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A visual aid for interpreting and filtering down-hole gamma logs

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Drill hole data provides an important source of geological information when exploring for minerals under deep sedimentary cover. Down-hole gamma logging can provide very detailed data on natural gamma radiation in rocks and sediments which helps distinguish certain rock types and alteration processes. Changes in gamma intensity reflect changes in potassium, uranium and thorium content in the rocks.

To be useful, the gamma data must be converted into lithological units and the first step is to identify lithological boundaries. The continuous wavelet transform (cwt) has been used in the past to identify geological boundaries from well logs, including gamma logs, in the oil and gas industry. However, the results of the cwt require interpretation by an expert in this field.

Hill et al [1] presented a method for converting the scale-space plot of the cwt of down hole geochemical data into a tessellated form that resembles a traditional geology log (Figure 1). The tessellation is relatively easy for a geologist to interpret, while retaining the scale-space and hierarchical information of the original cwt.

In this presentation we demonstrate the application of the tessellation method to gamma data. The tessellation is used to delineate lithological boundaries at multiple scales and to filter the tessellation to remove noise and unwanted small-scale geological variation.

Although originally developed for interpreting geochemical data, the cwt tessellation has the potential to be applied to a wide variety of signal types, both in the geosciences and in other scientific fields where multi-scale boundary detection is required.

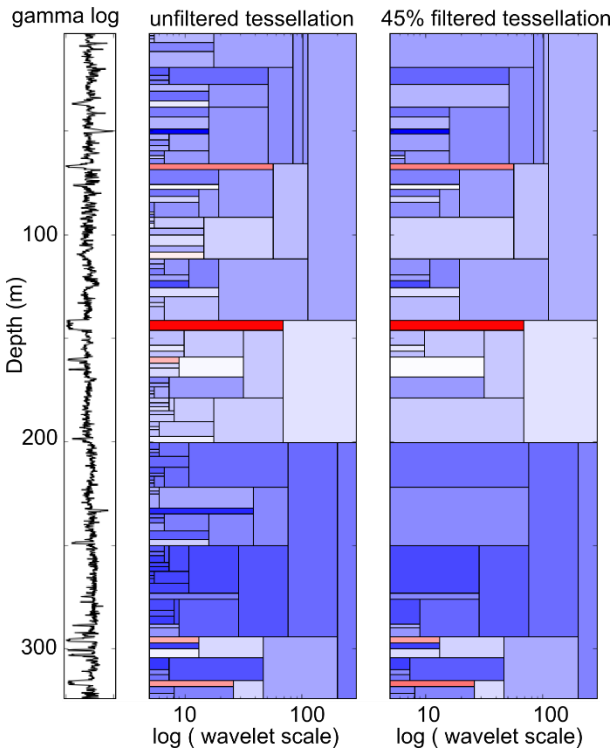

Figure 1: Tessellation of gamma data from BR1 drill hole, Brukunga Sulphide mine, South Australia. Tessellation rectangles are coloured by mean value of gamma signal.

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References:
[1] Hill, EJ et al. (2015) Computers & Geosciences 79: 47-57