

# Linking the mechanics of polygonal faults with hydrothermal activity and marine biosphere – the Guadeloupe geothermal system

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## Introduction

Polygonal faults are ubiquitous features, commonly observed in seismic images of fine-grained sedimentary successions along many passive margins. They have been reported from many areas around the world (Fig. 1)

Different models have been proposed how polygonal faults form, but the underlying mechanics are often poorly constrained.

In this study, we present data from a polygonal fault system in Guadeloupe, where it is directly accessible at the sea floor at a depth of 5 m. This offers a unique opportunity to investigate the mechanics of polygonal faults, which are most commonly only observed on seismic data.

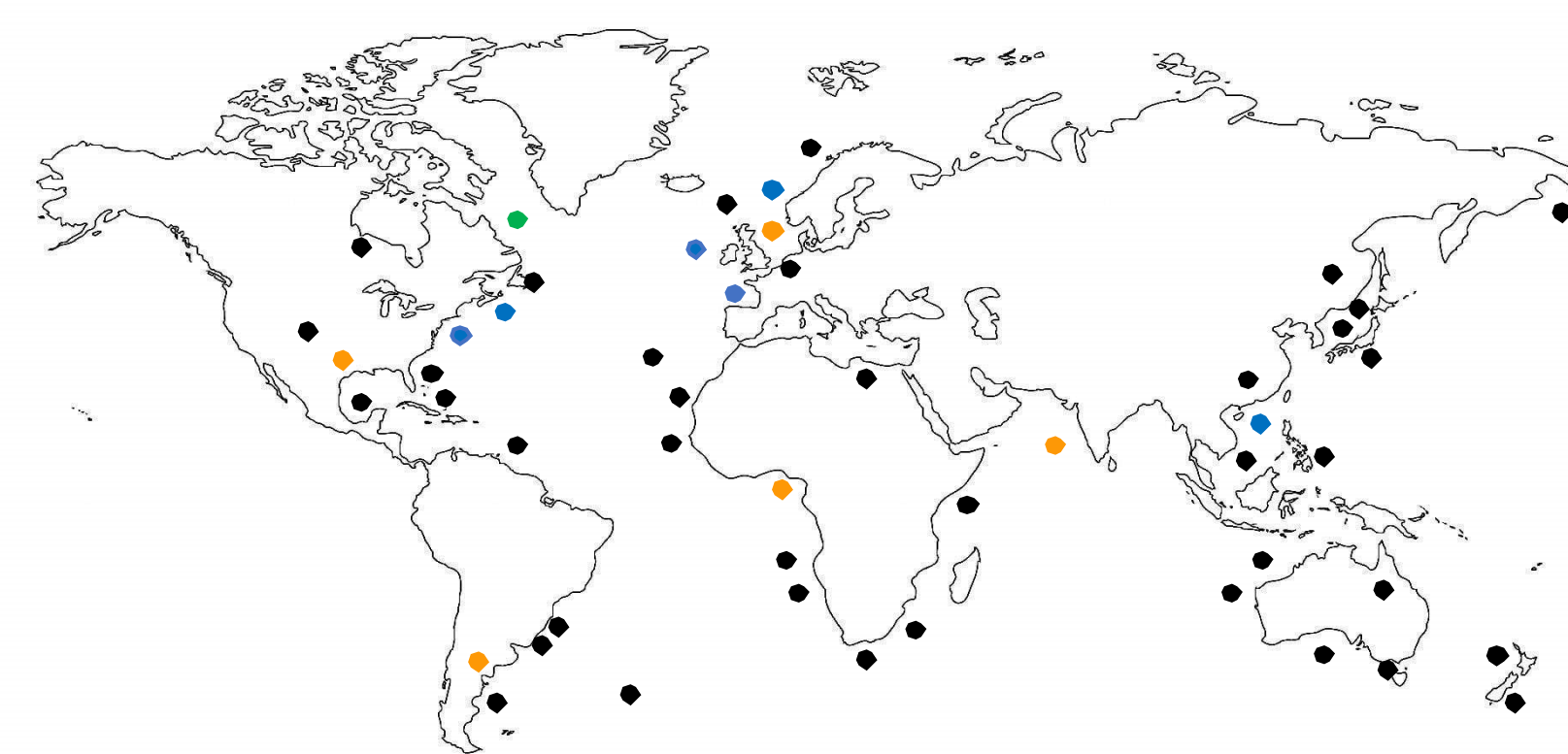
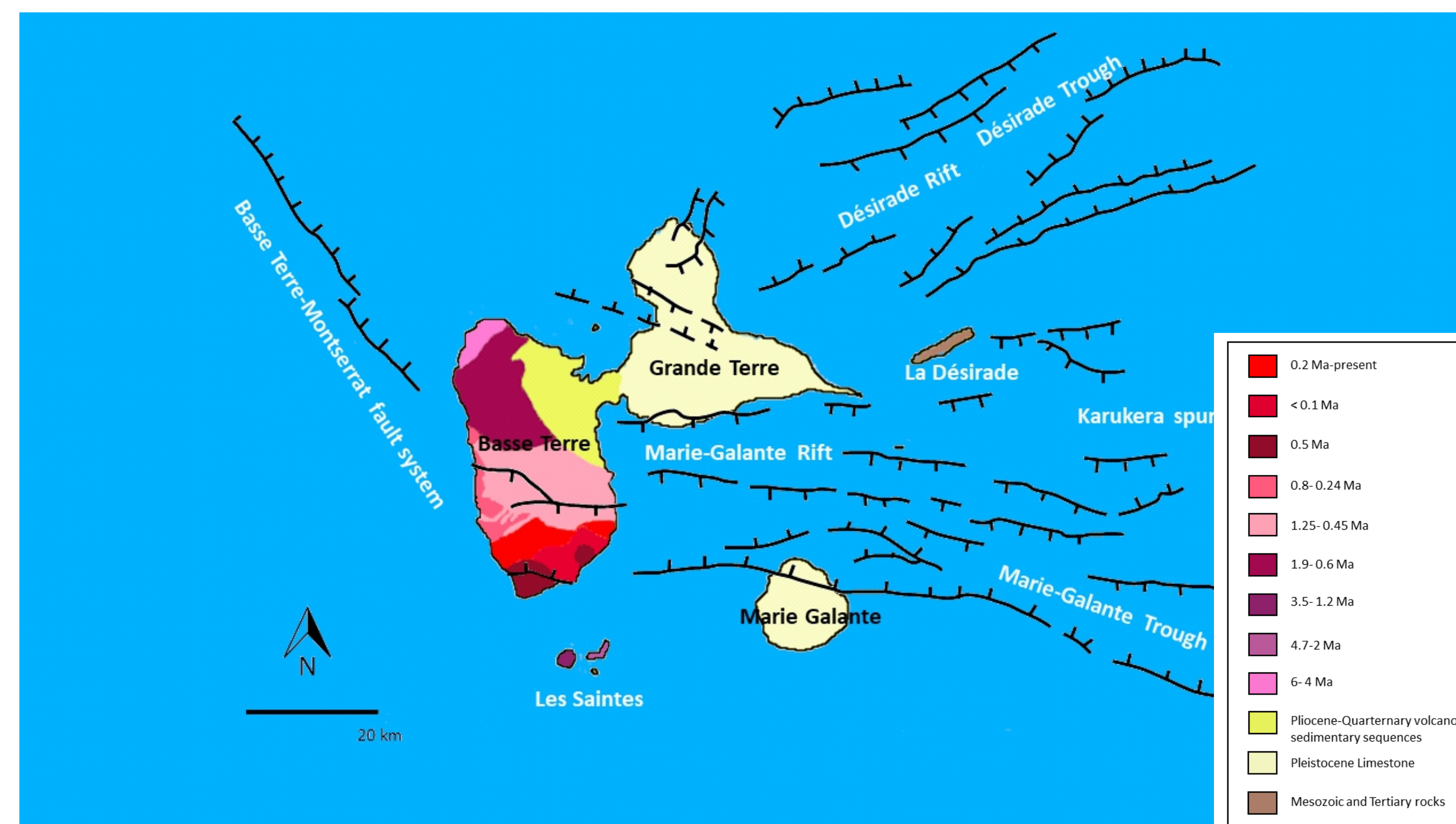


