

## Petroleum formation by Fischer-Tropsch synthesis in the Santos basin, offshore Brazil

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Fischer-Tropsch synthesis is used worldwide to produce liquid hydrocarbons from CO (or CO<sub>2</sub>) gas by reductive polymerization in hydrogen, at medium pressures and temperatures (200-300°C), over transition metal catalyst. Szatmari (1989) [1, 2] proposed that commercial petroleum formed by F-T synthesis, as CO<sub>2</sub> reacted with hydrogen from serpentinizing shallow mantle. The Santos basin [3, 4] offers excellent opportunities to test whether such large-scale synthesis takes place in nature on a basinwide scale. The Santos Basin, that contains the largest oil reserves discovered in the last 30 years in the western world, formed during Early Cretaceous South Atlantic rifting, east of the Paraná hotspot, over superextended continental lithosphere [5, 6]. Volcanic and post-volcanic activity provided large amounts of CO<sub>2</sub>, a small portion of which is retained in the oil. Hydrogen generated by serpentinization reacted with CO<sub>2</sub> in the reservoir; their rapid diffusion was impeded by the thick latest Aptian salt seal. Quantitative relationships of CO<sub>2</sub> and hydrocarbons with pressures and temperatures attest to Fischer-Tropsch synthesis.

[1] Szatmari (1989) *AAPG Bull.* **73**, 989–998. [2] Katz *et al.* (2008) *AAPG Bull.* **92**, 549–556. [3] Carminatti *et al.* (2008) 19<sup>th</sup> World Petroleum Congress. [4] Karner, G.D. Gambôa, L. A. P. (2007) *Geol. Soc. Spec. Publ.* **285**, 15–35. [5] Karner, Manatschal & Pinheiro (2007) *Geol. Soc. London*, 484 pps. [6] Zalán *et al.* (2009) AAPG ICE November 2009, Rio de Janeiro, Brazil.

## Application of the residual values instead of raw data in the geochemical evaluation

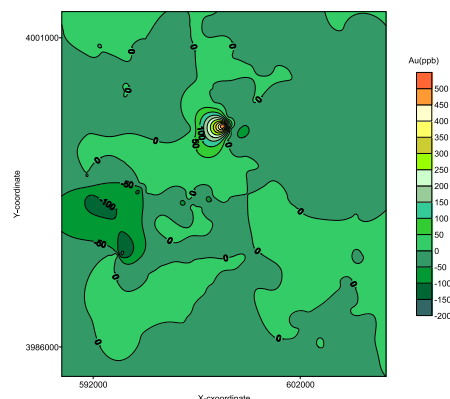
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### The geochemical residual values

In order to evaluate any deviation in the geochemical data from the general variation trend, identification and calculation of Residual Values, RV, could be one of the method. In data mine, based on the information from the study area, the source of local and regional RV could be interpreted.

The modelling of probability diagram was used to identify the number of general trend, characteristic of each trend and deconvolution of the different trends for a shear zone Au mineralized zone [1]. The complex ability of the general trend for the calculation of RV was estimated according to the modelling. Different numbers of threshold values, TV, were applied for the RV calculation and the best number of TV limitation was estimated. The RV map was drawn to evaluate the deviation in the geochemical data from the general variation trend and interpretation of the local and regional RV in the study area.



**Figure 1:** Residual values distribution

The RV map is a method for evaluation of the anomaly areas.

[1] Ghavami-Riabi (2010) *J. Geochem. Explor.* **104**, 27–33.