

## Transformations of hydrocarbons during hot subduction

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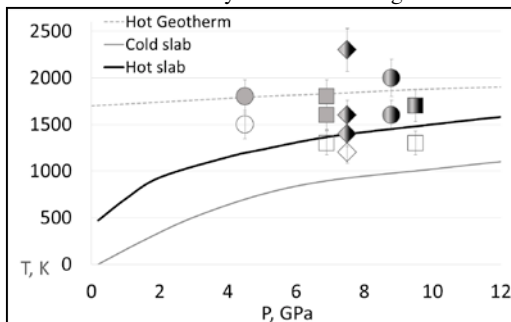
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As a part of the deep carbon cycle, hydrocarbons (such as oil and gas or organic precipitates) accumulate in sediments of subduction zones and may eventually sink down with the slab to the subcrust [1]. This study models some aspects of the behavior of hydrocarbons during slab subduction.

High-pressure experiments in diamond-anvil cells were conducted in order to investigate reactions in three systems using Mössbauer spectroscopy. Each system modelled the interaction between the hydrocarbon (HC) mixture and one of the potential rock-forming materials containing ferrous iron – iron oxide  $\text{Fe}_{0.94}\text{O}$ , ferropericlase  $(\text{Mg}_{0.8}\text{Fe}_{0.2})\text{O}$ , and pyroxene glass  $\text{Mg}_{0.91}\text{Fe}_{0.09}\text{Si}_{0.91}\text{Al}_{0.09}\text{O}_3$ .

Results of the study are shown in Fig.1.



**Figure 1:** Experiments compared to the Earth's geotherms. *Circles* – HCs-silicate system, *Squares* – HCs-ferropericlase, *Diamonds* – HCs-iron oxide (II); *Open symbols* – no reaction, *Shaded Grey* – iron hydride in the run product, *Shaded Grey/Black* – iron hydride and iron carbide in the run product.

Obtained results suggest that iron hydride ( $\text{FeH}$ ) and iron carbide ( $\text{Fe}_7\text{C}_3$ ) may possibly be formed from interaction between hydrocarbons and different types of  $\text{Fe}^{2+}$ -bearing rock during hot slab subduction.

[1] C. E. Manning (2014) *Nat. Geosci.* **7**, 333–334.