

The contribution of a multidisciplinary approach to conceptualize the structure and functioning of a complex Natural Mineral Water Glacial aquifer.

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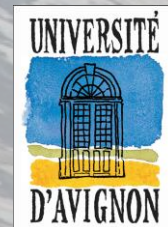
Water Institute by Evian – Danone Waters

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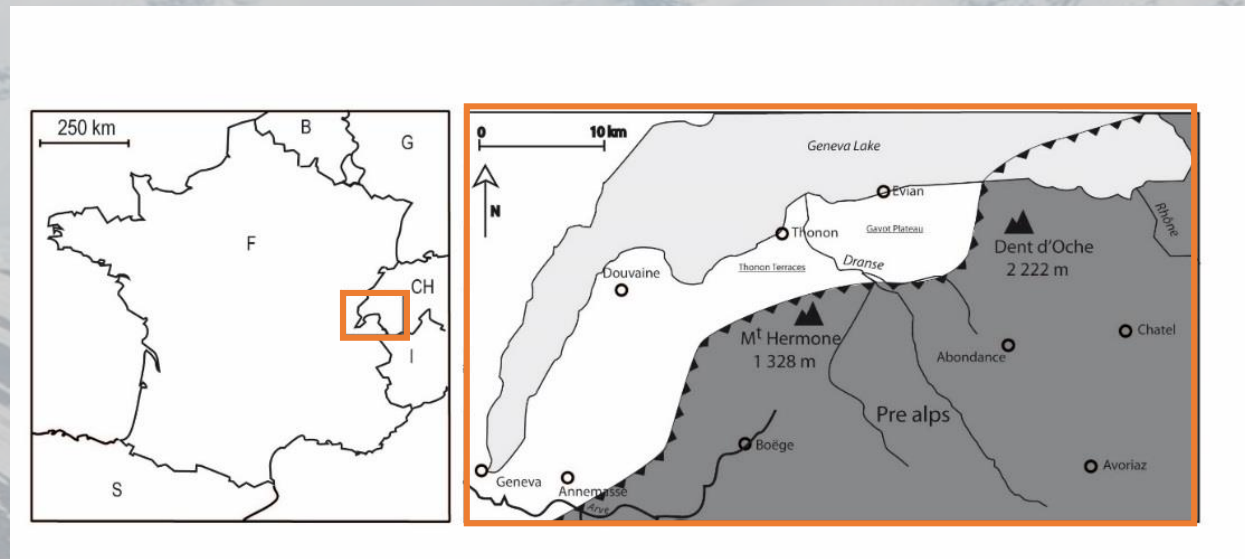
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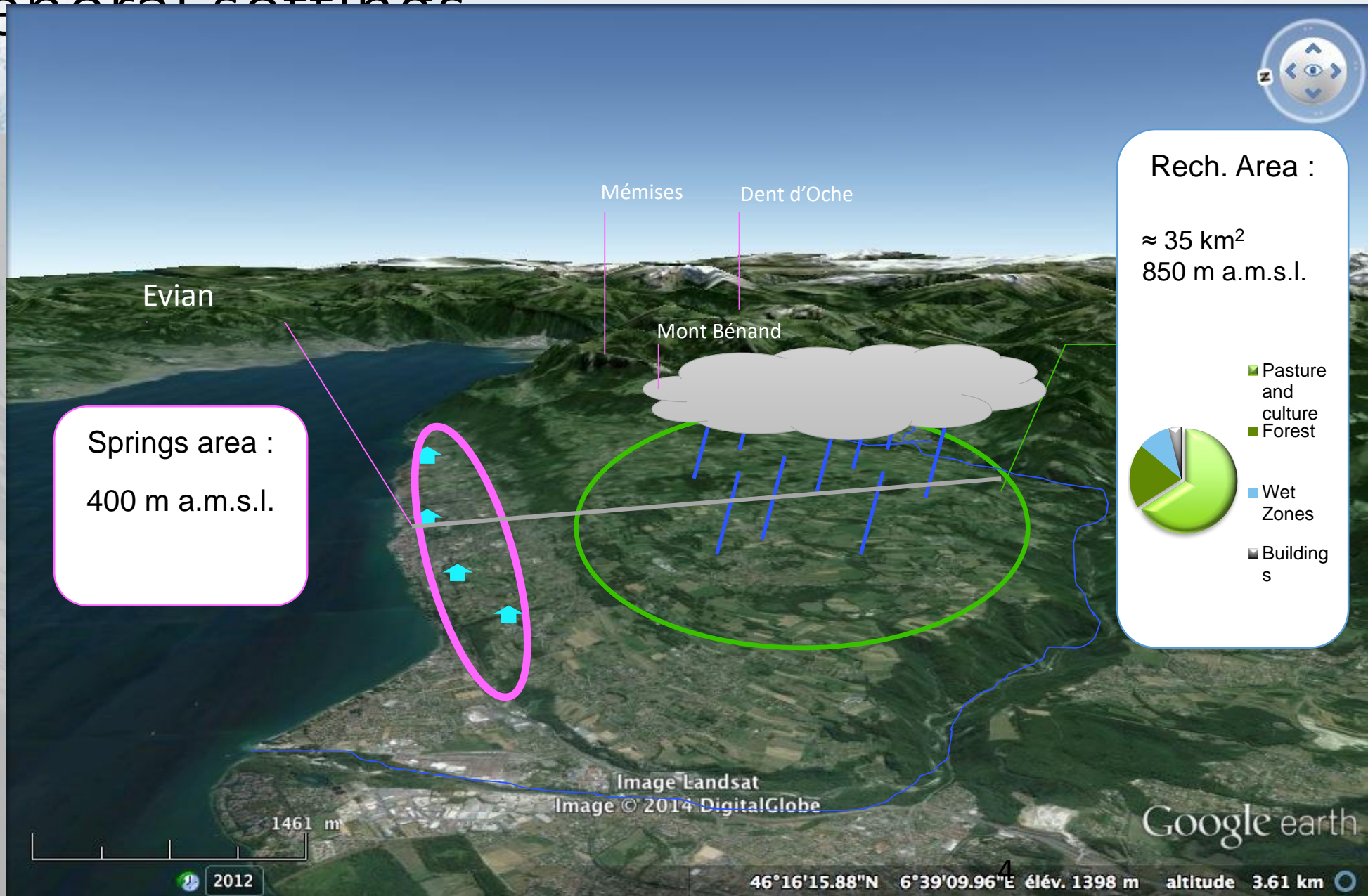
Outline

