Volcano F is the origin of 'floating stones'

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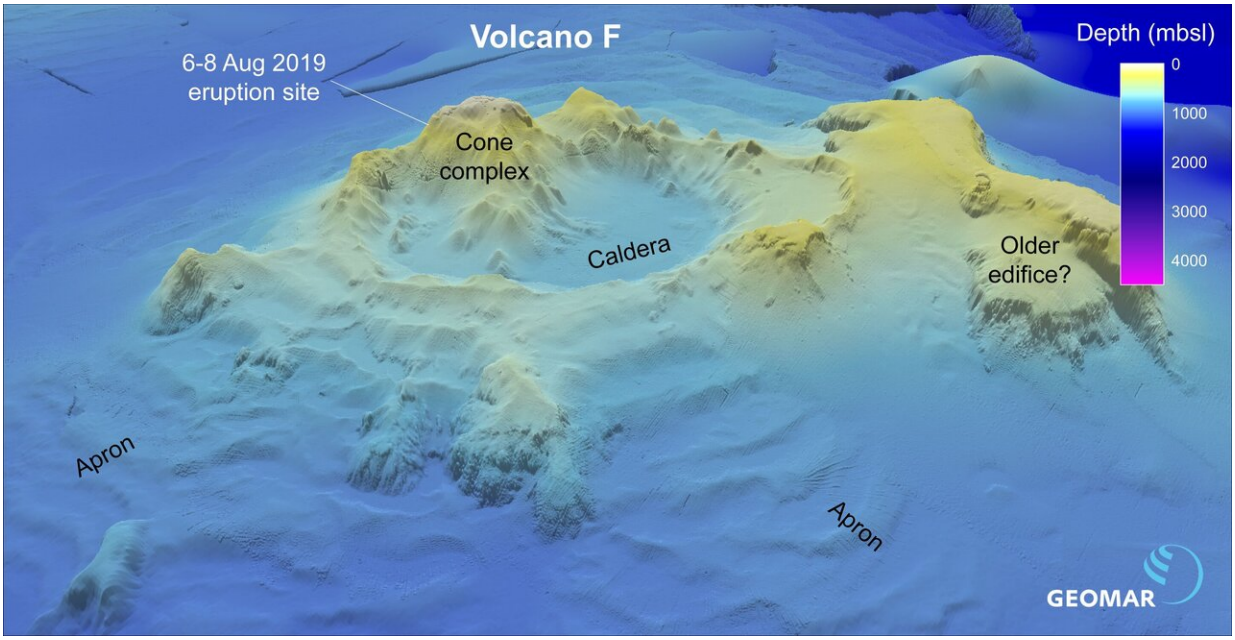

Credit: GEOMAR

Stones do not float in water—this is a truism. But there is hardly a rule without exception. In fact, some volcanic eruptions produce a very porous type of rock with a density so low that it does float: Pumice. An unusually large amount of it is currently drifting in the Southwest Pacific towards Australia. When it was first sighted in the waters around the island state of Tonga at the beginning of August, it almost formed a coherent layer on the ocean's surface. The "pumice raft" made it into headlines all over the world.

Various underwater volcanoes were discussed at that time as the potential source. But direct proof for the exact origin of the pumice was missing so far. Researchers at the GEOMAR Helmholtz Centre for Ocean Research Kiel (Germany), together with colleagues from Canada and Australia, are now publishing evidence in the *Journal of Volcanology and Geothermal Research* that clearly identifies the culprit. It is a so far nameless underwater volcano just 50 kilometres northwest of the Tongan island of Vava'u. "In the international scientific literature, it appears so far only under the number 243091 or as Volcano F," says Dr. Philipp Brandl of GEOMAR, first author of the study.

In January of this year Dr. Brandl and several of his co-authors were working in the region on the German research vessel SONNE. The expedition, named ARCHIMEDES, aimed at studying the formation of new crust in the geologically extremely dynamic region between Fiji and Tonga. "When I then saw the reports on the pumice raft in the media in the summer, I became curious and started researching with my colleagues," says the geologist.

The team found what they were looking for on of freely accessible satellite images. On an image of the ESA satellite Copernicus Sentinel-2 taken on 6 August 2019, clear traces of an active underwater eruption can be seen on the water surface. Since the images are exactly georeferenced, they could be compared with corresponding bathymetric maps of the seafloor. "The eruption traces fit exactly to Volcano F," says Dr. Brandl.

To be on the safe side, the researchers also compared this position with information from stations of the global seismic network that recorded signals from the eruption. "Unfortunately, the density of such stations in the region is very low. There were only two stations that recorded seismic signals of a volcanic eruption. However, their data is consistent with Volcano F as the origin," says Dr. Brandl.

Pumice can form during volcanic eruptions when viscous lava is foamed by volcanic gases such as water vapour and carbon dioxide. This creates so many pores in the cooling rock that its density is lower than that of water. "During an underwater eruption, the probability to generate pumice is particularly high," explains Dr. Brandl.

With the help of additional satellite images, the team traced the drift and dispersal of the pumice raft until mid-August. It slowly drifted west and reached an area of up to 167 square kilometres. This is about twice the size of Manhattan. The team was also able to constrain the magnitude of the underwater eruption. It corresponded to a volcanic eruption index of 2 or 3, which is similar to recent eruptions of Mount Stromboli, for example.

With the current direction and speed, the pumice raft is expected to hit the Great Barrier Reef off the eastern coast of Australia at the end of January or beginning of February. Biologists, in particular, are eagerly awaiting this event because pumice rafts may play an important role in the dispersion of fauna in the vastness of the Pacific Ocean. The Kiel team of geologists would like to examine samples of the pumice in order to determine the geochemistry of Volcano F more precisely. "Maybe our Australian colleagues will send us a few samples next year," says Dr. Brandl.

More information: Philipp A. Brandl et al, The 6–8 Aug 2019 eruption of 'Volcano F' in the Tofua Arc, Tonga, *Journal of Volcanology and Geothermal Research* (2019). DOI: 10.1016/j.jvolgeores.2019.106695

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