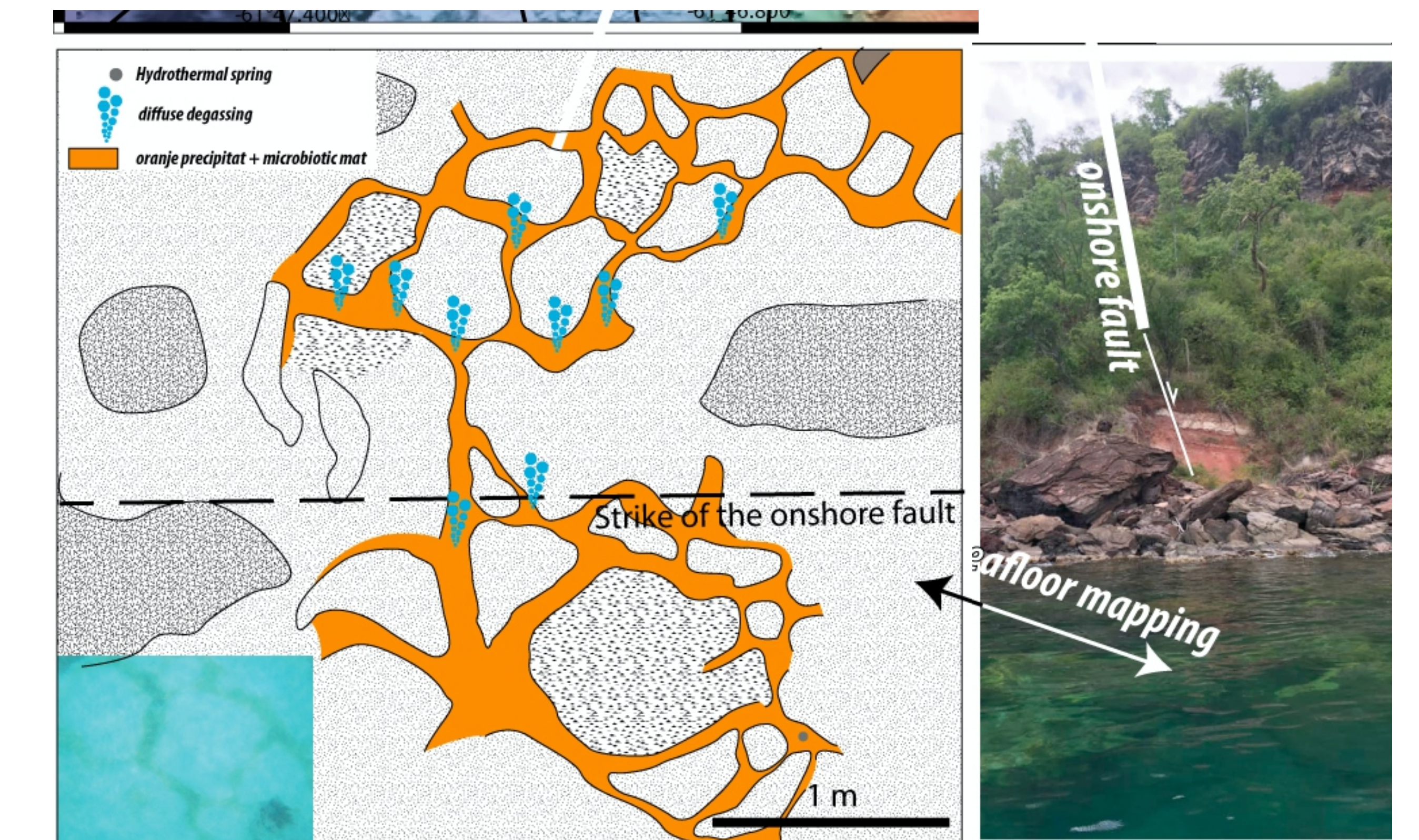
Figure 1: compilation of areas where polygonal faults have been reported. Different mechanisms for the formation of polygonal faults have been put forward, but the mechanics of these structures remain not well understood.