- Complex and heterogeneous site at all scales
 - Glacial deposits, high spatial variability
- Recharge area of the mineral aquifer
- Shallow aquifers in the recharge area
- Need for an hydrogeological conceptual model in the recharge area
- Highlight the need of several independent approaches

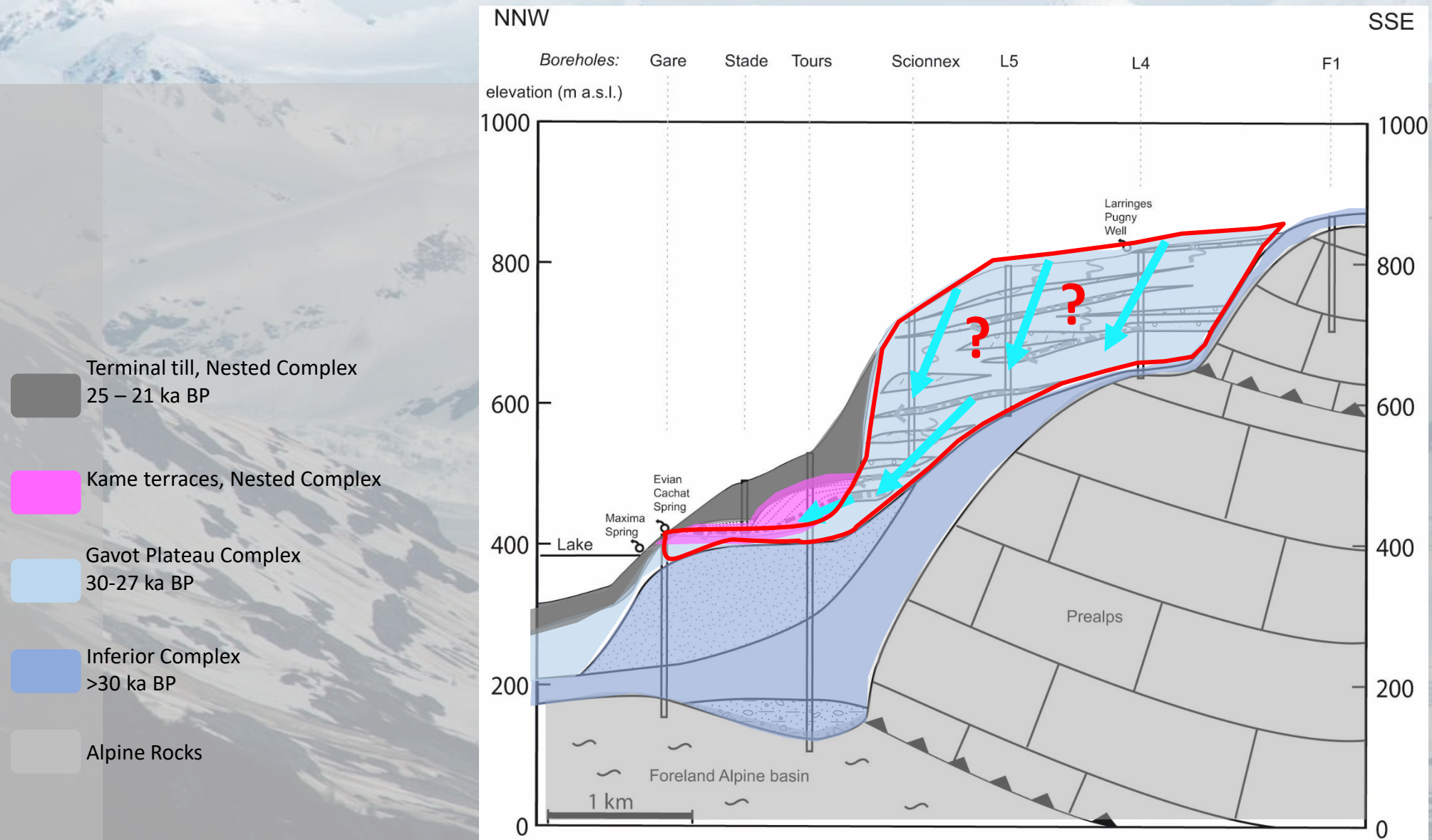
General settings



General settings



Geological settings

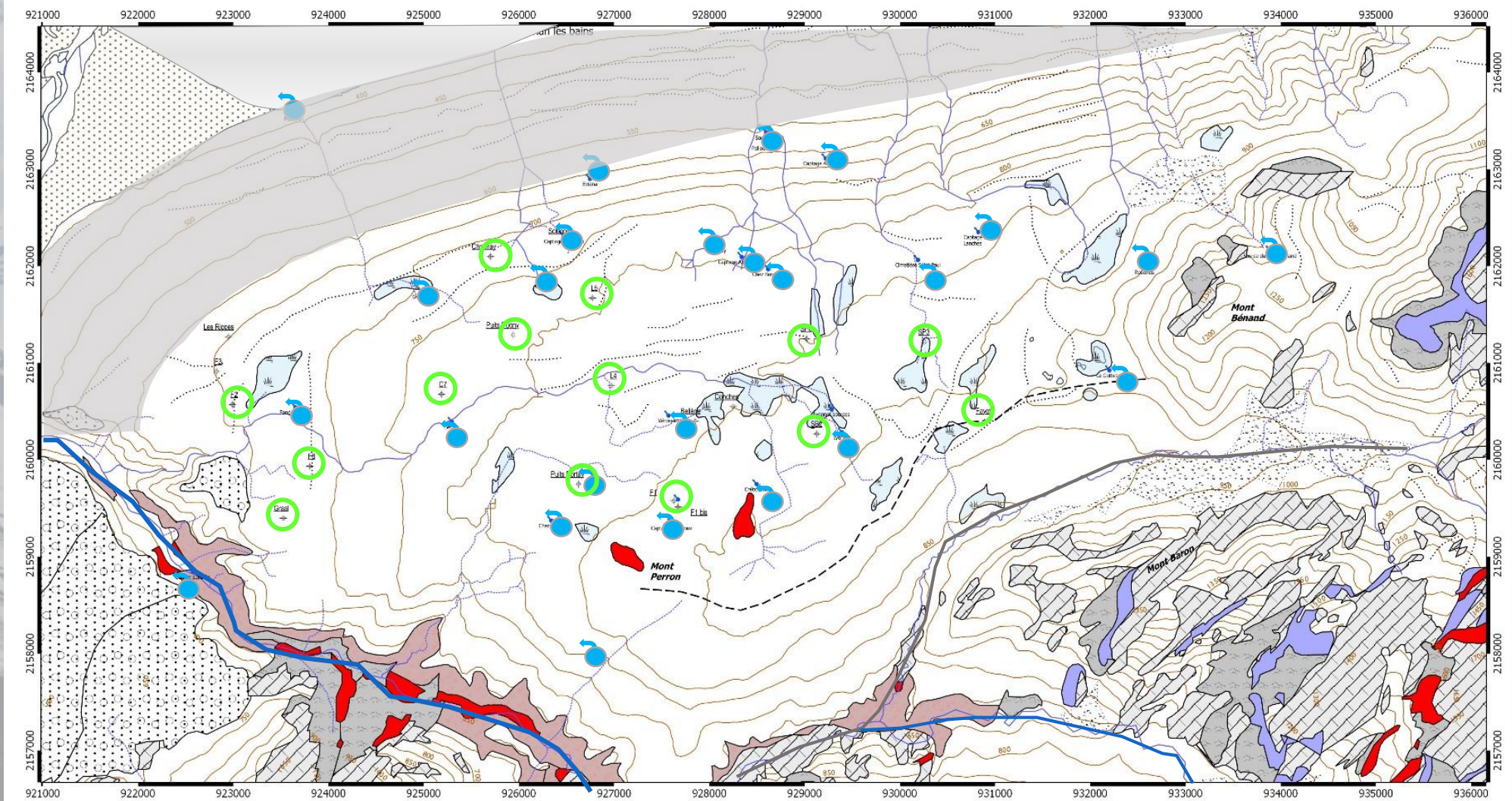


Problematic :

- Preferential recharge area / all Gavot Plateau area
- Functionning of shallow aquifers ?
