

Research vessel SONNE

SO318: 22.02. – 26.03.2026

San Diego – Ensenada – San Diego

Second weekly report: 2 – 8 March 2026



As mentioned in last week's report, we used the ROV dive on Sunday, 1 March, to investigate the lower slope area of the eastern flank of Thirtymile Bank. We had previously been able to clearly identify a gas flare there in the water column by means of acoustic signals, which would suggest the formation of a seep area on the seabed. An AUV map survey conducted before the dive showed a slightly hilly morphology, and the first camera images from the ROV showed large deposits of vesicomid clam shells covering the seafloor. After a signal was detected by the ROV's forward-looking sonar, the gas vent was quickly located less than 10 m away. The seafloor was covered with dense bacterial mats of white and orange colors, and individual bubbles could be clearly observed escaping from the seabed. We proceeded to carry out a complete video mapping from a height of 3 m with a high-resolution camera in 10 parallel strips at intervals of 1.3 m to record all larger organisms and obtain as accurate a picture as possible of the small seep field. We then sampled gas bubbles using the Gas Bubble Sampler by collecting bubbles in an inverted funnel attached to a pressure chamber (Fig. 1). The valve to the chamber was then opened with the second arm, whereby the pressure difference drew the gas into the chamber and, after closing the valve, the gas sample was stored until the ROV was retrieved.

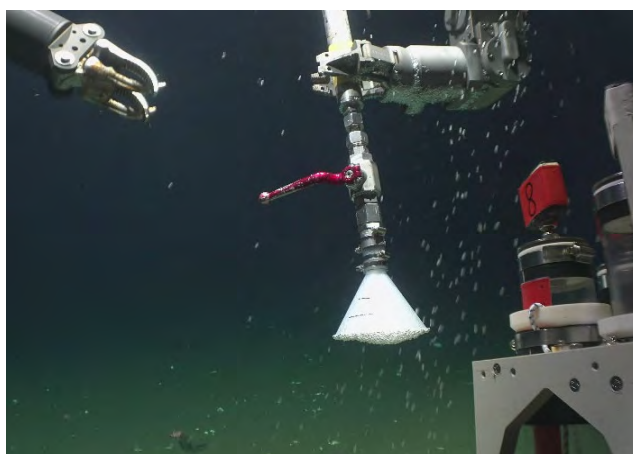


Figure 1: ROV QUEST collects gas bubbles escaping from the seabed using the Gas Bubble Sampler and stores them in the pressure chamber for later analysis. (© MARUM)

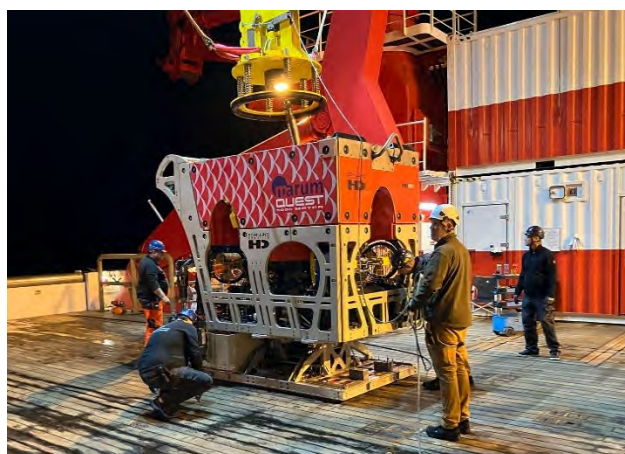


Figure 2: After a busy dive, ROV MARUM QUEST returns on board and is secured on the aft deck. (© G. Bohrmann)

We also took water samples above the bacterial field, inserted the temperature lance into the ground to measure the geothermal gradient, and began sampling with push cores. Unfortunately, at that moment, the power circuit for the ROV's hydraulics failed, so the vehicle had to be hoisted on board. The two devices remaining on the seafloor (temperature lance and push core) were then recovered in a second dive on Monday, 2 March, completing the goals of the seep field investigation.

