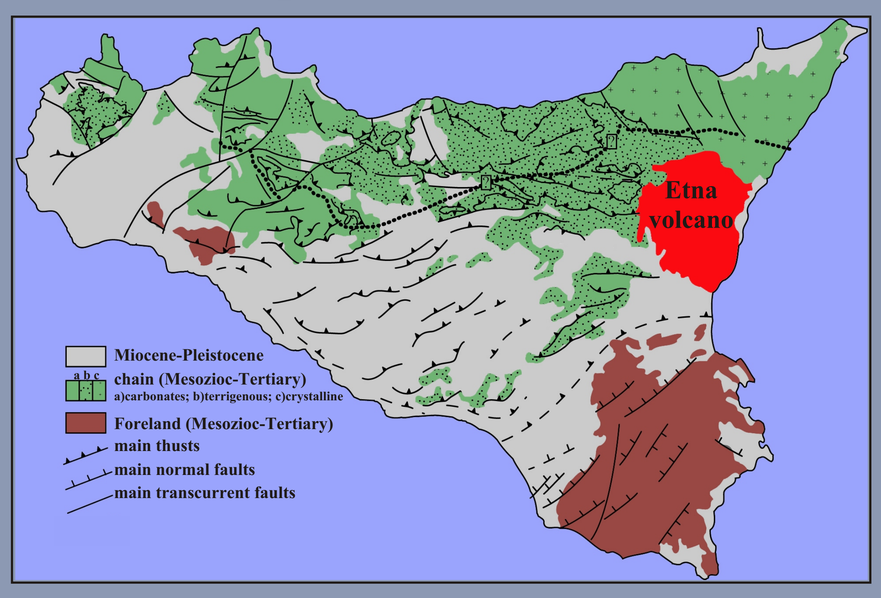
SOCIETY OF ENVIRONMENTAL GEOCHEMISTRY AND HEALTH
26th EUROPEAN CONFERENCE – SEGH 2008
"Health Implications of Environmental Contamination"
Athens, Hellas 31st March – 2nd April, 2008

SURVEY ON FLUORIDE, BROMIDE, CHLORIDE, NITRATE AND SULPHATE CONTENTS IN PUBLIC DRINKING WATER SUPPLIES IN SICILY (ITALY)

W. D'Alessandro[1], S. Bellomo[1], F. Parello[2], L. Brusca[1], M. Longo[1]

[1]Istituto Nazionale di Geofisica e Vulcanologia – Sezione di Palermo, Via La Malfa 153, 90146 Palermo, Italy, w.dalessandro@pa.ingv.it

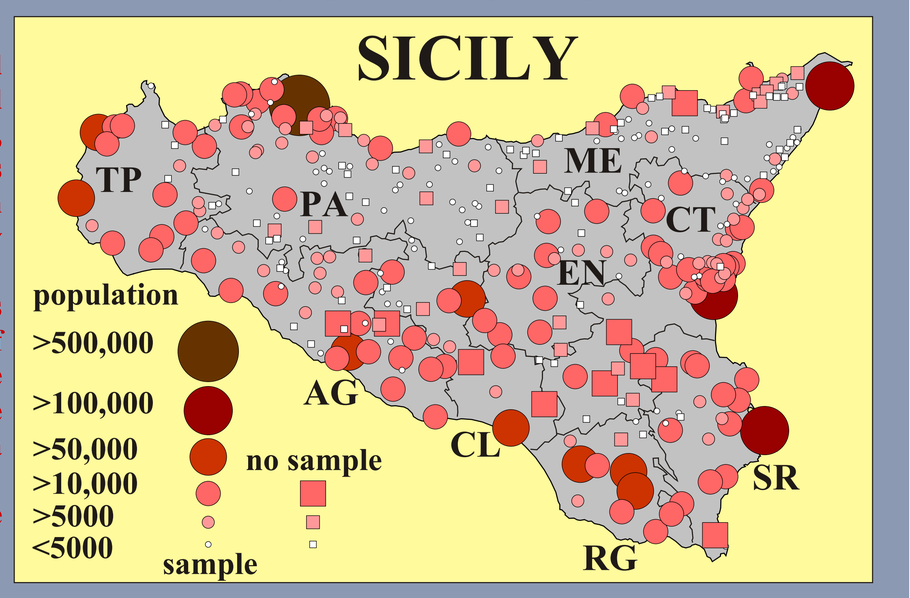
[2]Dipartimento CFTA, Università di Palermo, via Archirafi 36, 90123 Palermo, Italy, parello@unipa.it