- What are piezometers representativ of ?
- Flow path from the Gavot Plateau to the Evian MW aquifer

- Method :
 - Multidisciplinary approach

Shallow aquifers, springs and wells



Multidisciplinary approach

Hydrodynamique

Springs flow rate :

- measurement at low-water
- guess on the specific yield
- estimation of spring catchment : area and location/spatial extent

Multidisciplinary approach



Hydrodynamique

Springs flow rate :

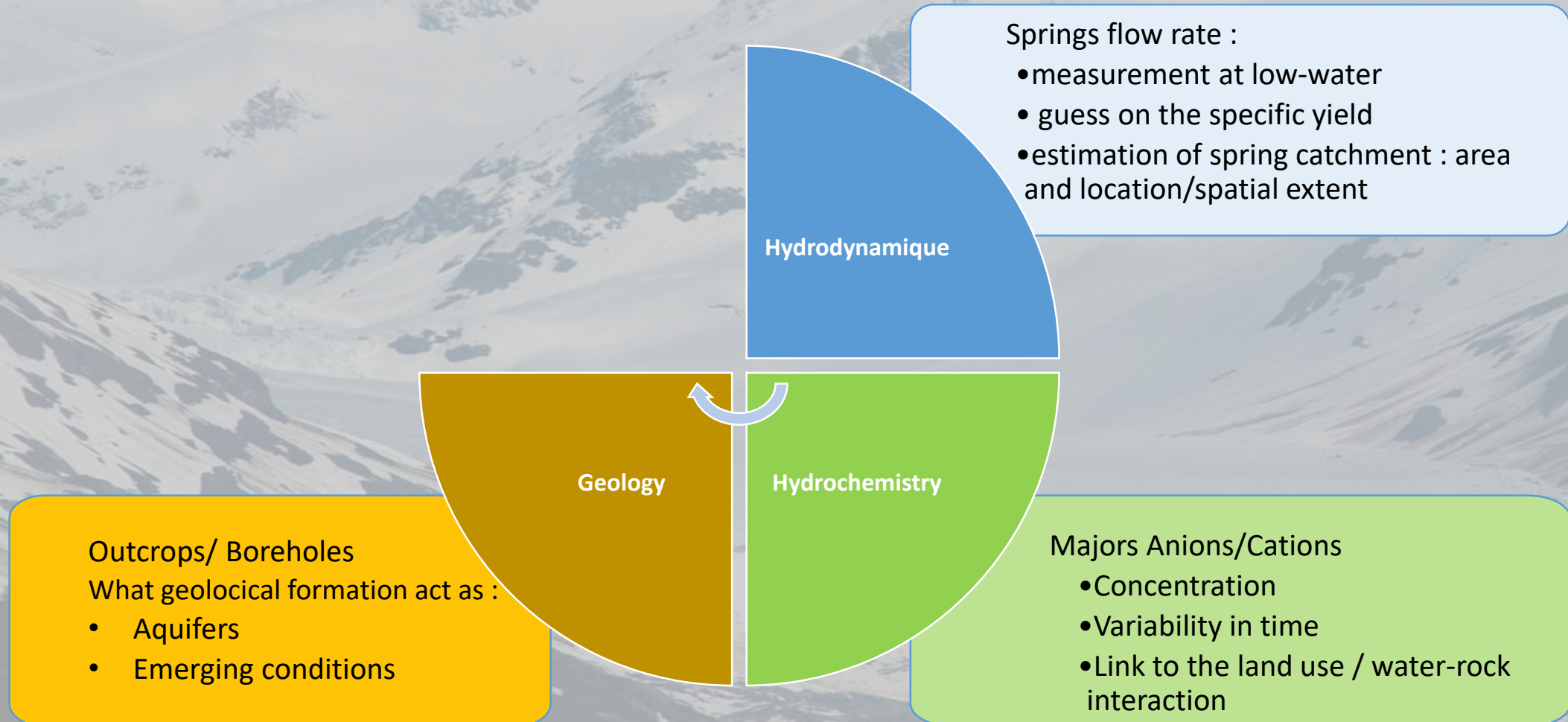
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Hydrochemistry

