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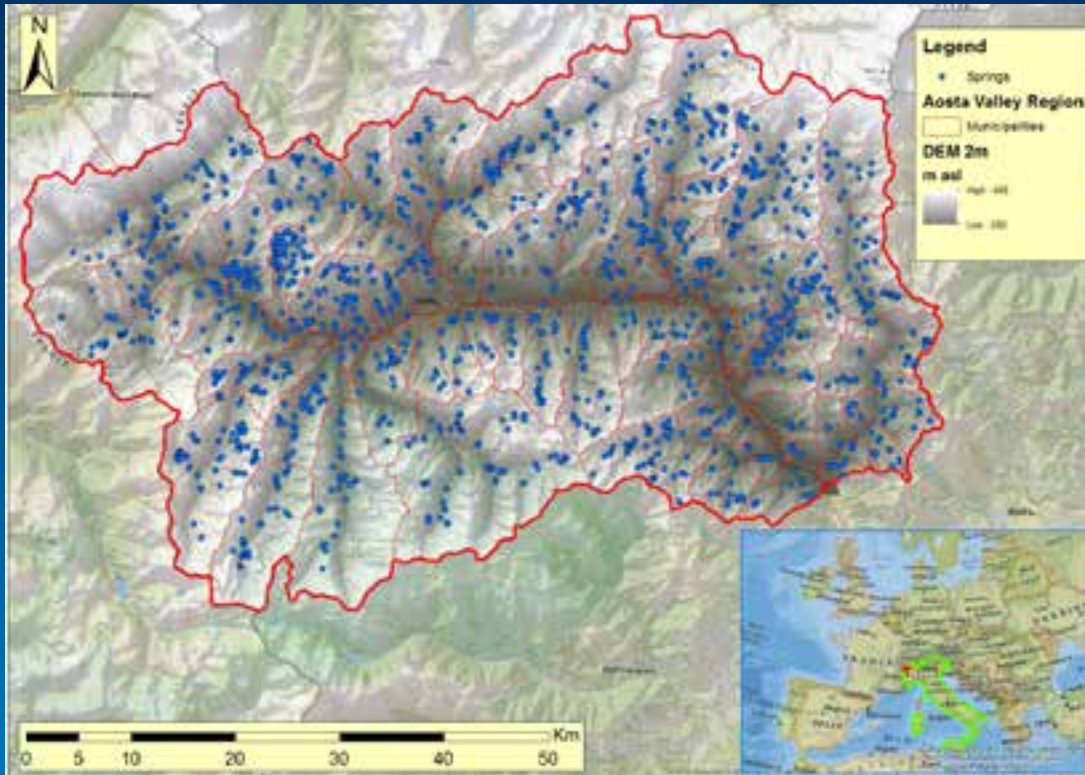
Springs management in mountain areas by GIS

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Framework



Ø Aosta Valley Region = 3000 km²

Ø 1700 springs (600 caught for drinking purpose)



The study:
Ø 40 springs inspected

Ø 13 springs selected for monitoring



Applicability

The purpose of the inspection was to find the appropriate outlet structures to install a monitoring probe



Weir
Profile



OTT Multiparametric Probes



Multiparametric Probes



Probe placement:

- Collocated distant from the weir in order to measure a correct discharge without turbulence
- Protected but a PVC pipe

1 hour reading interval:

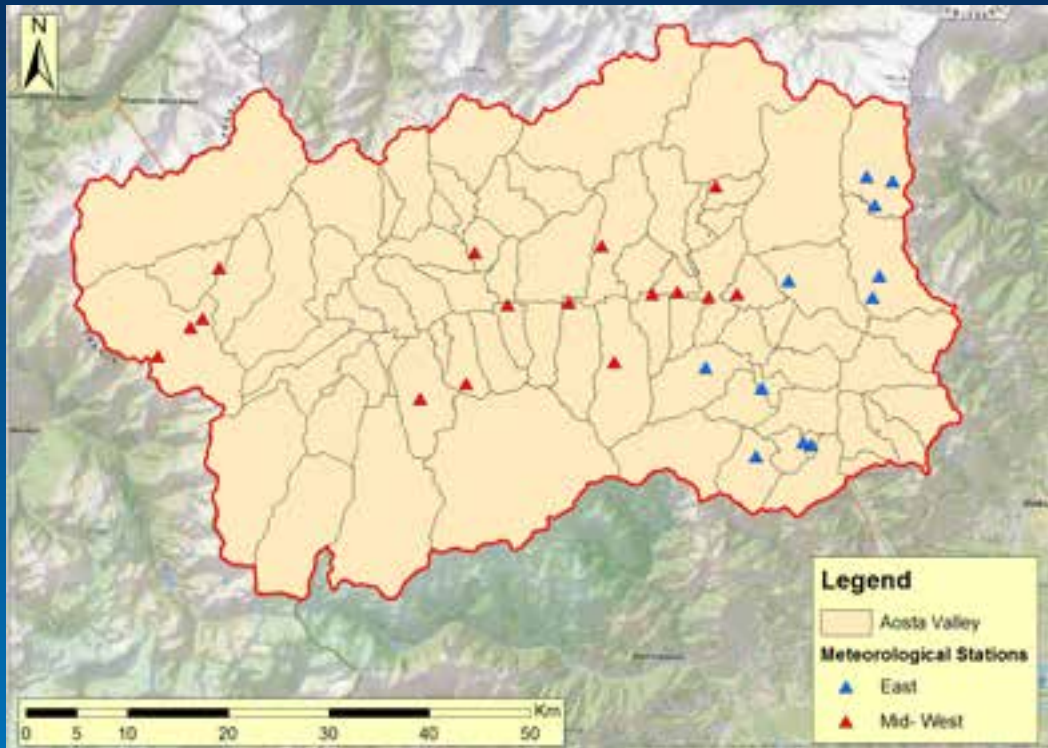
⊗ Temperature [° C]

⊗ Conductivity [$\mu\text{S}/\text{cm}$]

⊗ Water level [m]



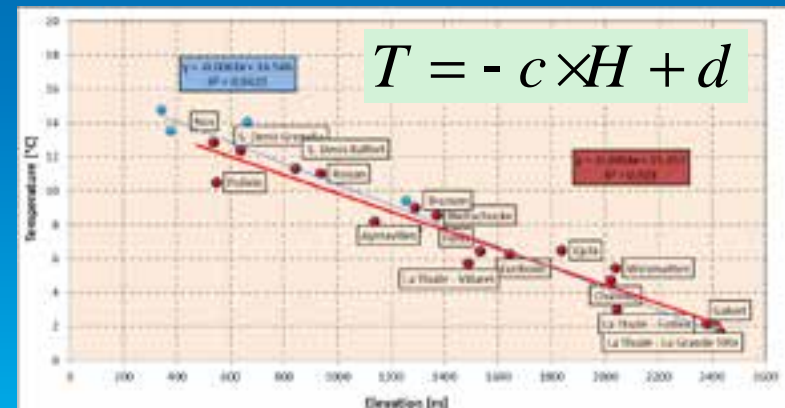
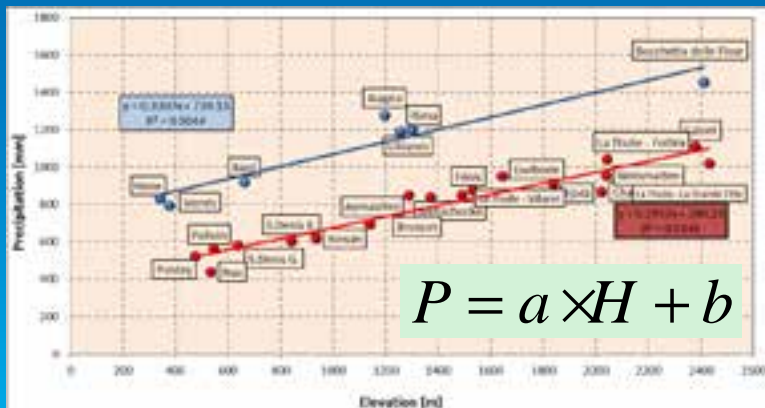
Meteorological Stations



