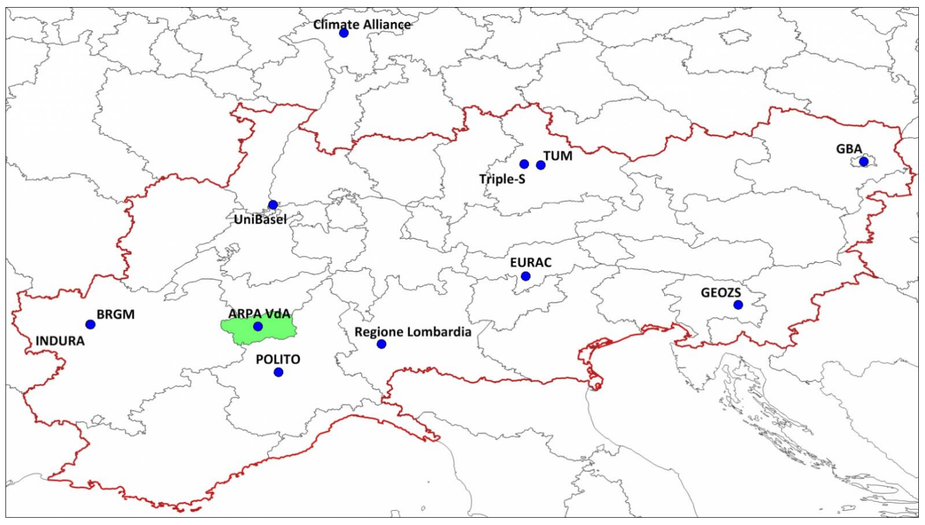
Pilot area Aosta Valley

Geographical features

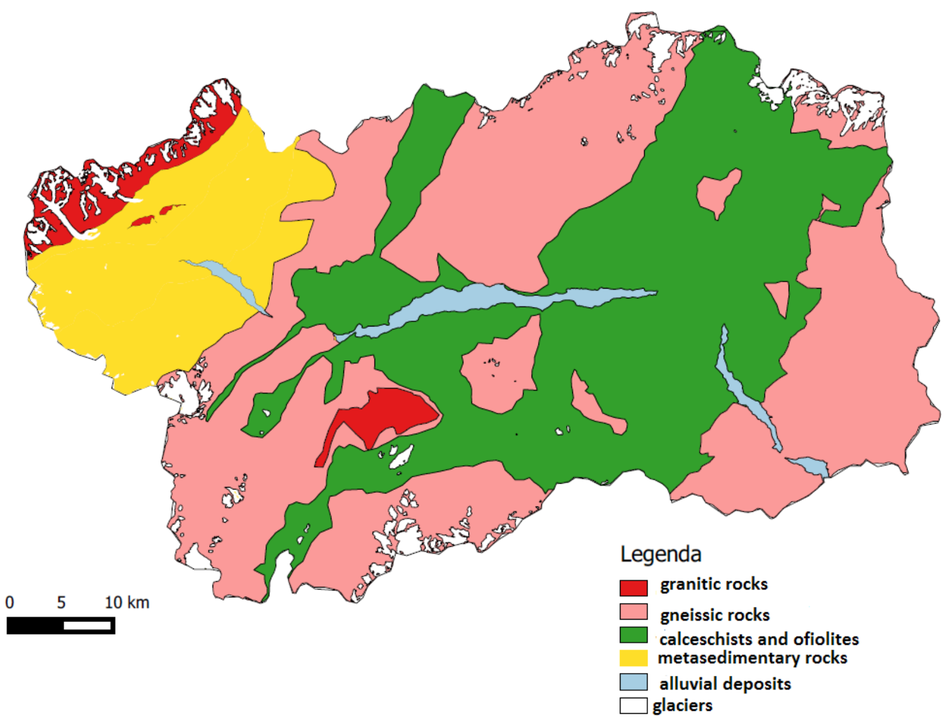
The Aosta Valley is the smallest Italian region, with a surface of 3,200 km^2 and a population of about 128,000 inhabitants. The region coincides with the highest part of the basin of the Dora Baltea river (long about 100 km), and the main towns (among which Aosta) are concentrated along the bottom valley at a average altitude of 350-600 m asl, however some major villages are located at much higher elevations.

The Aosta Valley is a mountainous region with an average altitude of 2,100 m a.s.l. and bounded by the highest peaks of the Alpine chain, such as Mont Blanc (4,810 m a.s.l.), the Monte Rosa Massif (4,554 to 4,634 m a.s.l.) and Cervino/Matterhorn (4,478 m a.s.l.). The region is characterised by an Alpine climate, with cold winter and short summer.