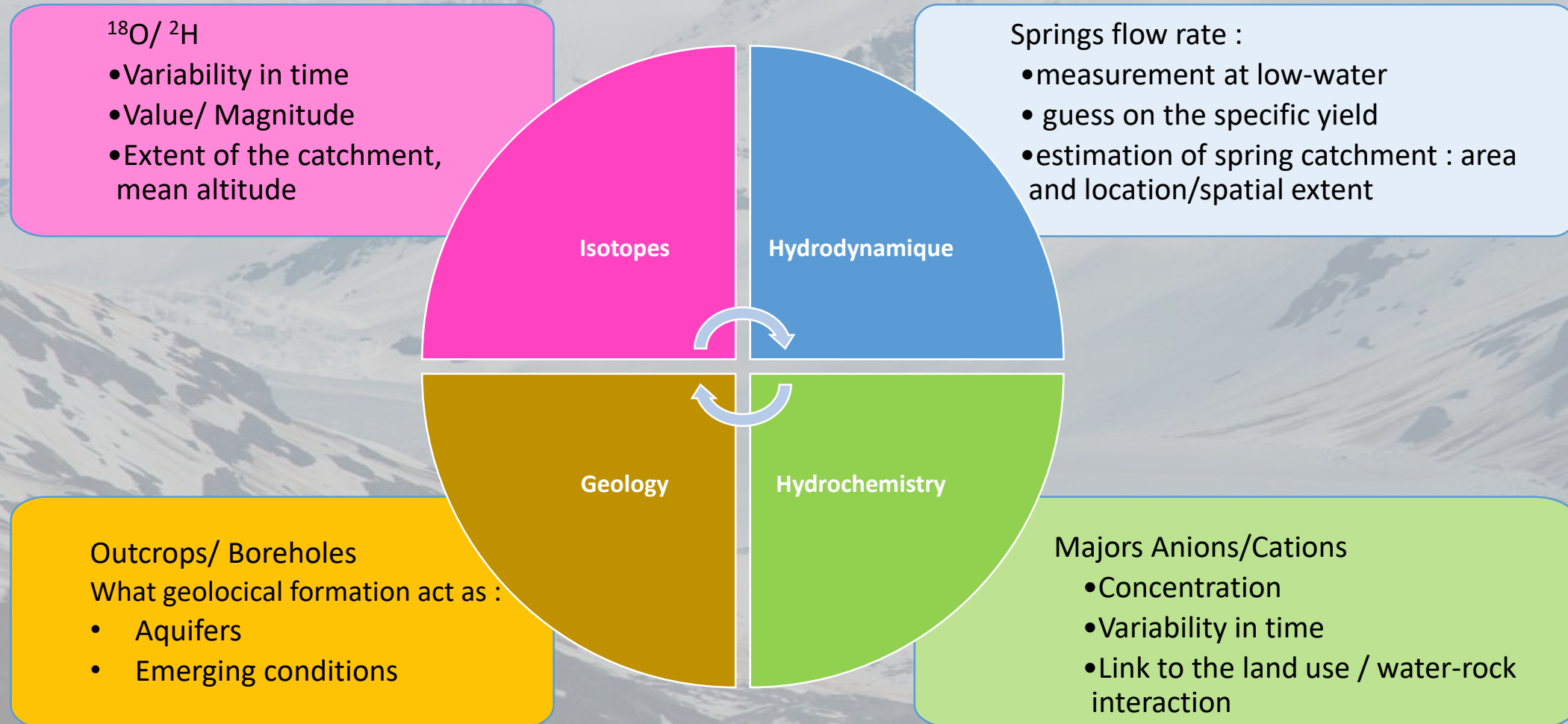
Majors Anions/Cations

- Concentration
- Variability in time
- Link to the land use / water-rock interaction