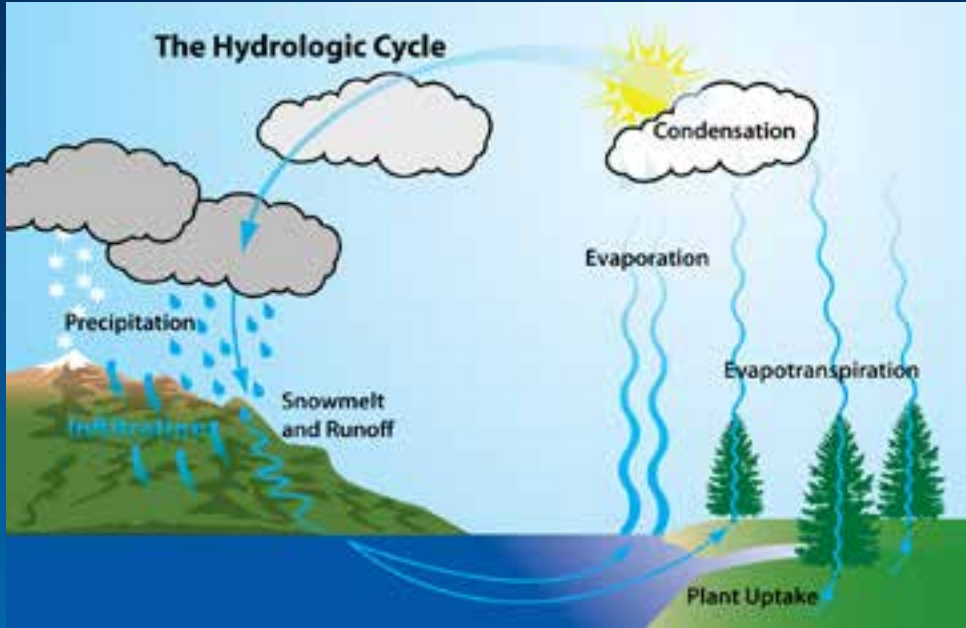
- Within the region there are 26 meteorological stations measuring collecting rainfall and snowfall data



- Linear Trend of Precipitation and Temperature related to Elevation



Inverse Hydrological Balance



- E_{tr} = Evapotranspiration (Turc)
- Q = Rainfall
- χ = Infiltration Coefficient
- I = Infiltration
- R = Runoff

