

GEOS4 GmbH · Peter-Huchel-Chaussee 88 · 14552 Michendorf · Germany

## **FIRST ANNOUNCEMENT**

*GEOS4 partnership with GFZ on Retention and Transport*

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## **PROJECT OPEN FOR SPONSORSHIP IN 2018**

We are very proud to offer this highly topical project for co-sponsorship in 2018:

### ***Polars in Fluid Inclusions (PIFI)***

- 2-years duration
- To be co-sponsored at 35k€ per year
- Discounted at 99k€ per year when co-sponsoring ***all three projects new in 2018***
- Minimum participant quota will apply

#### ***Kick-off March 1, 2018***

Please let me know if this project could be of major interest and you are giving serious consideration for 2018 funding. Email: [horsfield@geos4.com](mailto:horsfield@geos4.com) Tel: +49 331 288 1780.

Best wishes,



# *Polars in Fluid Inclusions (PIFI)*



Key Words: Migration caught in the act, cement stratigraphy, proximity indicators

## ***Background:***

Fluid inclusions in mineral cements from ore provinces and petroleum reservoirs often contain organic matter. Very simple molecules like methane and the wet gases have been characterised in individual inclusions using Raman spectroscopy, and higher molecular weight compounds have been detected in bulk samples using thermovapourisation or crushing followed by gas chromatography and mass spectrometry. Free or biodegraded oil can be present. Biomarker analysis has been conducted on oil inclusions after the leeching of surfaces to remove contaminants, followed by crushing under solvent. Combining homogenisation temperatures from aqueous and organic inclusions provides key insights into paleotemperature and pressure of reservoirs. While the hydrocarbon components have been widely evaluated, very little is known about the polar compounds contained in occluded oils or formation waters. The composition of polars in occluded crude oils gives first hand information on facies, maturity and migration distance, whereas those in aqueous inclusions yield clues as to oilfield proximity and paleo-OWC.

## ***Goal:***

Here we seek to make a comprehensive investigation of the hydrocarbons and non-hydrocarbons in fluid inclusions within a petroleum systems context.

## ***Area(s) of study:***

The initial focus will be on the Lower Saxony Basin, Germany, because the petroleum system is well researched using a wide variety of techniques, and most importantly fluid inclusion geochemistry and microthermometry of inclusions in a variety of strata are known in detail. Thus, calcite and quartz cementation in the major source rocks (Lias and Wealden), both parallel and perpendicular to bedding are present. Stable carbon and nitrogen isotopic compositions of gases have been measured. Evidence of both cumulative and instantaneous gas generation exists, as well as late biodegradation. Evidence of hydrothermal activity, consistent with a deep igneous body, has been presented. The main study area is expected to be augmented using additional samples from other petroleum systems, as provided by the sponsors, as time goes by.

## ***Approach:***

More than fifty high quality samples are available for study. These will be high-graded with reference to geographic and stratigraphic occurrence, homogenisation temperatures, salinity, as well as the available carbon- and nitrogen isotopes. Thermovapourisation will be used as screening tool. For selected samples detailed analyses will be undertaken using compound specific stable carbon and hydrogen isotopes, gas chromatography mass spectrometry and ultra-high resolution mass spectrometry (FT-ICR MS). Extreme caution will be given to ensure that contamination from partings and outer surfaces are eliminated.

## ***Experience and manpower:***

Volker Lüders  
Mareike Noah  
Andrea Vieth-Hillebrand  
Yufu Han (Ph.D student)  
Brian Horsfield  
Hans-Martin Schulz

## ***Deliverables***

Regional synthesis of results, and analytical database.