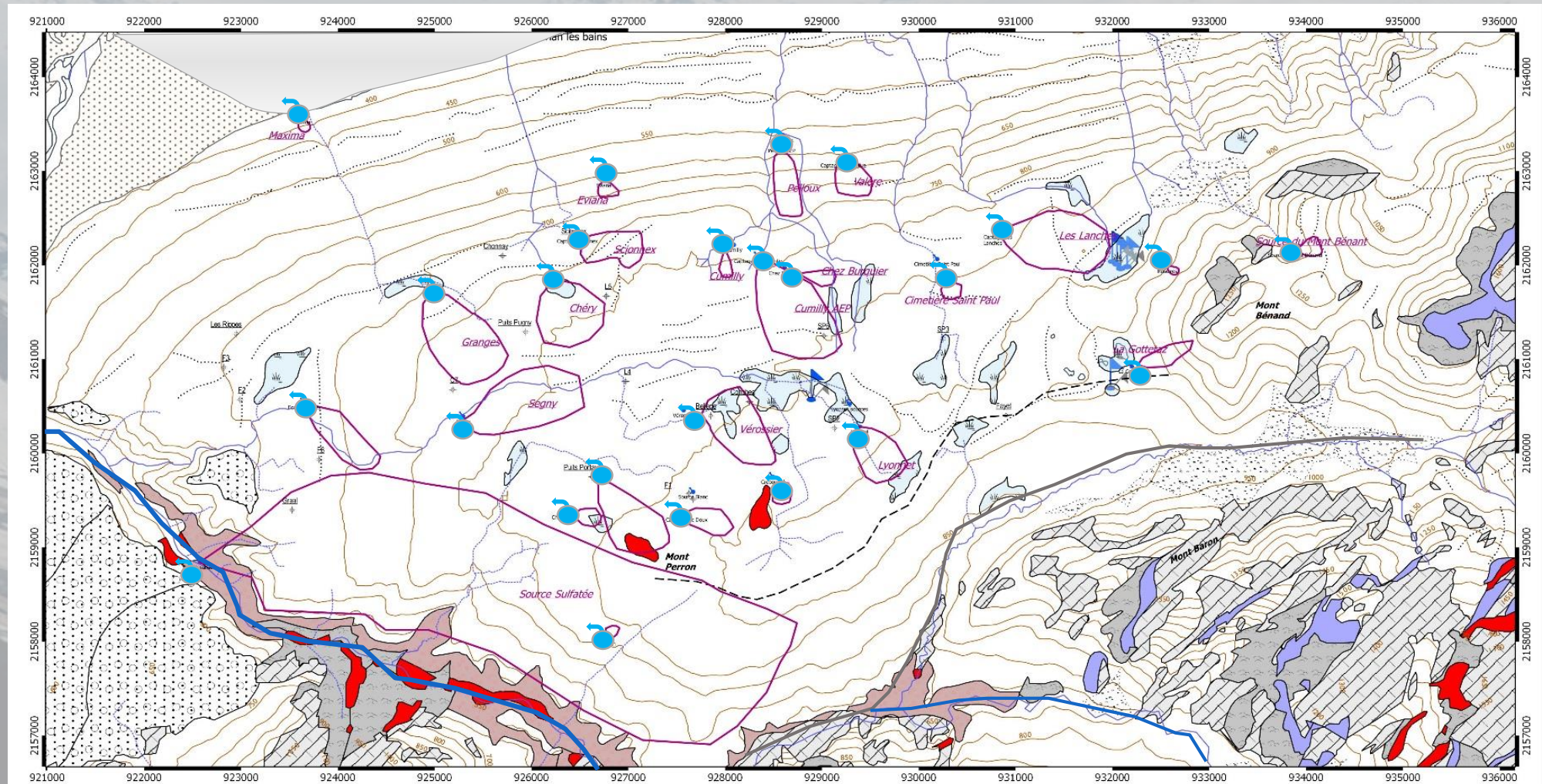
Multidisciplinary approach



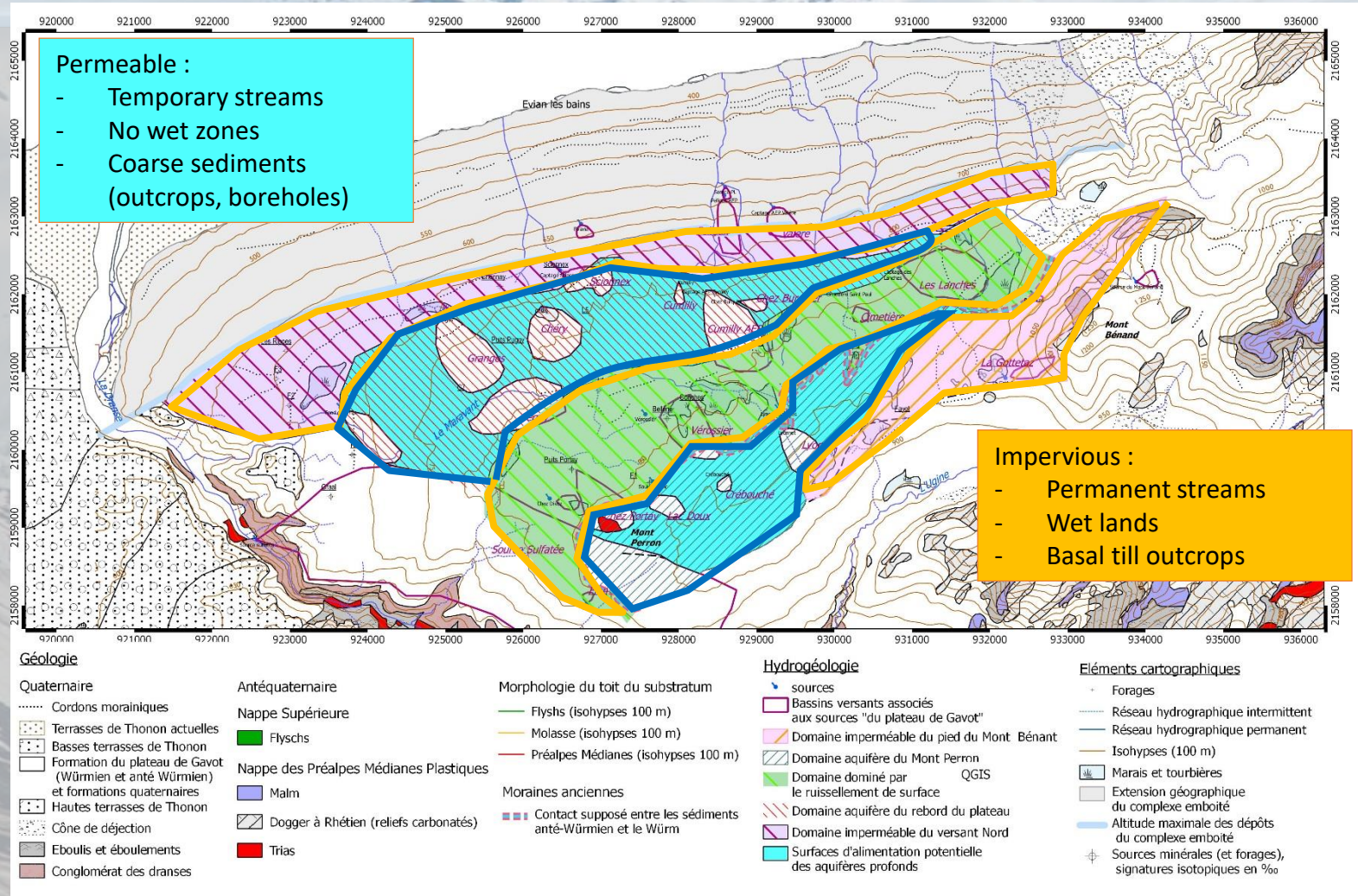
Multidisciplinary approach



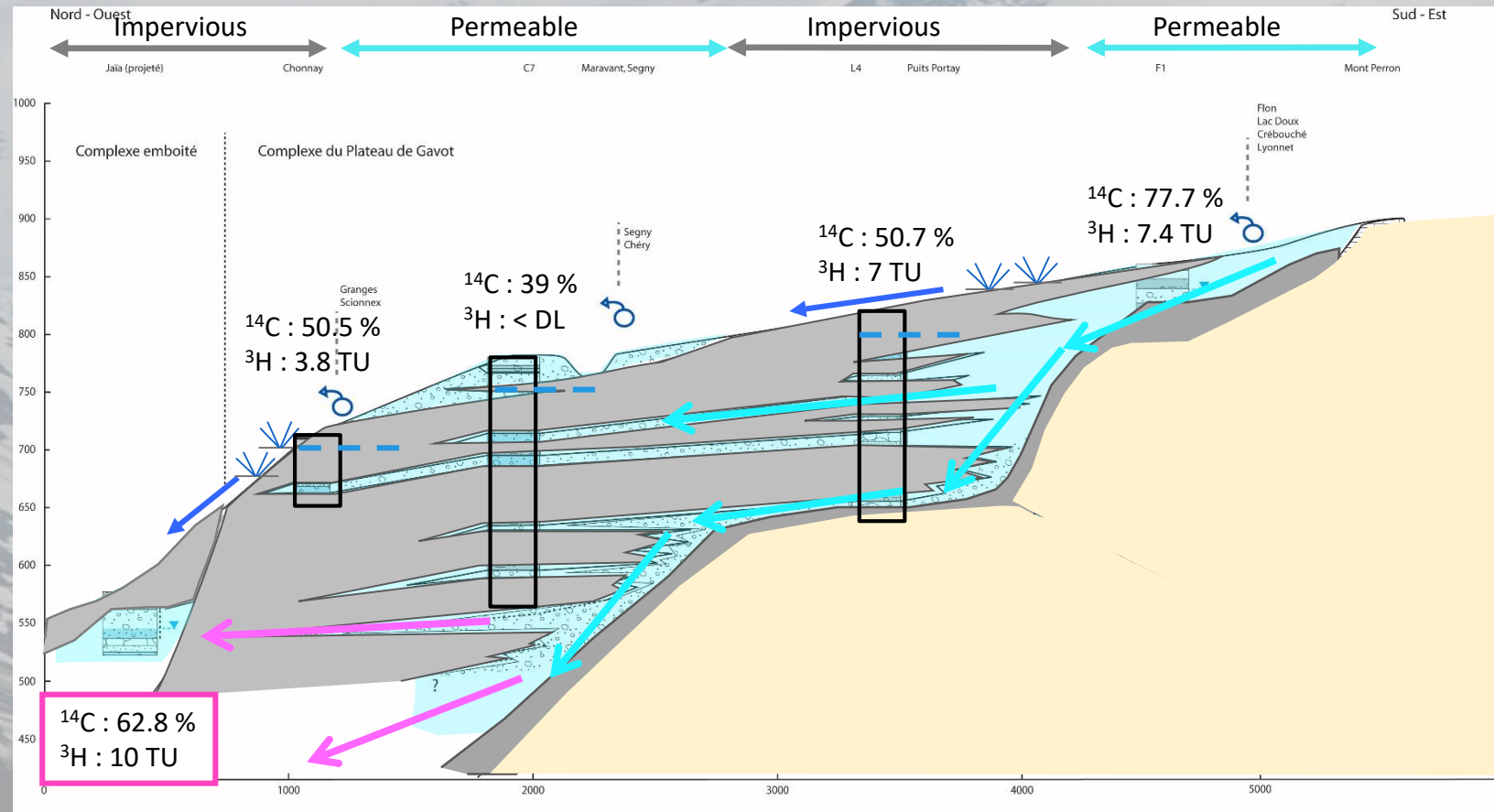