$$P = E_{tr} + I + R$$

$$E_{tr} = \frac{P}{\sqrt{0,9 + \frac{\chi P^2}{e L^2}}}$$

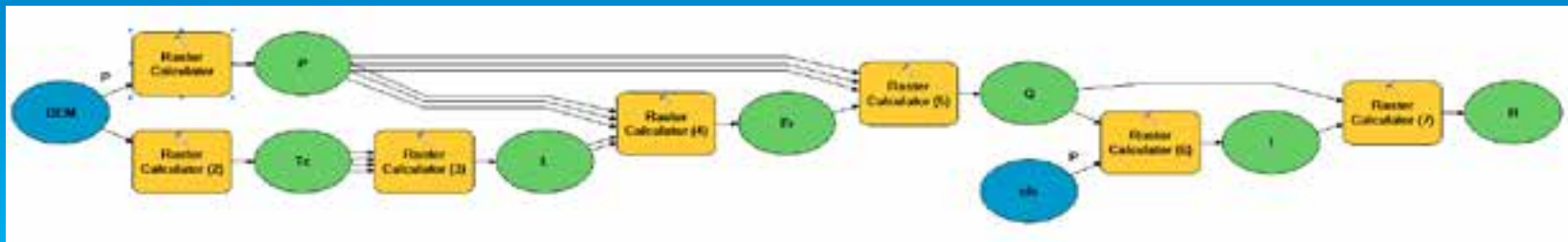
$$L = 300 + 25T_c + 0,05T_c^3;$$

$$Q = P - E_{tr};$$

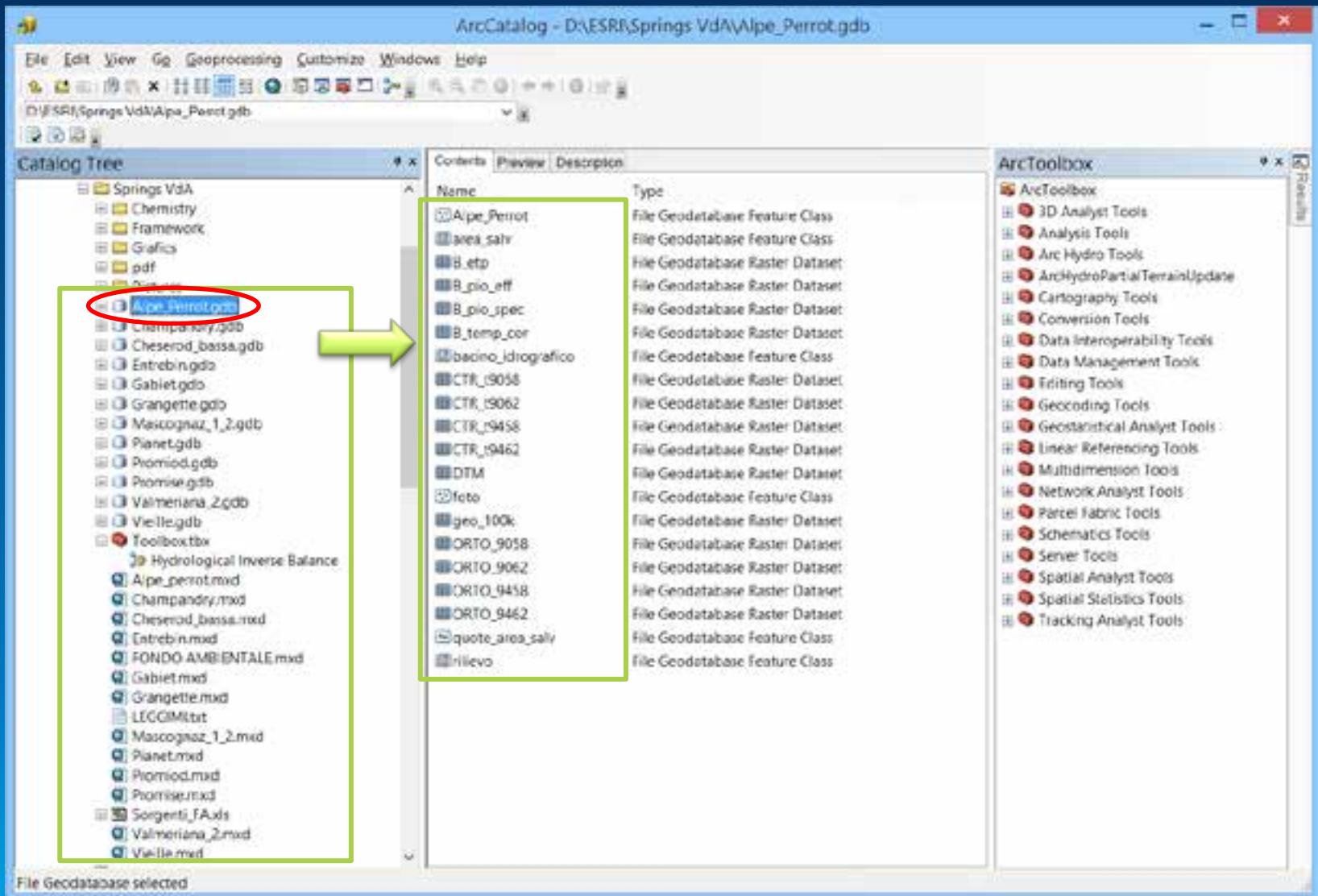
$$I = Q \times \chi;$$

