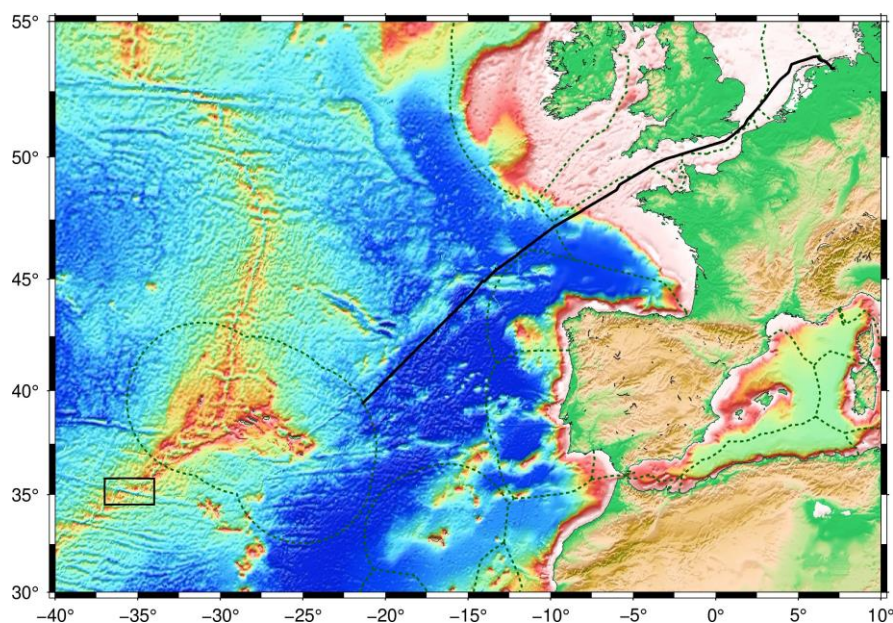


1. Weekly Report of Expedition No. M170 of RV METEOR

Emden, Germany (11.01.2021) – Emden, Germany (14.02.2021)

The scientific party of M170 (GPF 20-3_090) embarked RV METEOR at noon on 10th of January 2021 and began to set-up laboratories in the afternoon. On the next morning at 7:30 UTC RV METEOR left the harbour, beginning a 2200 nn transit into the working area to the south of the Azores.



Track of M170 and location of survey area (black box)

The *TRANSFORMERS* expedition is going to use geological and geophysical techniques to study the 120 km long Oceanographer transform fault to the south of the Azores archipelago near 35°N.

Transform faults, mid-ocean ridges and subduction zones build the foundation of plate tectonics.

Within this framework mid-ocean ridges define constructive plate boundaries, where new seafloor is created, while at subduction zones, called destructive plate boundaries, tectonic plates are recycled into the mantle; transform fault define the third type of plate boundary where two plates slide past each other without forming or consuming lithosphere. Any of the three types of plate boundary is the focus of tectonic and seismic activity.

However, recent research efforts suggest that oceanic transform faults – in contrast to transform faults on land – cannot be defined as conservative plate boundaries, but are rather highly dynamic features, nurturing extension and hence crustal and lithospheric stretching below the surface trace of the transform fault. Further, thinned transform crust is augmented by a second stage of magmatism as it passes the opposing ridge-transform intersection. These hypotheses will be tested during M170 along the Oceanographer transform fault. Therefore, a pilot study utilizing micro-earthquakes recorded on ocean-bottom-seismic receivers will reveal tectonic stresses acting on the transform fault. Bathymetric and side-scan sonar imaging as well as deep-tow video observations and geological sampling shall survey magmatic processes at the ridge-transform intersections.

During our south-westward transit, we are currently preparing 30 ocean-bottom-seismometers and hydrophones for deployment on the seabed, including a test of all release units on 15th and 16th of January; all releasers performed well, establishing an acoustic link between a ship-mounted hydrophone and the units at 1000 m water depth.

We expect to arrive in the working area on 20th of January 2021 in the early afternoon. First, we are going to deploy the seismic network along the transform fault plate boundary to record natural

seismicity. Further, we will map the seafloor fabric using the shipboard EM122 echosounder and a deep-tow side-scan sonar, before we will ground-truth mapping efforts using deep-tow video tows and geological sampling.

In the name of all cruise participants, best regards from 38°38'N / 22°24'W,

Ingo Grevemeyer

GEOMAR Helmholtz Centre for Ocean Research Kiel