Multidisciplinary approach : springs catchments



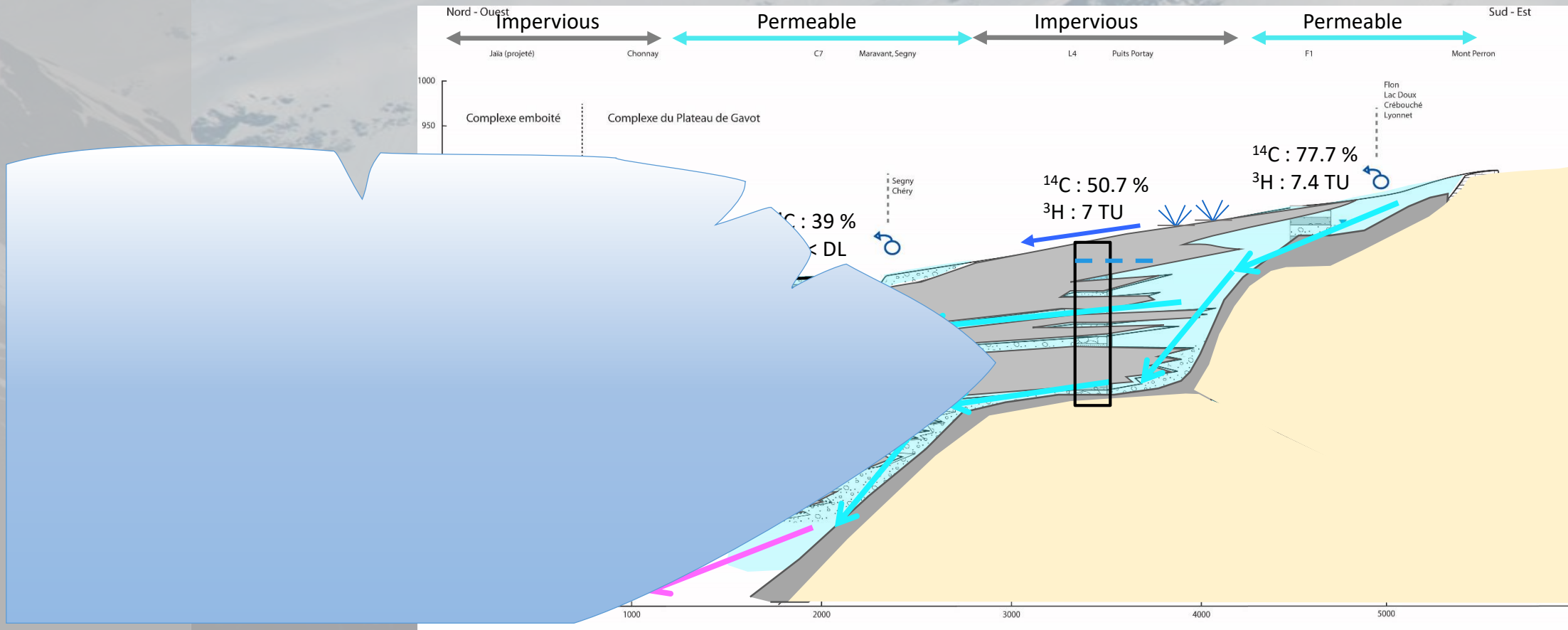
Multidisciplinary approach : link to the geology