$$R = Q - I;$$

Development of Inverse Hydrological Balance Model

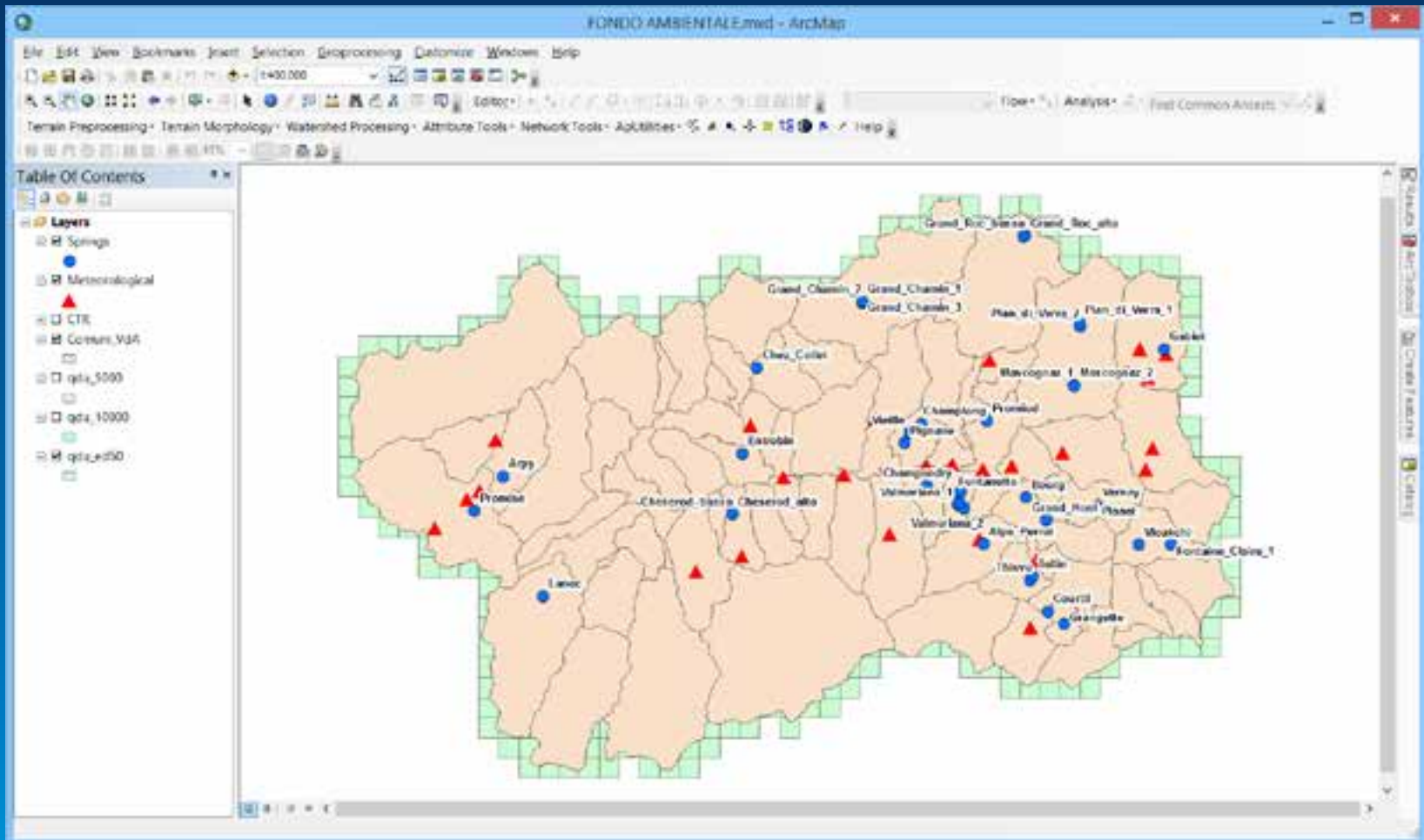


Geodatabases



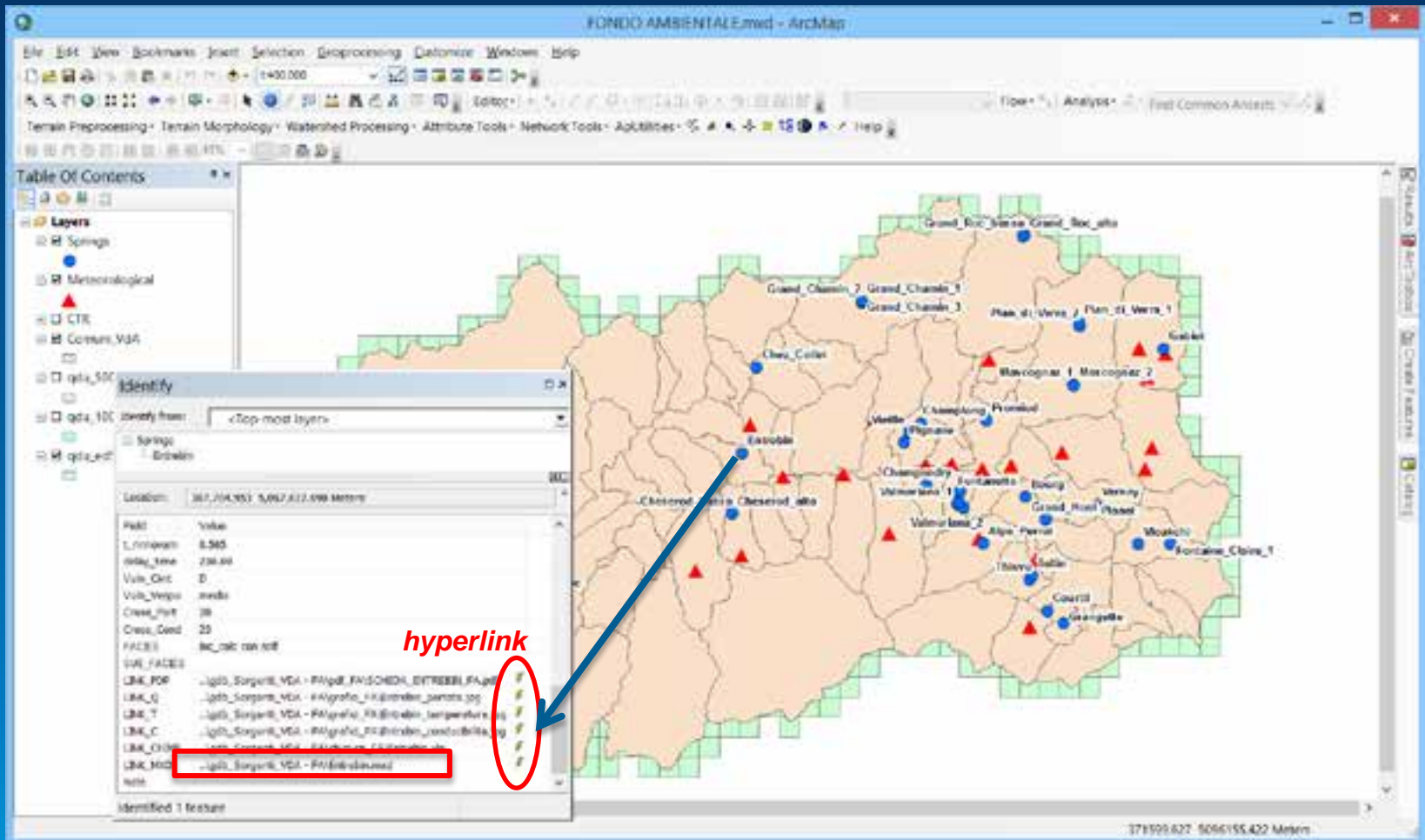
Geodatabase structure in ArcCatalog

ArcMap Global project



