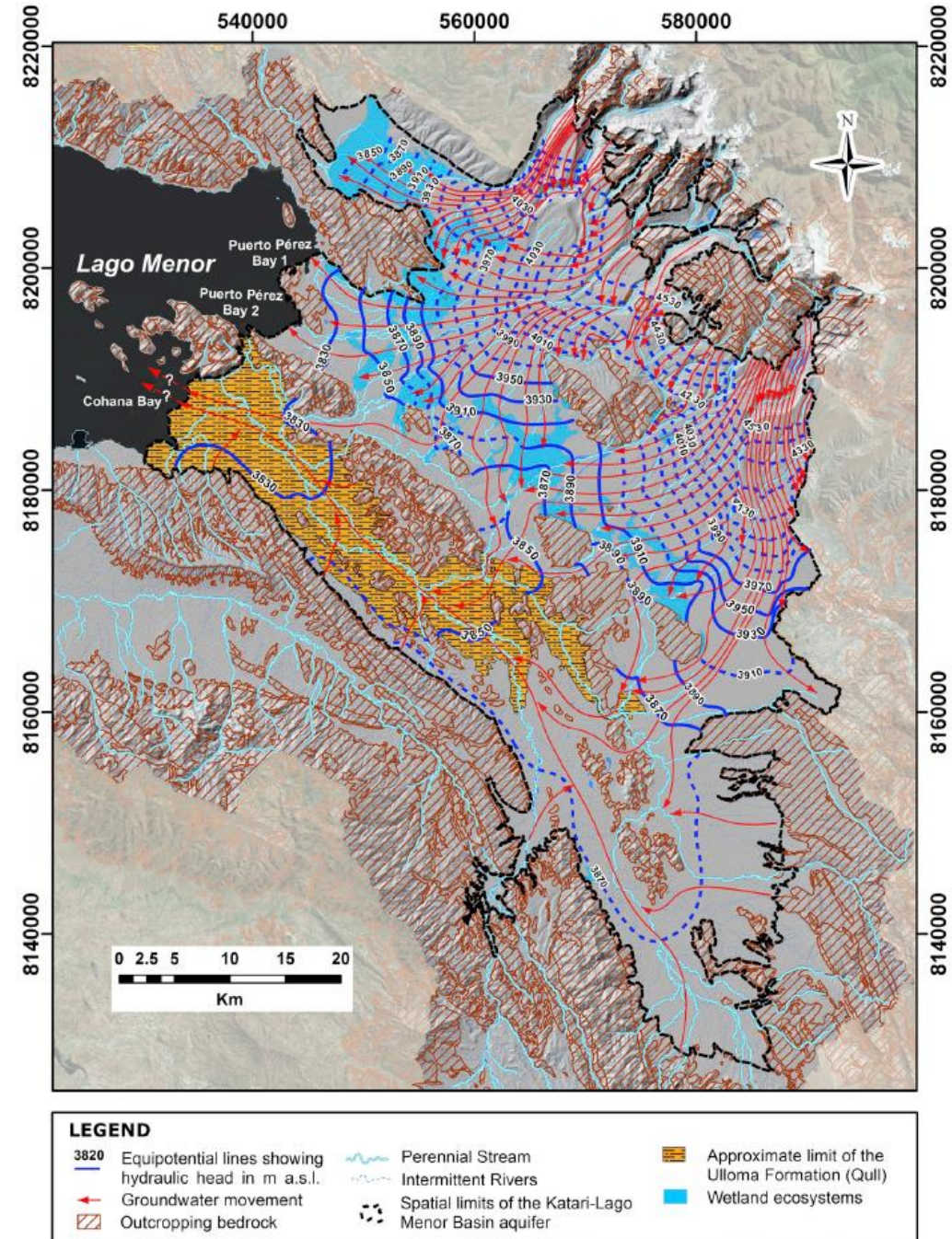
From the upper Piedmont, following the topography towards the SW. Part of the groundwater flow reaches the Lacustrine plain and follows the SE-NW topographic gradient towards Lake Titicaca (Cohana Bay).

Groundwater discharge:

In the Puerto Perez Bay or Cohana Bay. Part of the flow is constrained against outcropping rock formations between the Piedmont subsystem and Lacustrine plain, resulting in the formation of wetlands, where water evaporates.

Groundwater recharge:

Most groundwater recharge results from the infiltration of precipitation and runoff on the high mountain ranges.



