Exploring the ecology of continental deep-subsurface communities through a multi-technique approach

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The study of deep-subsurface sediments has been a matter of growing interest in the recent years, since the potential discoveries could greatly alter our views of the global biogeochemical cycles. However, most of the studies in that subject have been performed in marine sediments, while the information on the continental subsurface is still scarce. The Iberian Pyrite Belt (IPB, southwest of Spain) is a massive sulphide deposit that fuels the unique extreme ecosystem of Rio Tinto. Additionally, it's subsurface is considered to be a good Mars analogue because of the presence of jarosite and related sulphate minerals. Previous studies had already found evidences of litotroautotrophic microorganisms down to a depth of 166 meters below the surface (mbs) [1]. In order to gain further information on this matter using massive sequencing techniques, a 613 m deep borehole was performed in the context of the European Research Council project IPBSL (Iberian Pyrite Belt Subsurface Life) [3]. Microbial presence throughout the borehole was studied by a mixture of Illumina and 454 high-throughput sequencing of the 16S rRNA gene, as well as by using a 450 antibody-containing microarray specially designed for the search of microbial biomarkers [2]. The results revealed the presence of an endolithic community adapted to the dry conditions of this deep-bedrock ecosystem, with many members bearing similarity to extremophilic bacteria found in deserts and permafrost. Several signatures from litoautotrophic bacteria such as sulphate and iron reducers were also retrieved. These preliminary results allowed us to generate a vertical profile of the microbial communities that were present in the deep subsurface of the IPB, and will prove of great value to the understanding of geomicrobiological cycles in continental deposits.

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