- Ø Framework
- Ø Springs
- Ø Meteorological stations

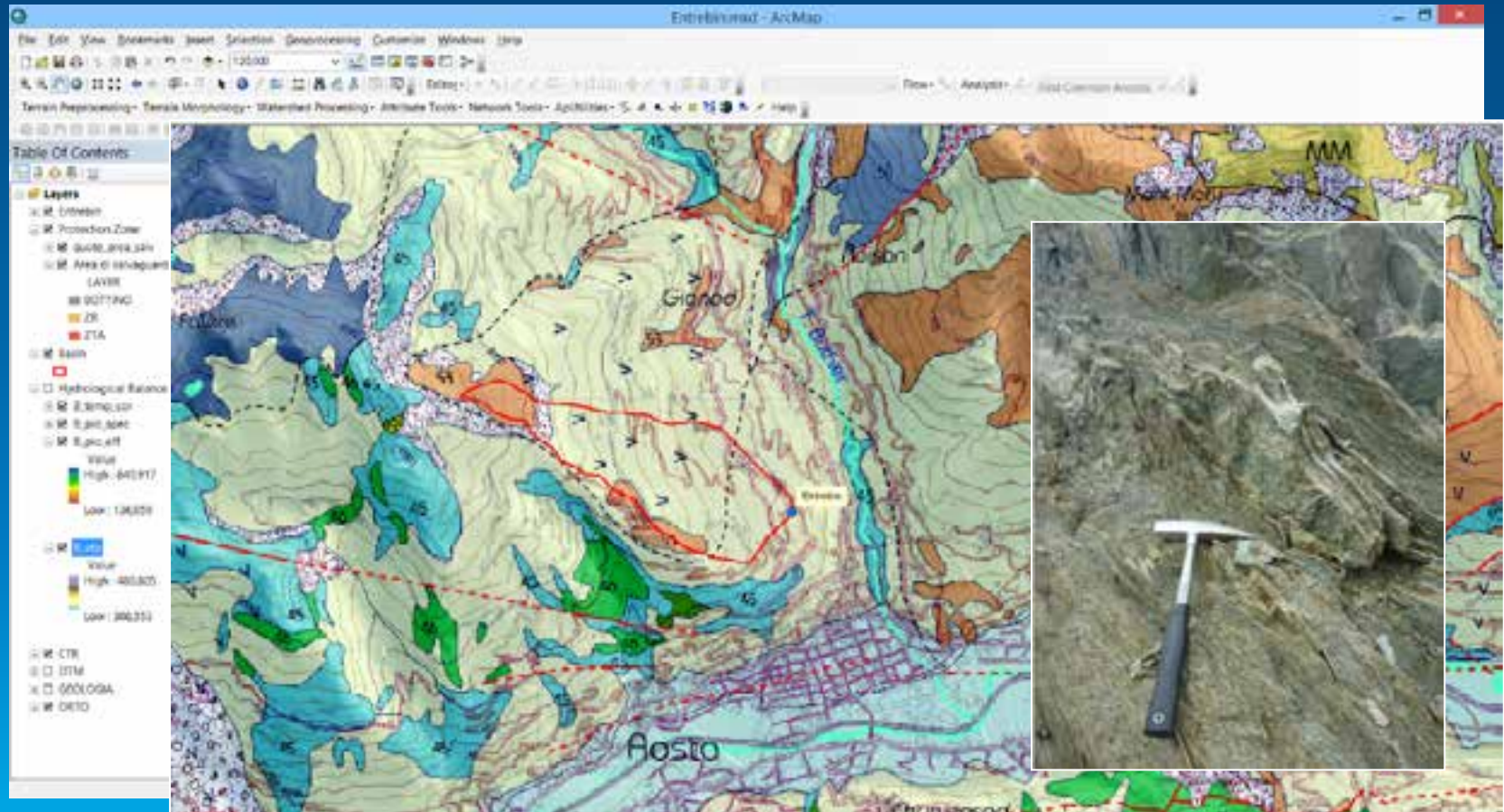
ArcMap Global project



Hyperlinks allow to connect the global project with the individual .mxd projects containing information of each spring

