Supporting information for

How Do Secondary Minerals in Granite Help Distinguish Paleo- from Present-Day Permeable Fracture Zones? Joint Interpretation of SWIR Spectroscopy and Geophysical Logs in the Geothermal Wells of Northern Alsace

Carole Glaas[1,2,3], Jeanne Vidal[2,4], Patricia Patrier[3], Jean-François Girard[1], Daniel Beaufort[3], Sabine Petit[3], Albert Genter[2]

[1]University of Strasbourg, CNRS, UMR 7516 IPGS, 5 Rue René Descartes, 67084 Strasbourg Cedex, France
[2]ES-Géothermie, Bat Le Belem 5 rue de Lisbonne, 67300 Schiltigheim, France
[3]University of Poitiers, CNRS UMR 7285 IC2MP, HydrASA, Bat B8 rue Albert Turpain, TSA51106, F-86073 Poitiers Cedex 9, France
[4]University of Chile, FCFM, Dept. of Geology, Andean Geothermal Center of Excellence (CEGA), Plaza Ercilla 803, Santiago, Chile

Content of this file

Text S1, S2, S3 and captions of Figures S1, S2 and S3.

Introduction

This supporting information provides details on the SWIR results acquired in both GRT-2 and GPK-1 wells like the intra-sample variability and comparison between manual fit and automatic fit with the TSS software.

Text S1 and S2

For both GRT-2 and GPK-1 wells the intra-sample variability of the granite cuttings was tested. As each cuttings bag represents sections of drilled rocks (see section 3.1.1.) and as the cuttings could not be homogeneously mixed in the bag, several measurements were carried out on the same cuttings bag. In the GRT-2 well 10 measurements were done on the same cuttings bag (Figure S1) whereas only 5 measurements were done in the GPK-1 well (Figure S2) because of a lower amount of cuttings available. Error bounds were then calculated for each cuttings bag in order to observe if the range of variation is not exceeding the scattering of the data. In both wells, we can observe that the variability is low in unaltered granite and higher in the hydrothermally altered granite. Also, the variability observed in the GRT-2 well is higher

than in the GPK-1 well. These differences in both wells could be due to the heterogeneity of the mineralogy.
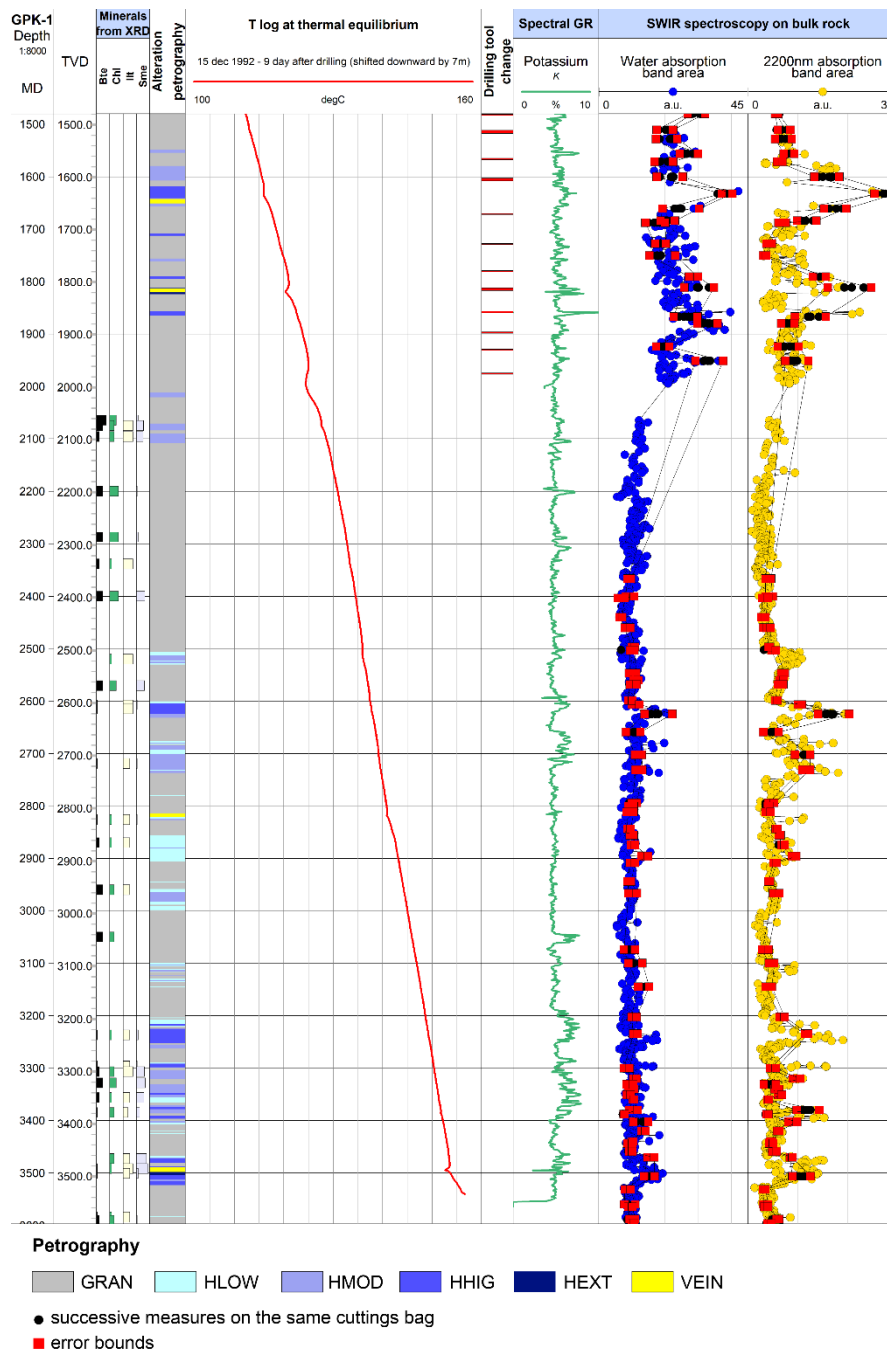