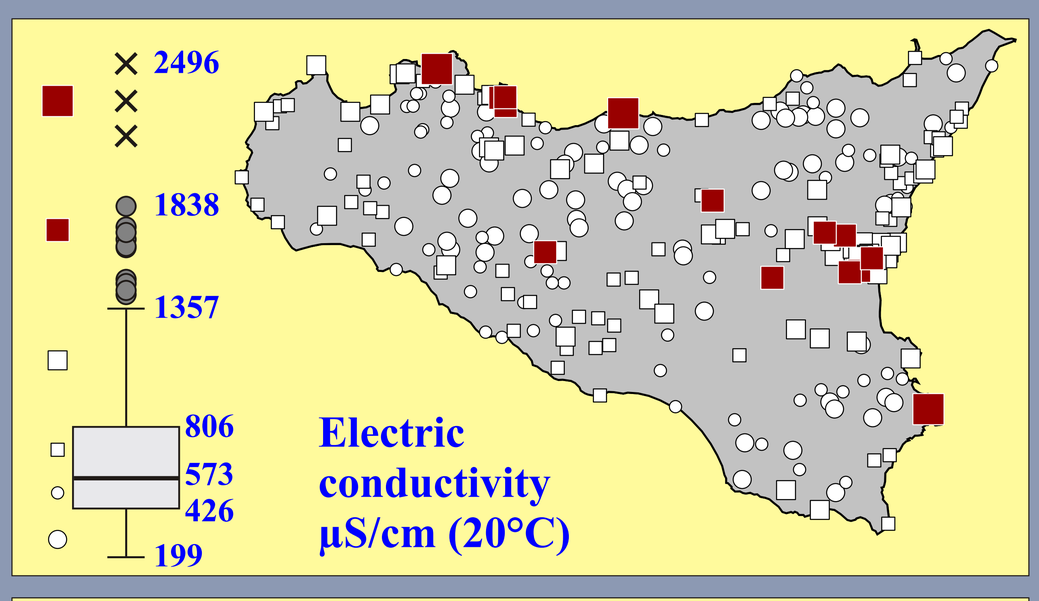


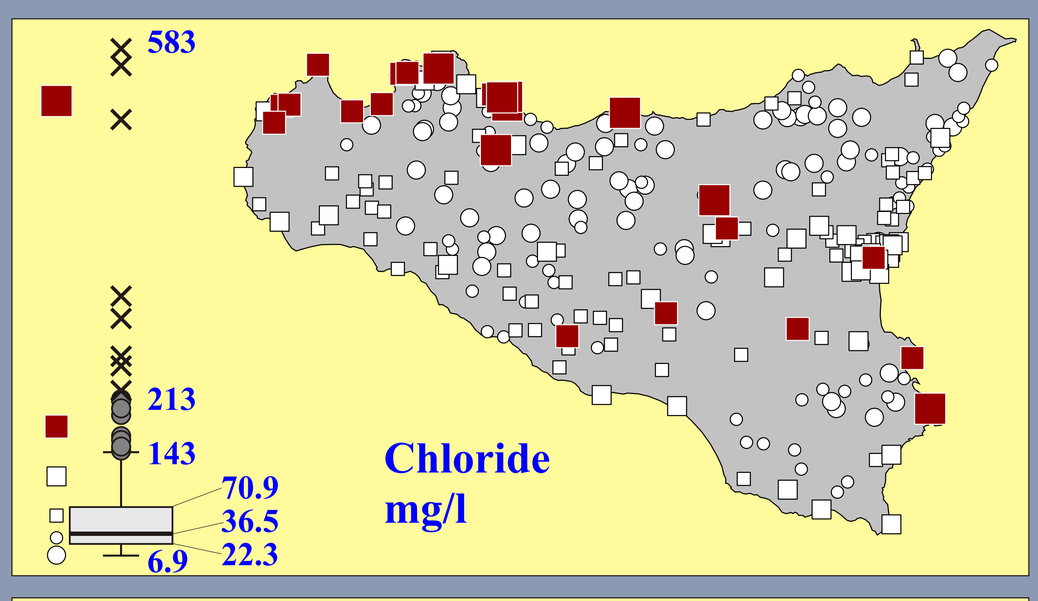
Six hundred and sixty-seven water samples were collected from public drinking water supplies in Sicily and analysed for electric conductivity and for their chloride, bromide, fluoride, sulphate and nitrate contents. The samples were, as far as possible, collected evenly over the entire territory with an average sampling density of about one sample for every 7600 inhabitants.