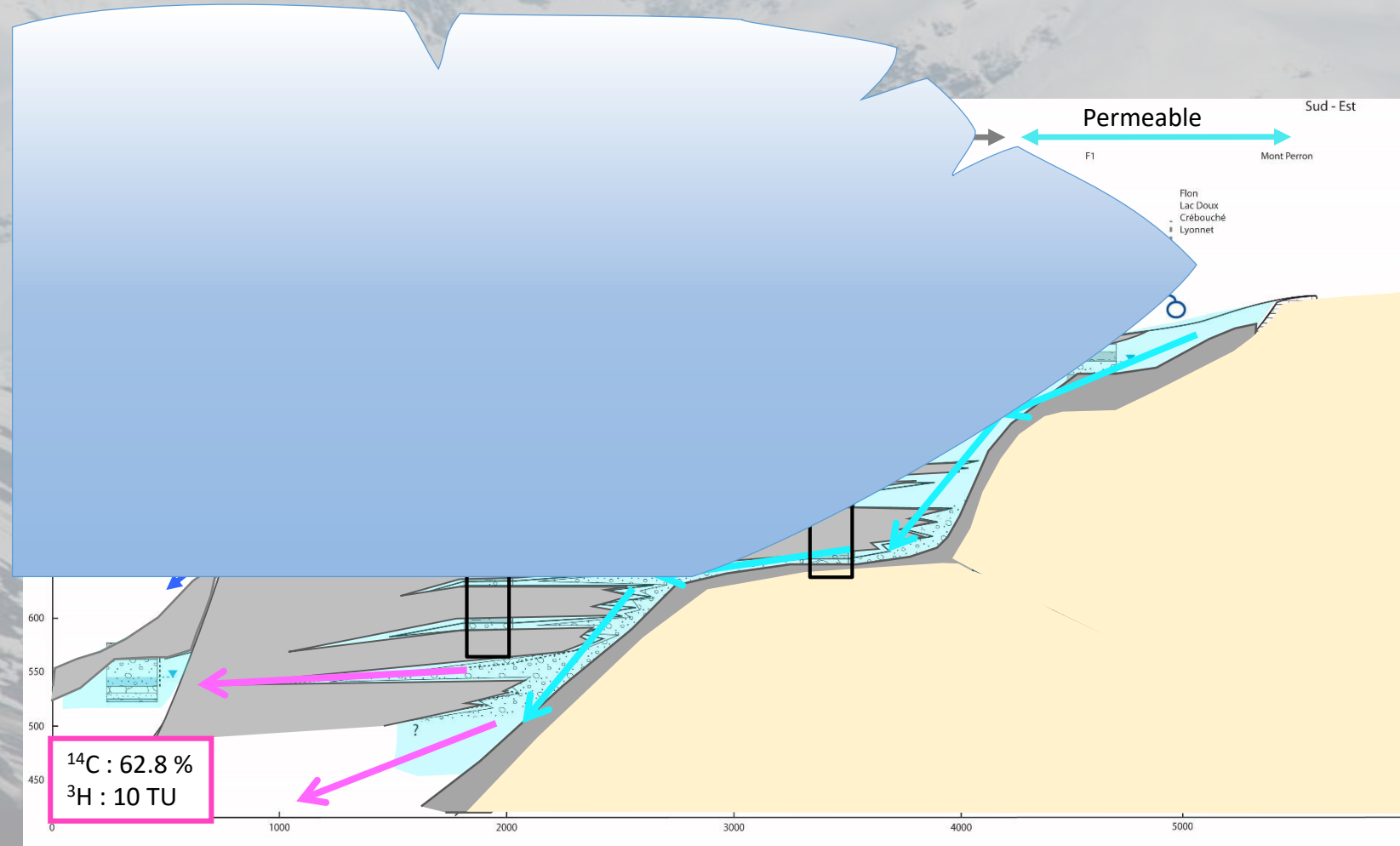
Multidisciplinary approach : link to the geology



