

Groundwaters in northern of Portugal: geographical and geological settings, hydrochemical typologies and exploitations

Águas subterrâneas do setor norte de Portugal continental: Enquadramentos geográfico e geológico, tipologias e aproveitamentos

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Abstract

The northern Portugal area is rich in groundwaters, particularly in mineral waters and fresh waters. This is also the area where is great the diversity of hydrochemical typologies. This typologies are mainly the result of geological factors. There are approximately 54 poles of sources of groundwaters with relationship to geologic setting: igneous rocks, metasedimentary and metavulcanic rocks and ophiolitic complex with basic and ultrabasic rocks. In this domain the occurrences of groundwater are frequently linked to areas of major fractures in a context of deep terrains under geomorphologic point of view.

In this area it is possible to define 9 hydrochemical families that characterize the groundwaters in northern Portugal:

- Bicarbonated, sodium (occasionally sodium/calcium or calcium/sodium), CO₂-rich, fluoride and normally acid.
- Bicarbonated (sometimes bicarbonated/chlorinated or chlorinated/bicarbonated), sodium, sulphurous, fluoride, alkaline.
- Bicarbonated/carbonated, sodium, sulphurous, silicated, hiperalkaline
- Bicarbonated, sodium, sulphurous, hiposilicated, alkaline.
- Bicarbonated, sodium, fluoride, alkaline. If hyposaline is not fluoride, acid.
- Bicarbonated, calcium, sodium, fluoride, alkaline. If hyposaline is not fluoride, acid, with a little more sodium than of calcium.
- Bicarbonated, sodium, sulphated, sulphurous, hyposaline, alkaline.
- Chlorinated, sodium, hyposaline, acid.

- Chlorinated/bicarbonated, sodium, hyposaline, acid.

The main hydrochemical families are represented in F1 and F2 families. The groundwater has been exploited in thermalism (therapeutic and wellness thermalism), bottling and geothermal energy, however, currently, in the majority of these poles there is no exploitation, about 50 %.

In the natural mineral waters domain are recognized therapeutic properties, mainly in the areas such as rheumatological, musculoskeletal, otorhinolaryngological and dermatological.

The groundwaters that are used most often in therapeutic applications are F1 and F2 families, while at the bottling domain the waters of F1 and F5 families are the most relevant.

In parallel with the more classic usages today there is a growing interest in the usages of these resources in areas such as geothermal energy, in dermocosmetic products and in “designed peloids”.

The integrated exploitation of groundwater in articulation with regional natural products prospective new economic opportunities associated with areas of occurrence. In the case of mineral waters opportunities can pass also by health tourism, spa tourism and nature tourism.

Key words: mineral waters, fresh waters, hydrochemical typologies, exploitation of groundwaters

Palabras clave: aguas minerales, aguas frescas, tipologías hidroquímicas, la explotación de las aguas subterráneas