The samples were collected in 251 out of 390 municipalities and are representative of 87% of the total number of inhabitants (> 5,000,000) and 76% of the total surface (25,708 km^2) of the Sicilian Region. The distribution of the population in Sicily is shown in the right figure and a simplified geological map is shown in the left figure.

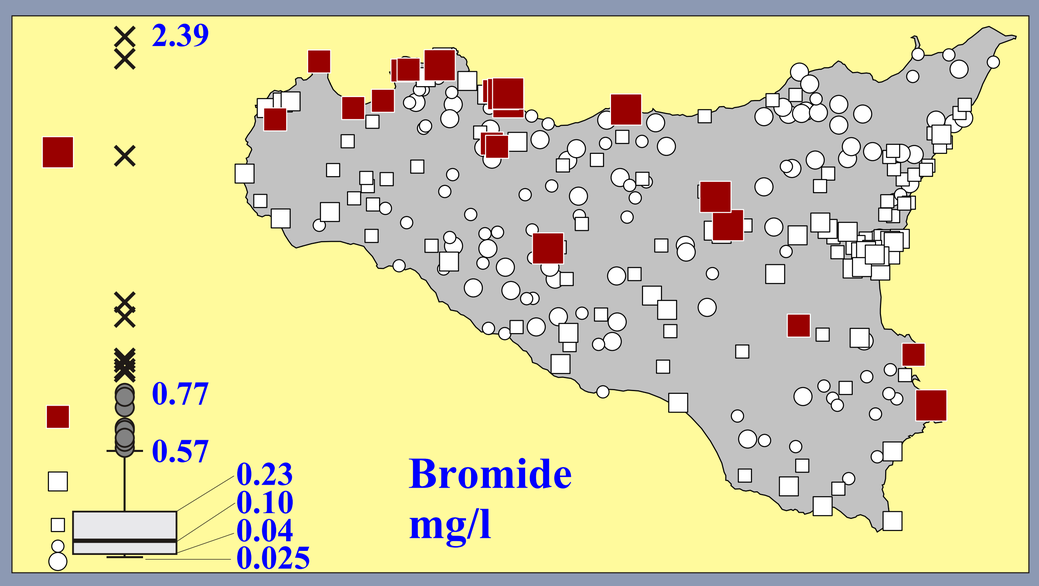
Results averaged at the municipality level are show in the figures below.

