Supplementary Materials

S1 : Mixing lines used for calculation of the end-member composition of the Fatu Kapa fluids.

S2 : Modified after Von Damm et al. (1991). Plot of the molality of dissolved SiO$_2$ in equilibrium with quartz in seawater versus temperature for isobars from 1500 to 1000 bars according to Von Damm et al. model. The Si most enriched fluid collected at Kulo Lasi is represented by the blue star. The red circle covers the range of Si concentrations and T encountered in fluids from the Fatu Kapa vent field.

S3 : Modified after Bischoff and Pitzer (1989). Stars stand for Kulo Lasi fluid phases characteristics. They nearly plot on the 150 bars isobar. The close up of the 400 °C – 300 bar region shows that seawater could produce the observed salinities at Kulo Lasi by phase separation at about 320-350 bars and 415-420 °C.

S4 : Modified after Kawagucci et al. (2013). Plots of H$_2$ concentration versus CH$_4$ concentration in various hydrothermal fluids. The grey area represents values observed in a hydrothermal experiment using natural seafloor sediments. Values obtained for the Wallis and Futuna vent fields are reported: Kulo Lasi brine and condensed vapour phases are marked by the red square and the blue diamond, respectively, and the blue shaded area covers the range of values obtained in the Fatu Kapa field.

S5 : Modified after Lupton et al. (2015). (a) Plot summarizing $^3$He/$^4$He ratio versus C/$^3$He for various mantle provinces, including mid-ocean ridges (black-filled symbols), submarine arc volcanoes (blue), and sub aerial arc volcanoes (green). Values for the Fatu Kapa vent field are reported as orange diamonds. $^3$He/$^4$He is expressed as R/Ra. Crosses indicate average values for MORBs and for sub aerial arcs from. (b) Similar plot including values for hotspot volcanoes such as Loihi, Kilauea fumarole, Yellowstone Park gases, Reunion, and Fatu Kapa (orange diamonds).

S6 : Distribution of linear fatty acids in various environments. Data are from (Blumenberg et al., 2007) for Massive Sulphide Deposits (MSD); (McCollom et al., 2015) for Lost City (LC) fluids; (Cooper and Bray, 1963) for petroleum, recent and ancient sediments; (Ben-Mlih et al., 1992) for 13°N mussels.

S7 : Distribution of linear alkanes obtained by thermogenic maturation in various crude oil basins and abiotic Fischer-Tropsch Type experiment (McCollom and Seewald, 2006).

S8 : Example of a post-processed video sequence using the Typhoon algorithm to estimate displacements (instantaneous – left panel; averaged on 25 frames – right panel) on one of the small black smokers in the Kulo Lasi caldera.

S9 : Example of a post-processed video sequence using the Typhoon algorithm to estimate displacements (instantaneous – left panel; averaged on 25 frames – right panel) at the base of the Carla chimney.

S10 : Example of a post-processed video sequence using the Typhoon algorithm to estimate displacements (instantaneous – left panel; averaged on 25 frames – right panel) at the top of the massive Obel$^8$ chimney.
S11: Time series of the estimated displacements corresponding on the video sequences shown in figures S8, S9 and S10.

References


Figure S5
The figure shows the distribution of FA in various geological environments. The concentration of FA (ppb) is plotted against the carbon number (C8 to C20). Legends indicate different sources of FA: Recent sediments (x10 ppm), Ancient sediments (x100 ppm), Petroleum (x10-1 mg.L-1), MSD (ppb), LC fluids (ppb), and 13°N mussel (x10-4 ppm).
Figure S7: Crude Oil Basins and FTT Experiment