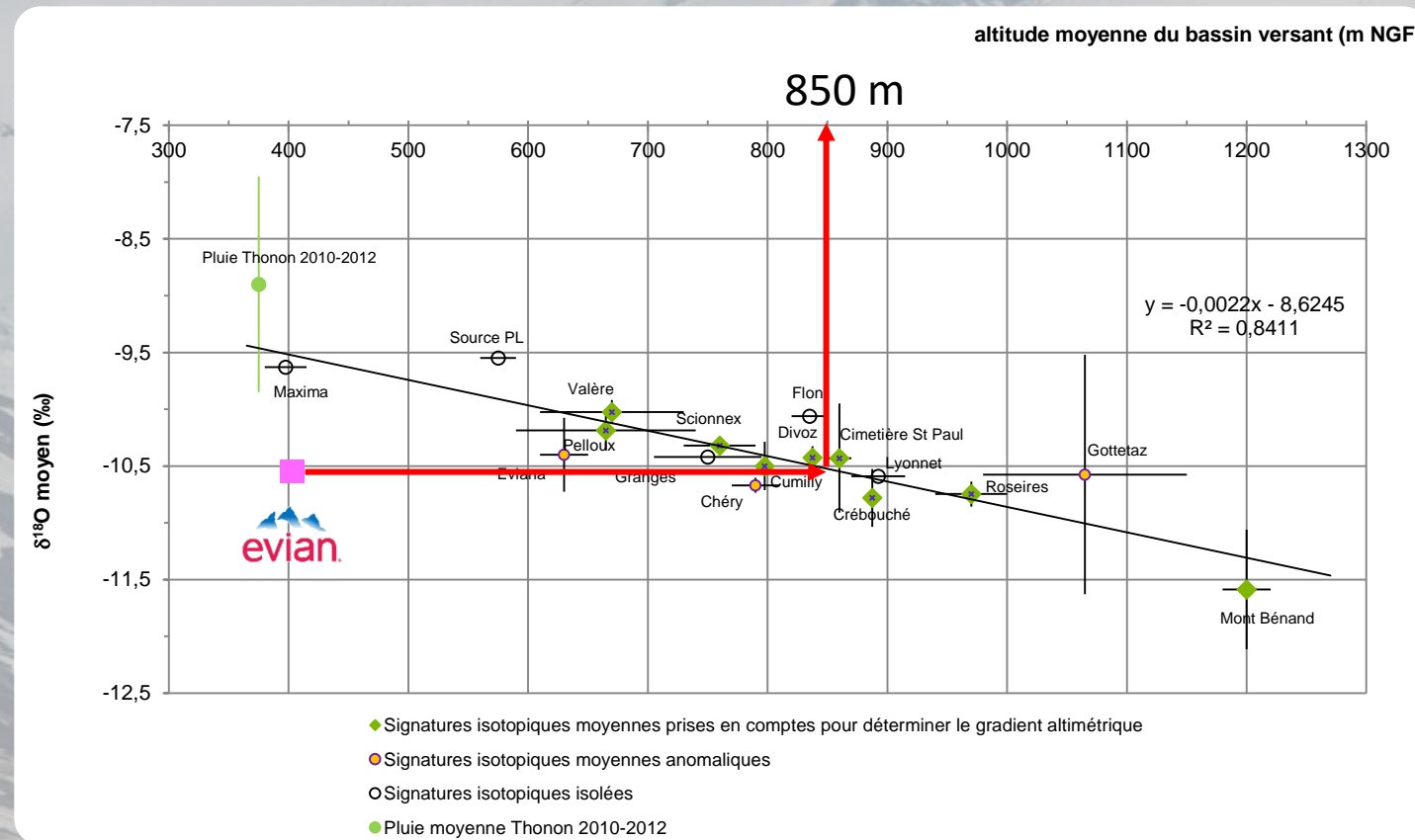
Geological interpretation and teaching



Geological interpretation and teaching

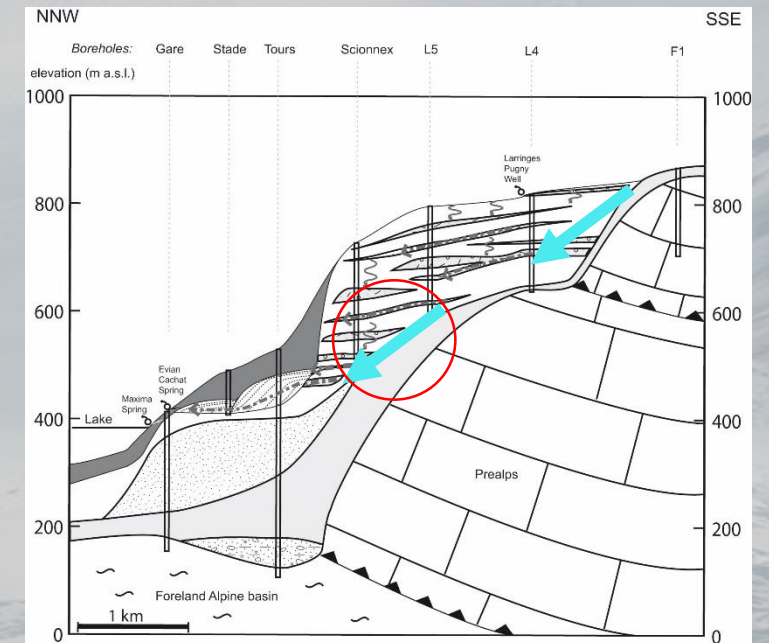


Evian NMW recharge area : confirmation from ^{18}O



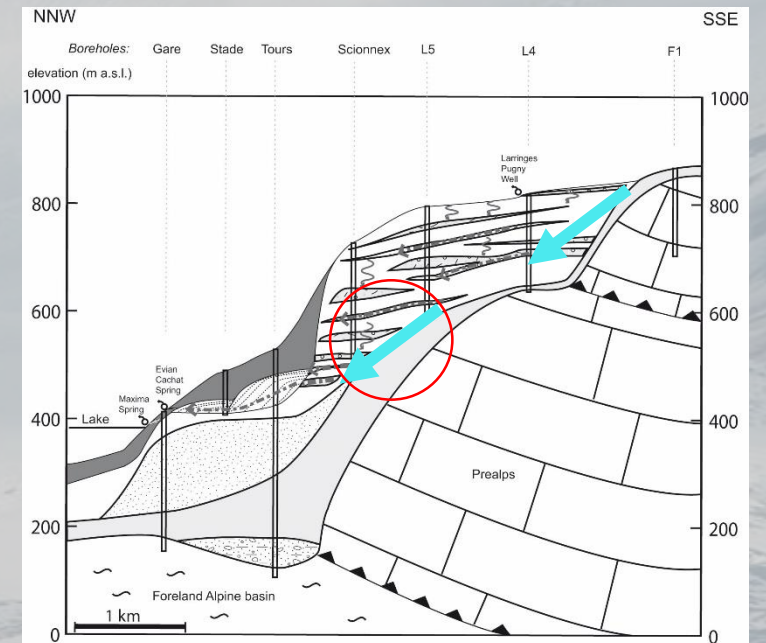
Conclusions

- ❖ Preferential flow path at the side of the glacial complex
 - ❖ Permeability and transmissivity higher close to the discordance than in the glacial complex itself
 - ❖ No drillholes at that place yet



Conclusions

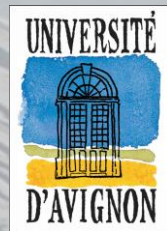
- ❖ Preferential flow path at the side of the glacial complex
 - ❖ Permeability and transmissivity higher close to the discordance than in the glacial complex itself
 - ❖ No drillholes at that place yet
- ❖ Exchange with alpine bedrock ?
- ❖ Need for comparison on other site, but quite rare



Conclusions

- ❖ Better shallow aquifers comprehension :
 - ❖ improved local isotopic gradient (^{18}O)
- ❖ Evian recharge area : limited area
 - ❖ Great advance for protection policies
- ❖ Multidisciplinary approach :
 - ❖ Nedd for Trial/Error approach -> time consuming
 - ❖ Each approach provide unique information
 - ❖ All approaches merged together : greater confidence, cross control

Thank you for your attention



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