## The Geology of Guadeloupe

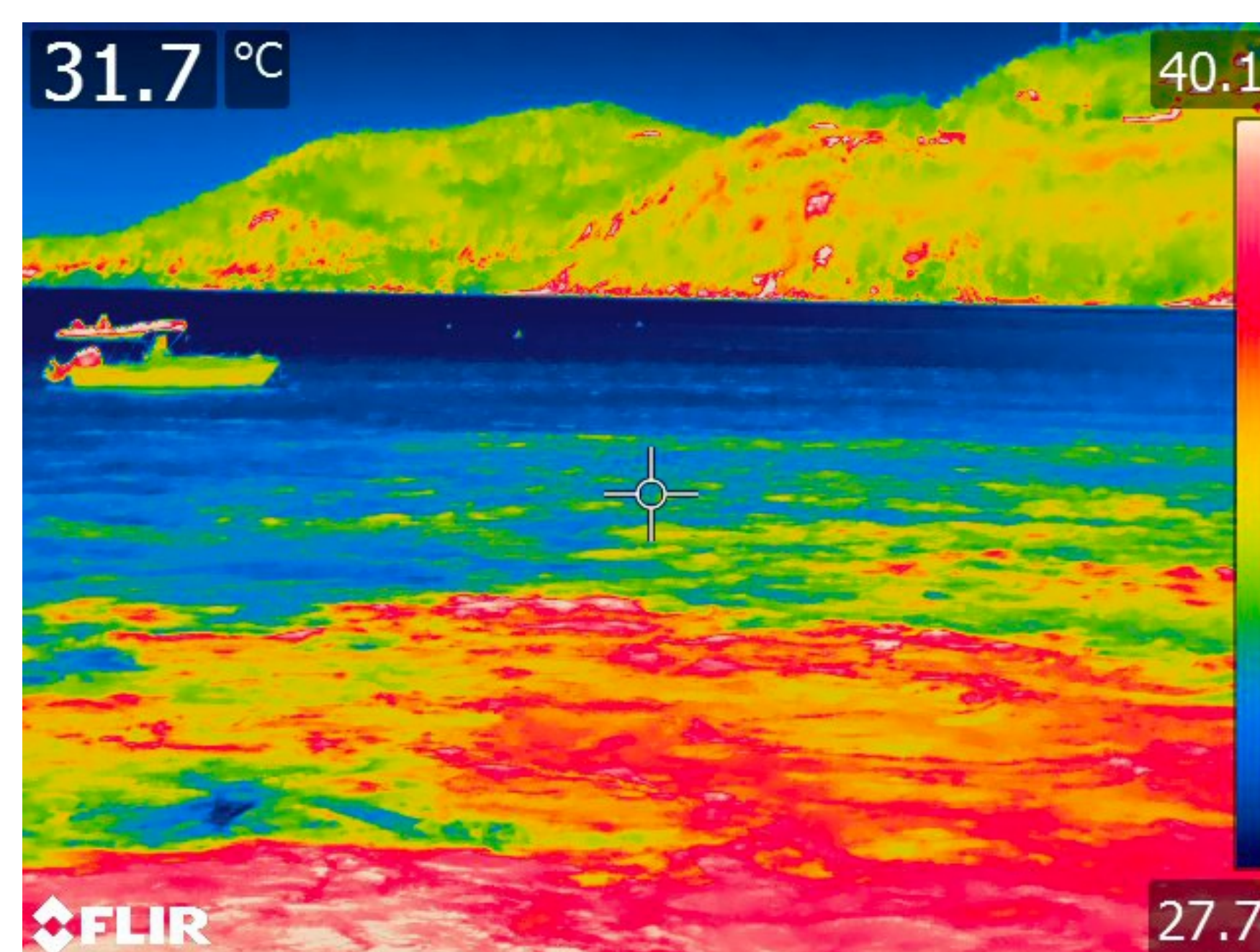


Guadeloupe shows relatively distributed hydrothermal activity, not only close to the active volcano but also in an area aptly named Bouillante, some 20 km from the volcano. Important for geothermal energy, one geothermal power plant active and another one planned