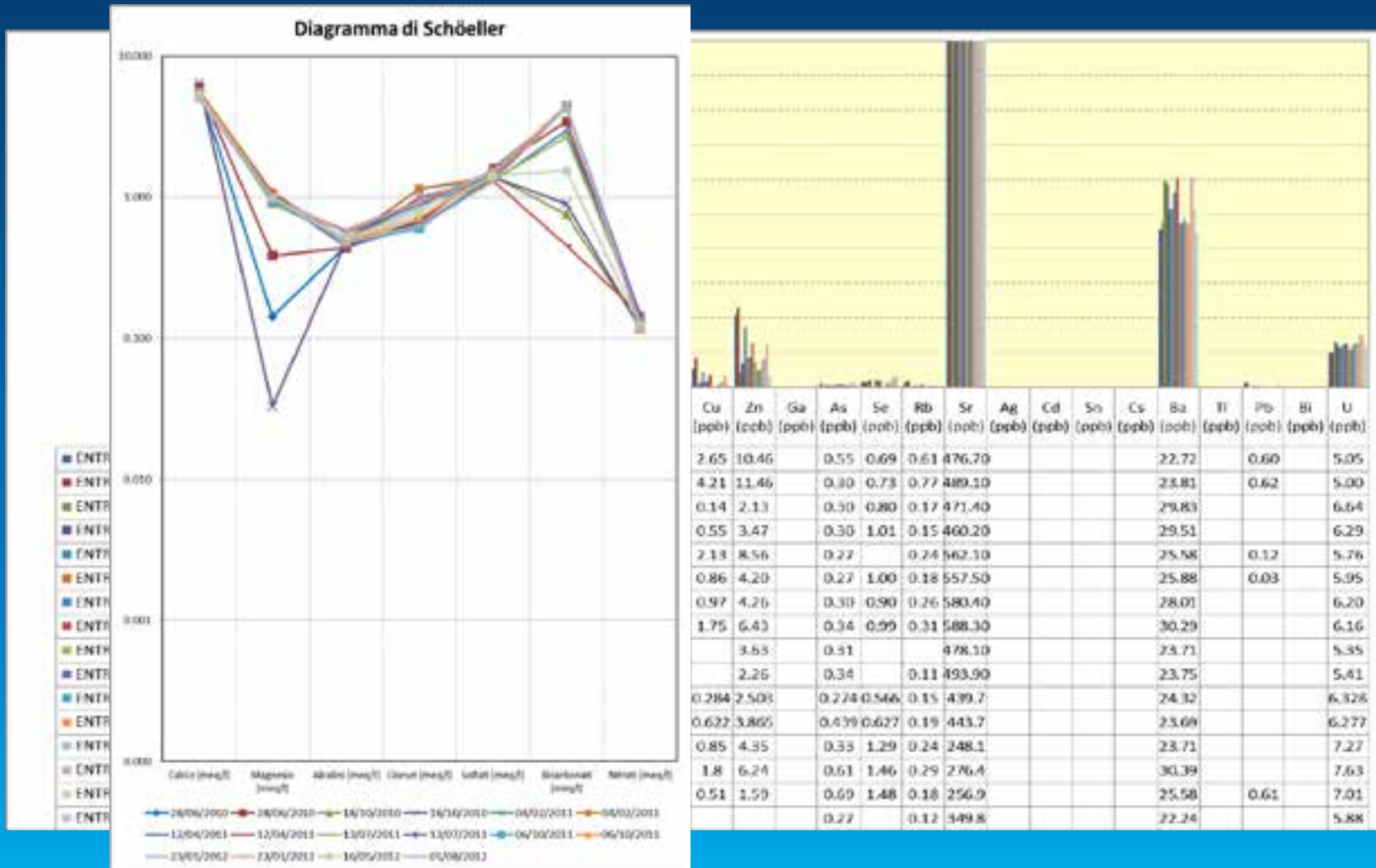
ArcMap Single Project

- Spring Location & Basin
- Delineated protection zones
- Ortho image (2m x 2m)
- Technical Map
- Hydrological Balance Results
- DTM (2m x 2m)
- Regional Geological map (1:100.000)
- Geological relief



