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A deep-towed magnetic survey in the southern Okinawa Trough: Implications for hydrothermal system detection

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The Okinawa Trough (OT) is widely recognized as an area with extensive volcanism and hydrothermal activity. However, finding new hydrothermal vent sites in this region remains a technical challenge due to their small sizes. A deep-towed magnetic survey can acquire short-wavelength signals, which can provide useful information on the shallow subsurface structures of hydrothermal systems. In 2017, a deep-towed magnetic survey was conducted in selected area of the southern OT. After data processing and removing the regional magnetic field, crustal magnetization map was obtained by assuming a magnetized layer with a constant thickness of 500 m whose top surface is the seafloor. In addition, onboard echo sounder signals (EK-60) suggest the presence of gas plumes emanating from the seafloor within the water column. Some of these emanating gas plumes are concentrated in several small areas that correlate well with magnetization lows in the study region. The deep-towed magnetic survey results and other geochemical/geophysical observation results suggest that the Geolin Mounds (GLM) site and site Penglai Fault Zone (PFZ) are the highly potential hydrothermal areas in the southern OT.