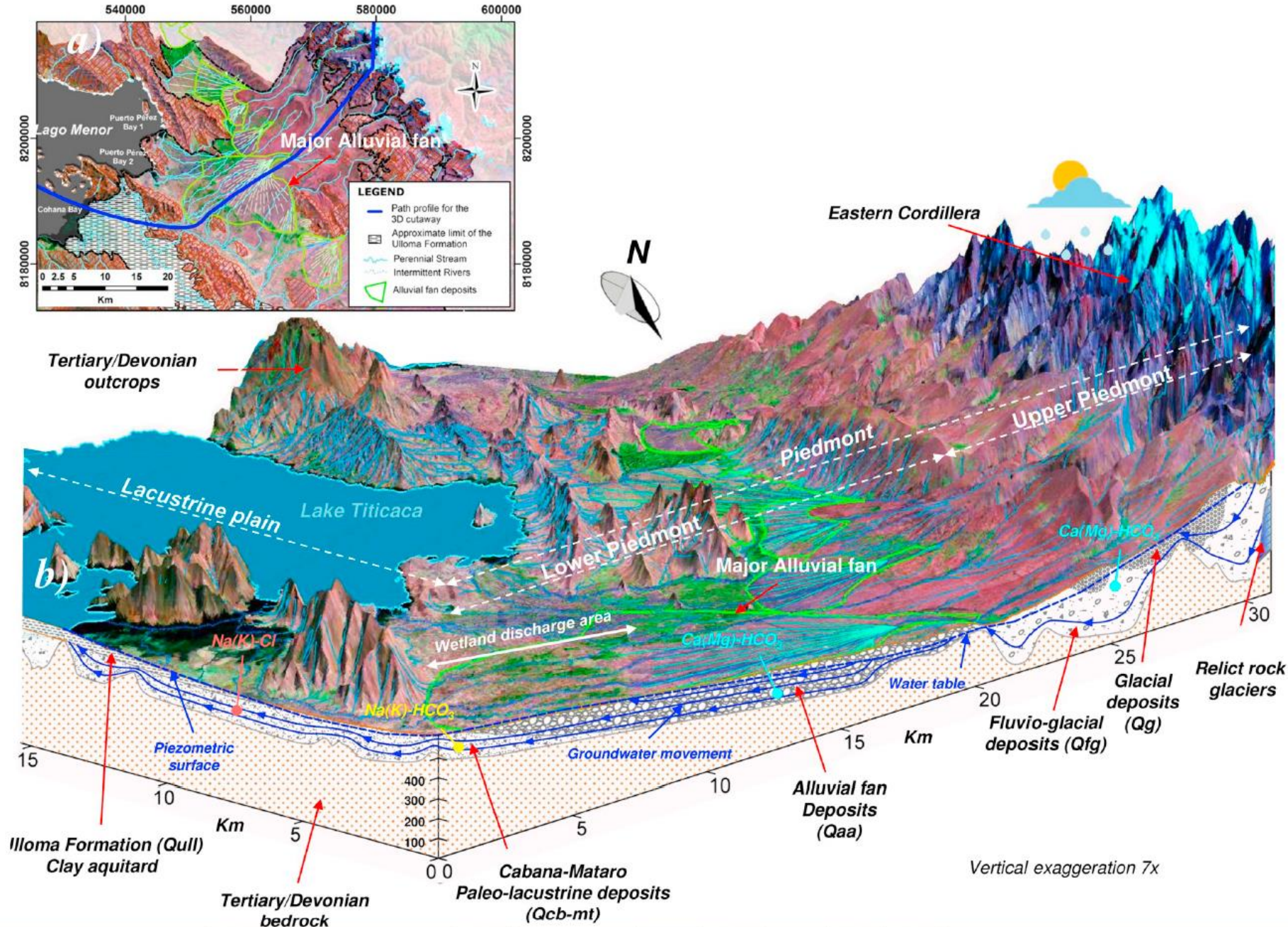
Conceptual model

Preliminary study compiling:

- ⇒ Geometrical extension (vertical and lateral)
- ⇒ Main water flow system
- ⇒ Limit conditions
- ⇒ Main geochemical processes during groundwater flow

Next step:

Development of a 3D numerical groundwater flow model to improve the understanding of the whole groundwater flow system



References

Flores Avilés G. P., Descloitres M., Duwig C., Rossier Y., Spadini L., Legchenko A., Soruco A., Argollo J., Pérez M. P., Medinaceli W., 2020. Insight into the Katari-Lago Menor Basin aquifer, Lake Titicaca-Bolivia, inferred from geophysical (TDEM), hydrogeological and geochemical data. *Journal of South American Earth Sciences* 99,102479. <https://doi.org/10.1016/j.jsames.2019.102479>.

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