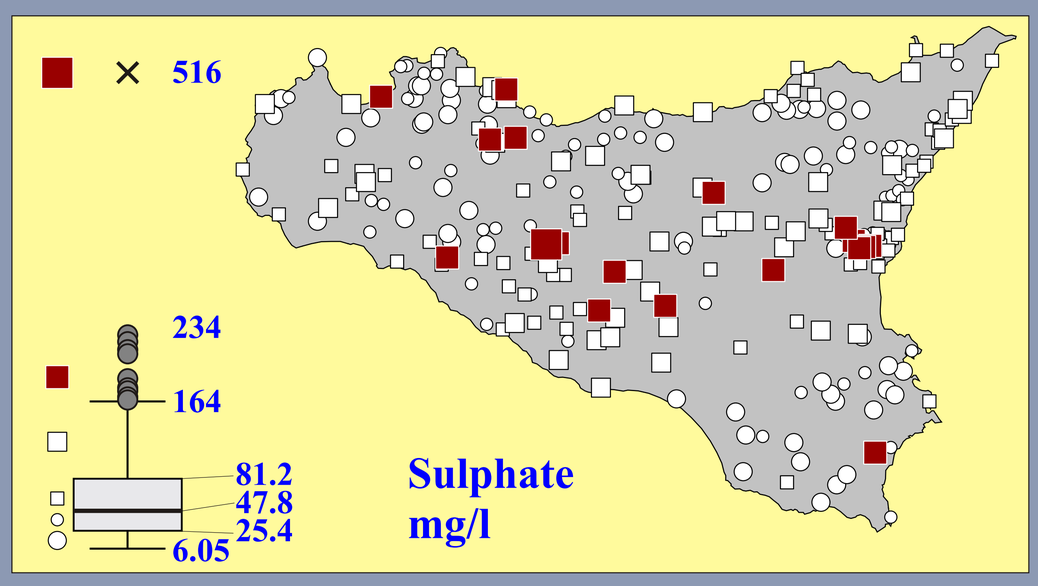






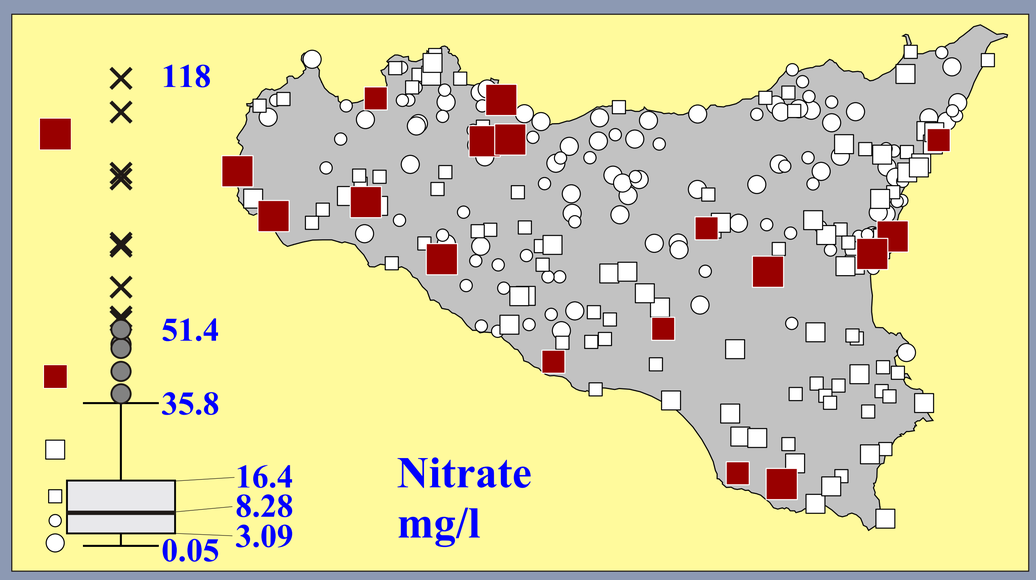
The contents of chloride and bromide, ranging between 5.53 and 1302 mg/l and between < 0.025 and 4.76 mg/l respectively, correlated well with the electric conductivity, a parameter used as a proxy for water salinity. The highest values were found both along the NW and SE coasts, which we attributed to seawater contamination, and in the central part of Sicily, which we attributed to evaporitic rock dissolution. Chloride and Bronide contents exceeded in about 4.6 and 3.4 % of the cases the respective guideline values of 250and 1 mg/l.