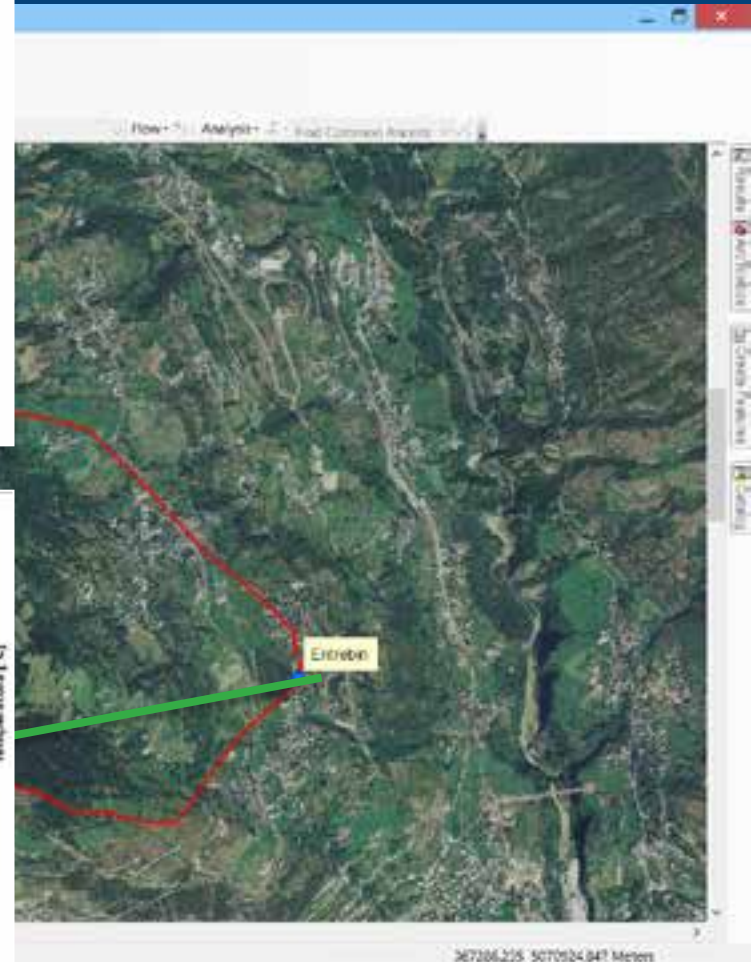
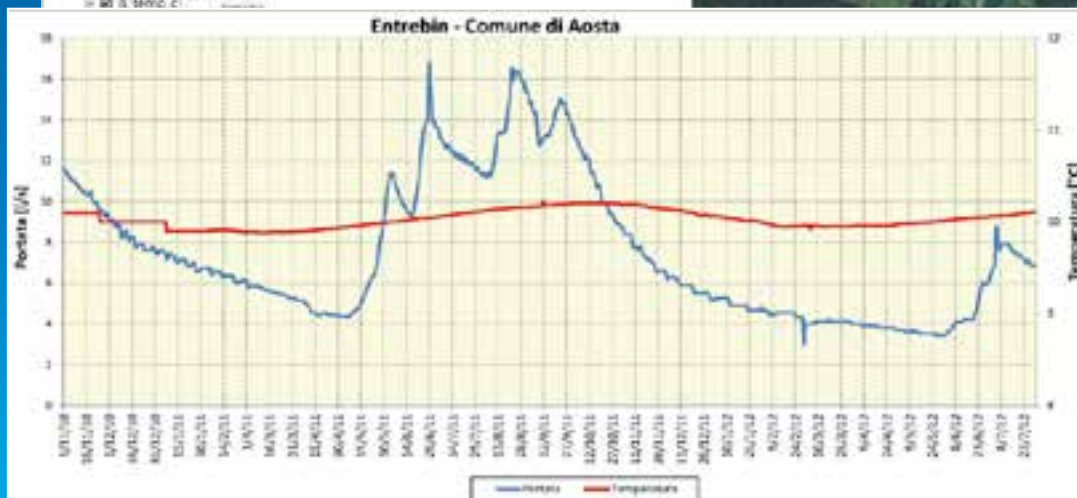
ArcMap Single Project

Hyperlinks consent to access the chemic analysis files in order to maintaining update datas, tables and grafics



ArcMap Single Project

Hyperlinks consent the access to probe data's file



Conclusion

- **In this application ArcGIS was used to:**
 1. **Organize original data**
 2. **Create Hydrological Invers Balance Model**
 3. **Store results and collecting data in geodatabase**
 4. **Navigate dynamically through different project**
 5. **Access to different file in order to update monitoring data and facilitate the resources management**

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Thank you

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