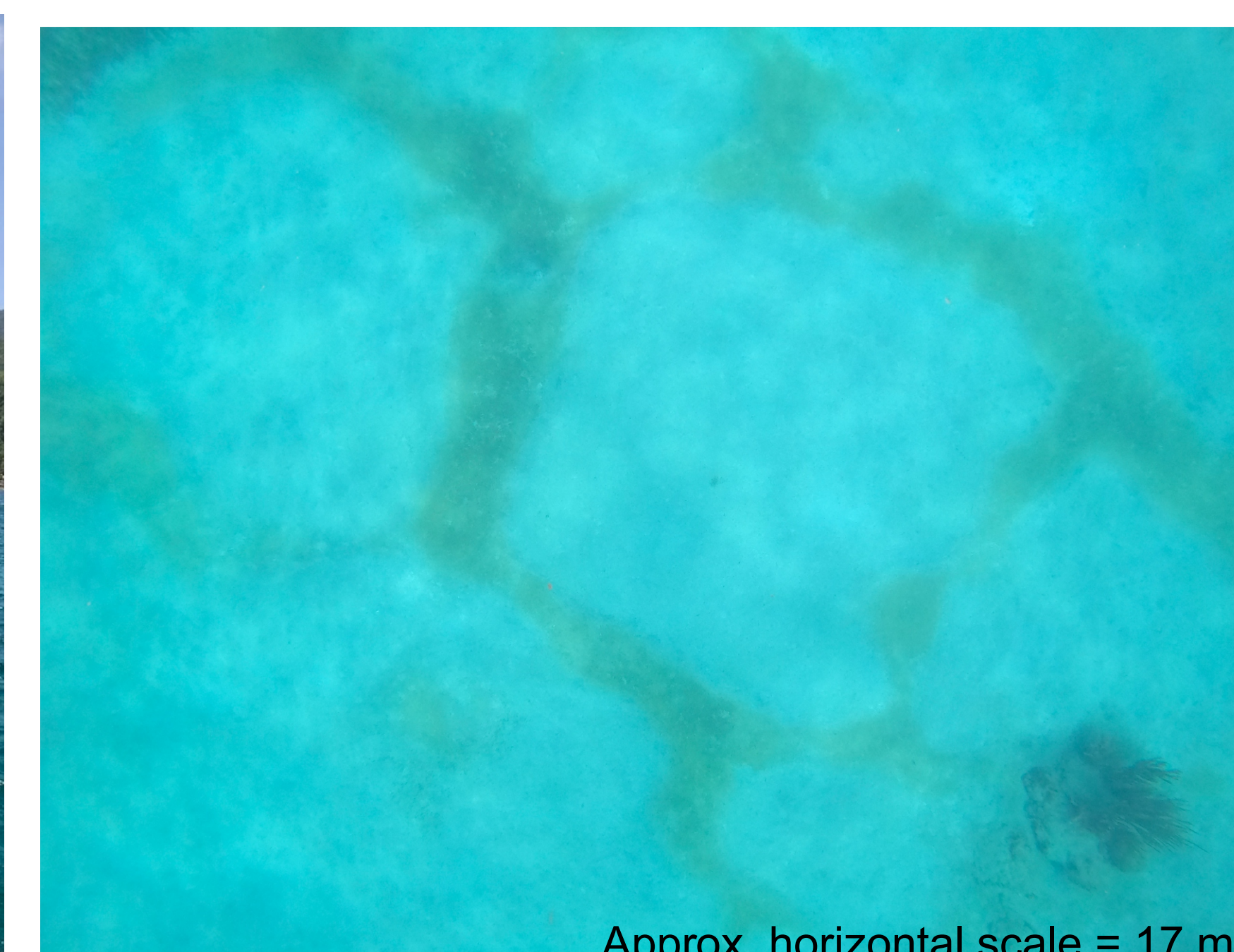
## Mapping polygonal structures



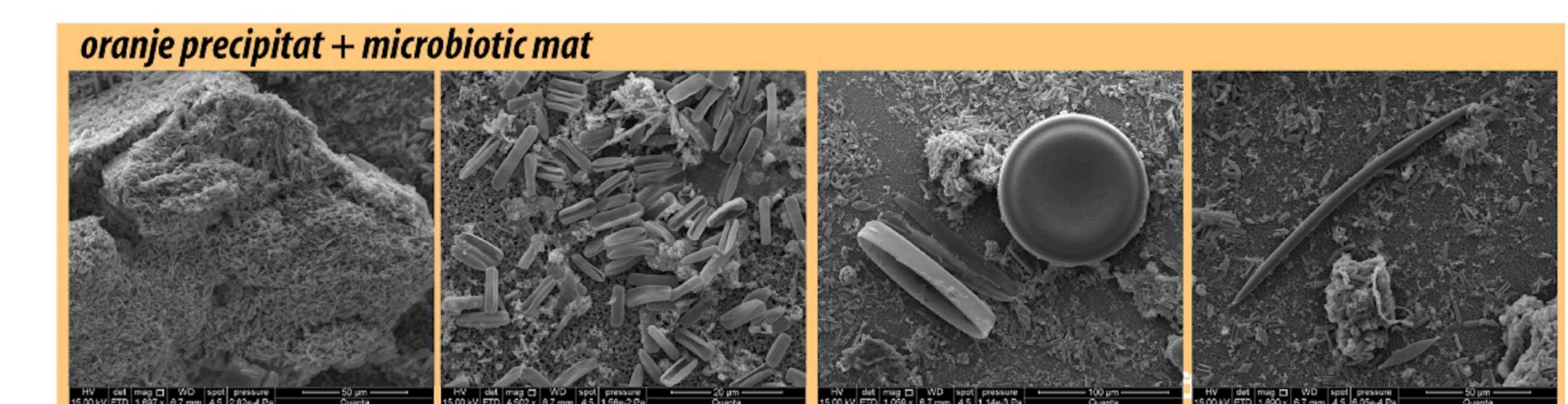
## Bouillante Bay - hot fluids



## Tahiti beach - polygonal structures



## Why orange?



- Samples contained orange biofilm: microbial origin?
- SEM images: orange patches of sand colonised by diatoms
- Diatoms like Si-rich hydrothermal waters. Orange patches signify diffuse discharge of Si rich hydrothermal water?

At Tahiti Beach in Guadeloupe polygonal structures can be observed a water depth of 5 meters. The structures are distinct because of their bright orange color, which are of microbial origin. The system is exceptional, as it provides an accessible link between a hydrothermal system and marine biota.