Figure S1: Composite log of the GPK-1 well presenting the secondary minerals, the petrographical log built from the mineralogical observations, the temperature log, the spectral K-GR log and the SWIR results. The successive measurements realized for each cuttings bag are represented by black full circles and the error bounds calculated from these successive measurements are represented by the distance between red squares for each cuttings bag.
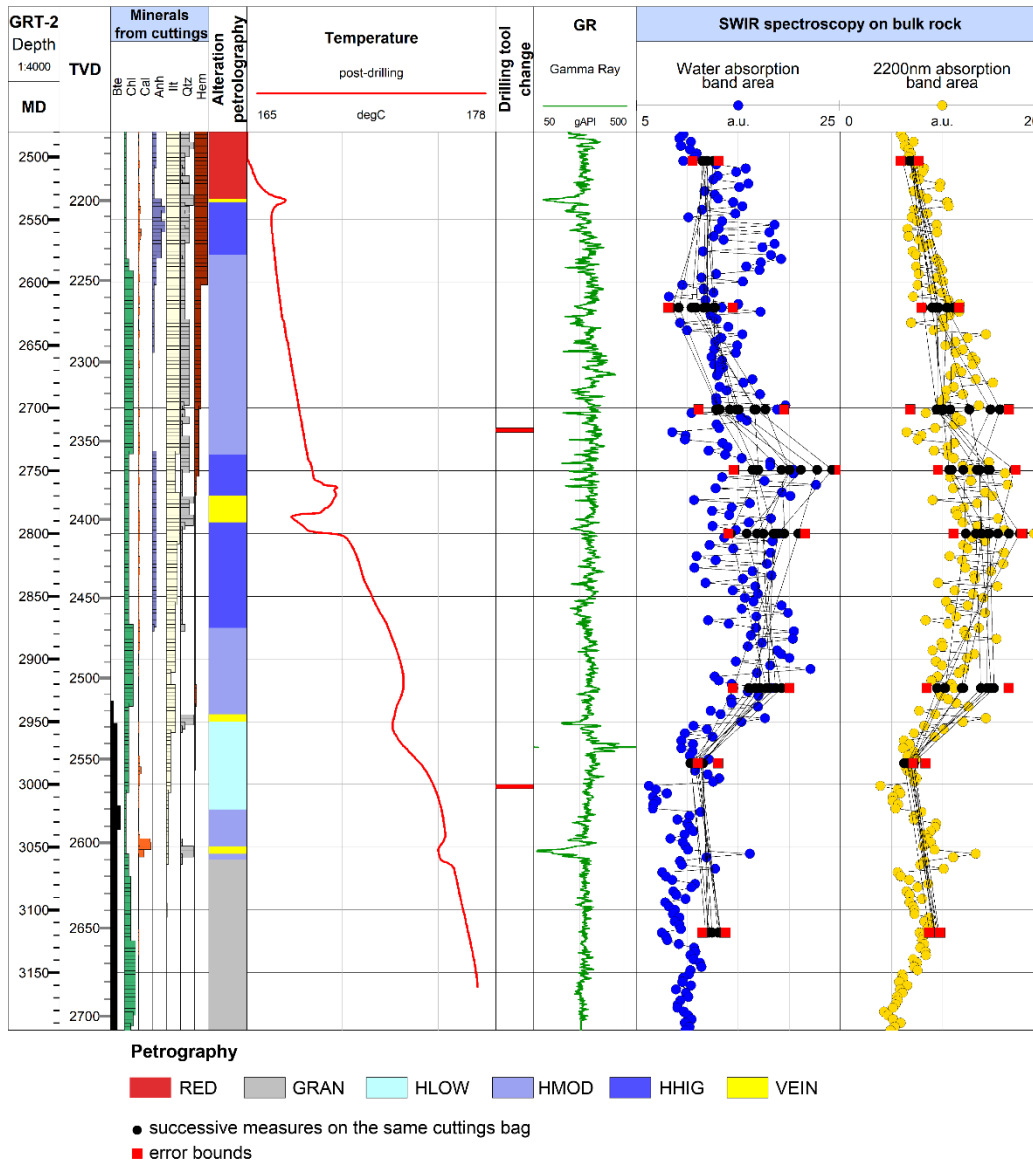
Figure S2: Composite log of the GRT-2 well presenting the secondary minerals, the petrographical log built from the mineralogical observations, the temperature log, the GR log and the SWIR results. The successive measurements realized for each cuttings bag are represented by black full circles and the error bounds calculated from these successive measurements are represented by the distance between red squares for each cuttings bag.