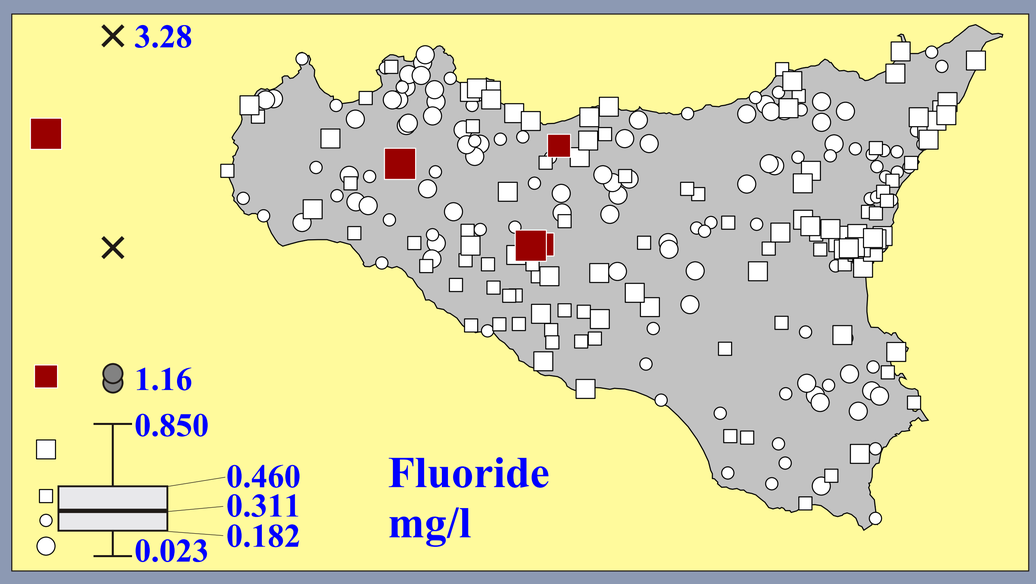


The sulphate concentrations varied between 6.03 and 516 mg/l, exceeding in about 1.2% of the cases the guideline level of 250 mg/l. The highest values were mostlyrelated to evaporitic rock dissolution but sometimes also to seawater intrusion.

The nitrate concentrations were in the range 0.05 – 296 mg/l. Of the analysed samples about 4.4% exceeded the maximum admissible concentration (MAC) of 50 mg/l. The highest values were always measured in areas of intense agricultural exploitation.



The fluoride concentrations ranged from 0.023 to 3.28 mg/l, while the highest values (only 2 exceeding the MAC of 1.5 mg/l) generally attributed either to the leaching of crystalline (volcanic or metamorphic) or evaporitic rocks or to contamination from a hydrothermal component.



CONCLUSIONS

Apart from these limited cases of exceeding of MACs, the waters of public drinking water supplies in Sicily can be considered safe for human consumption for the analysed parameters. Some limited concern could arise from the intake of bromide-rich waters (about 3% exceeding 1 mg/l) because of the potential formation of dangerous disinfection by-products. Also nitrate concentrations, although sometimes exceeding MAC, display generally level well suited for human consumption, the population-weighted average being about 16 mg/l for the whole Sicily.

As regards geographic distribution, the best water quality was found in areas with the most humid climate and with huge aquifers in the north-eastern part of the island. On the contrary especially along the southern coasts of Sicily, arid conditions and the widespread presence of impermeable lithologies, sometimes forces the use of low quality water resources. But it is also worth to note that bad management often exacerbates water quality and quantity problems in these areas.