Sampling of the seep field with the autoclave piston corer (DAPC) and the analysis carried out on board proved that gas hydrates exist in the near-surface sediments of the seep, which, due to their high methane content, support chemosynthetic communities on the seafloor. After spending two and a half days exploring

this seep field, primarily with ROV QUEST (Fig. 2), and collecting a large number of samples (Fig. 3), it was clear that we had to give this newly discovered methane-rich zone on the seafloor a name. During the discussion at the science meeting on board Research vessel SONNE, the term Kinkipar Seep was unanimously voted for. In the language of the Tongva indigenous people, Kinkipar refers to the neighboring island of San Clemente or to a former indigenous settlement on the island.



Figure 3: Once the dive is complete and ROV QUEST is secured back on the aft deck, the scientists arrive to receive the samples collected from the seabed during the dive. (© G. Bohrmann)

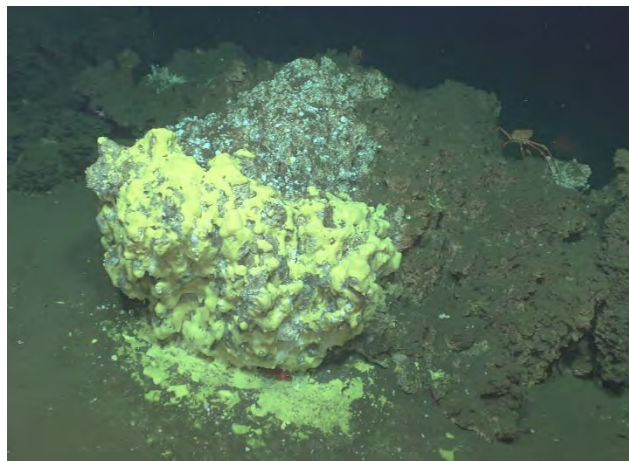


Figure 4: Barite rock formations protruding as isolated blocks above the sediment-covered seabed. In addition to the dark, probably older barite deposits, fresh barite is precipitated in areas characterized by bacterial mats (© MARUM)

After completing these investigations, we moved to the San Nicolas Ridge, about 50 nautical miles away, where an earlier dredge operation by the US Geological Survey had yielded barite. Fluid seeps with barite formation are our targets on the seabed, and these were to be expected at the San Nicolas Ridge. The ridge, which runs approximately northwest-southeast, is about 5-6 km wide, rising from about 1600 m in the southwest and 1200 m in the northeast to a water depth of 850 m. Its northeastern flank, which is significantly steeper, appears to be associated with a fault that can be considered a deep fluid pathway to the seafloor. The first high-resolution bathymetric map of this region was generated with the two MBARI Mapper AUVs on Tuesday, 3 March. The maps amazed us all, because almost the entire northeast slope of the San Nicolas Ridge is covered with hundreds of small hills ranging from a few meters to tens of meters in size. On the ridge itself, in addition to such structures, we could also see larger prominent areas, which give the map a very impressive micromorphology. During three dives on Wednesday, Thursday, and Saturday, using the ROV QUEST 5000, we investigated some of the most striking relief structures, which appear to consist almost exclusively of barite rocks that were precipitated by former fluid seepage events.

During each of the three dives, we also discovered numerous discrete fresh barite precipitates, which were significantly lighter in color relative to the massive older barite structures and mostly covered with white or orange microbial mats (Fig. 4). These areas were also inhabited by many smaller organisms, such as snails and crustaceans. We took extensive samples from many of these locations for detailed geochemical, microbiological, and mineralogical analyses. After a day of bad weather on Friday, 5 March, which we used for surveying with the EM122 and Parasound ship systems, we were able to extend the existing AUV map along the ridge axis in both directions on Saturday, 7 March. We are very satisfied with the exciting research results of the first two weeks and hope to obtain the research permit for Mexico next week. We have already heard the first positive signs from the Mexican authorities and plan to obtain the required visas for all scientists at the Mexican consulate in San Diego on Tuesday March 10.

Greetings for the weekend on behalf of all participants,

Gerhard Bohrmann,

FS SONNE, Sunday, 8 March, 2026

ROV QUEST's dives can be followed live on the MARUM YouTube channel:

<https://www.youtube.com/@marumTV>