



## **Mud volcano venting induced gas hydrate formation at the upper slope accretionary wedge, offshore SW Taiwan**

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TsanYao Mud Volcano (TYMV) is the largest mud volcano cone in the Hengchun Mud Volcano Group (HCMVG), located at the upper slope of the accretionary wedge, southwest of Taiwan. The region is under active tectonic activity with the Philippine Plate, moving northwestward at a rate of  $\sim 8$  cm/year. This region also receives huge quantity of suspended particle load of  $\sim 100$  mT/year at present time from adjacent small rivers of the Island of Taiwan. Large loads of suspended sediments influx become a major source of organic carbon and later gas and other hydrocarbon. Gas and fluid in the mud volcano are actively venting from deep to the sea floor on the upper slope of the accretionary wedge. In order to understand venting on the HCMVG, echo sounder, towcam and coring were carried out. Pore water sulfate, chloride, potassium, calcium, stable isotope O-18, gas compositions, dissolved sulfide were analysed.

The HCMVG consists of 12 volcano cones of different sizes. Large quantity of gas and fluid are venting directly from deep to the TYMV structure high, as well as 50+ other vents as appeared as flares on the echo sounder. Some flares are reaching to the atmosphere and likely a source of green house gases to the atmosphere. Venting fluids include gas bubbles, suspended particle, mud, and breccia. Breccia size could reach more than 12 cm in diameter. Circular bands in different color appeared around the cone may represent stages of vent eruptions. Compositions of vent gas include methane, ethane and propane. High proportions of ethane and propane in the vent gas demonstrated that source of gas are thermogenic in origin. Patchy authigenic carbonate, bacterial mats, bivalves, tube worms and other chemosynthesis organisms were supported by venting gas AOM process near the sea floor.

Pore water chloride concentrations show distinct variation pattern from center cone to the side of the volcano, with low in the center and high away from the cone. Pore water with higher than seawater chloride indicated gas hydrate formation in sediments away from the mud volcano cone.