Text S3

For the GRT-2 well, position and half width at half maximum (HWHM) were locked for each simulation profile. However, different sets of position and HWHM were used. The simulation profiles were accepted with a weighted profile R-factor (Rwp) lower than 0.05. For the GPK-1 well, with regard to the huge amount of profiles calculated (1190), position and HWMH were free fitted by TSS for each simulation profile. The areas of the water absorption band and the 2200 nm absorption band were also fitted manually

for some profiles to compare if there is a significant deviation of the area with the free fitting. Results showed that there was no significant change in the area between profiles fitted manually or free-fitted by TSS for the GPK-1 well (Figure S3).
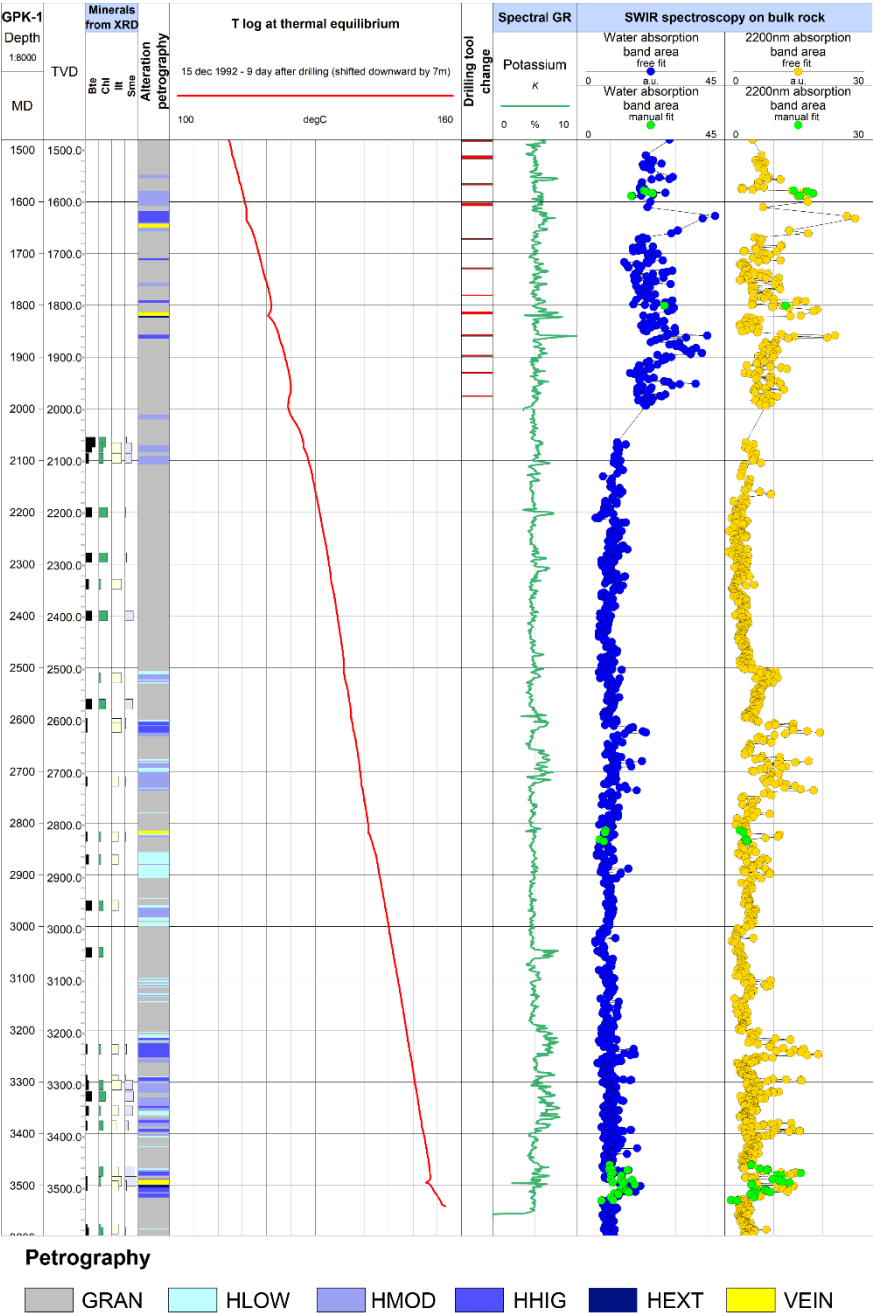

Figure S3: Composite log of the GPK-1 well presenting the secondary minerals, the petrographical log built from the mineralogical observations, the temperature log, the spectral K-GR log and the SWIR results that were free-fitted with the TSS software (blue and yellow full circles for water and 2200 nm absorption band areas, respectively). The light green full circles represent the SWIR results manually fitted.