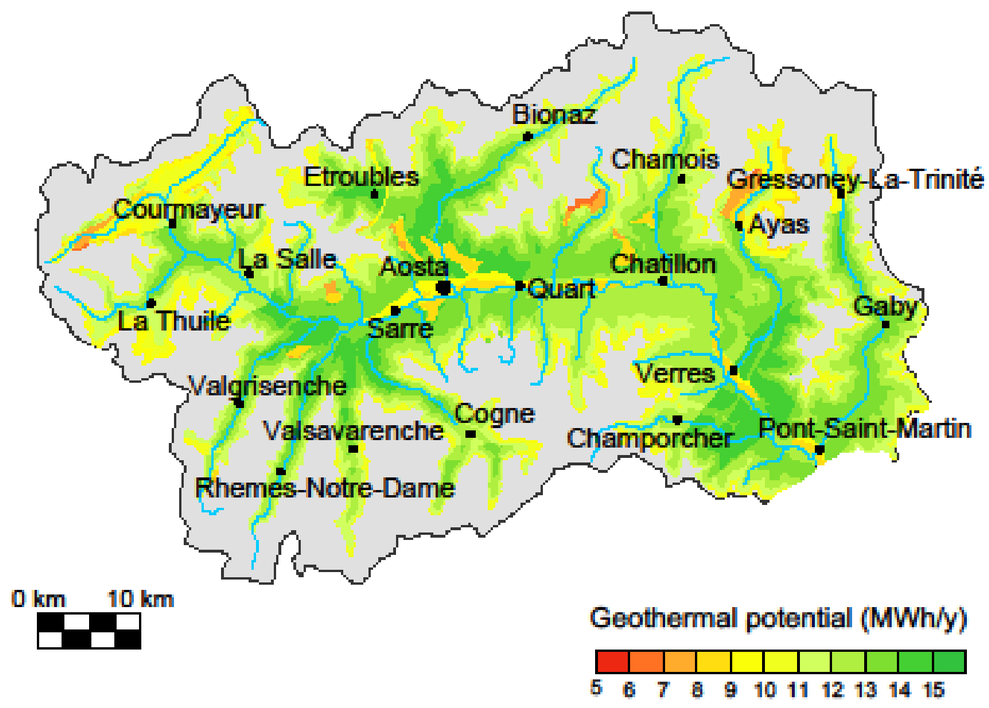
Geological and hydrogeological features

The Aosta Valley is located in the hearth of the Europe-vergent belt of the Alps. The only sector not undergone to metamorphism during the Alpine orogenesis is the north-western sector, corresponding to the Mt. Blanc massif. All the other rocks are metamorphic. Quaternary alluvial sediments (sandy gravels) in the bottom valley are of great hydrogeological importance since they host very thick and permeable aquifers, exploited mainly for industrial and drinking use, and lately even for geothermal use. Their recharge is granted by seasonal snowfall melting, in addition to several glaciers covering about 5% of the total regional area.



Estimation of shallow geothermal energy potential

The **closed loop** geothermal potential of the Aosta Valley has been calculated with the G.Pot method for a standard BHE 100 m deep. The map shows globally high values of geothermal potential, higher than 10 MWh/y in most of the territory as a consequence of the good thermal conductivity values obtained with the laboratory measurements on 13 rock samples, while lower thermal conductivity can be assigned to the alluvial sediments in the main valley bottom.



Concerning the **open loop**, a favourable situation was found in the Aosta plain, since the thick and conductive gravels offer a very suitable porous medium for a highly productive aquifer. Due to the absence of very low depths to water, no negative influences from a critical groundwater level rise could be identified within the analysed system size. For shallow wells near the main river of the valley, the infiltration of cold surface water can lead to very low groundwater temperatures during winter and spring. Apart from this cautionary recommendation, the thermal use of groundwater is possible throughout the analysed area.

Therefore **the geothermal mapping showed that closed- and open-loop systems can represent a rational and efficient solution that can be used alternatively all over the regional territory, covering entirely or most of the heating and, where needed also the cooling, demand of residential and public buildings.**

Implementation into energy plans

The thermal energy demand of each building with prevailing residential function was estimated at regional scale. For the considered number of buildings (41,703 records), the total estimated thermal demand is equal to 1,959,208.4 MWh per year. Looking at the total heated surface of the considered residential building stock, the average thermal demand is around 140 kWh/m^2. A clear convenience of the gas-boiler and ACS with respect to the oil-boiler and ACS was found, due to the high difference in fuel costs in Italian context. However, the real discriminant factor, in the economic and financial analysis, is constituted by the application of subsidies. Thanks to them, there are relatively low and medium return times for the oil boiler and gas boiler combinations, respectively. Although this is true for both closed and open-loop systems, in Valle d'Aosta the open-loop HP plants show a greater convenience.

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