

天然氣水合物儲集系統精密觀測與取樣-臺美與臺德合作計畫

執行單位

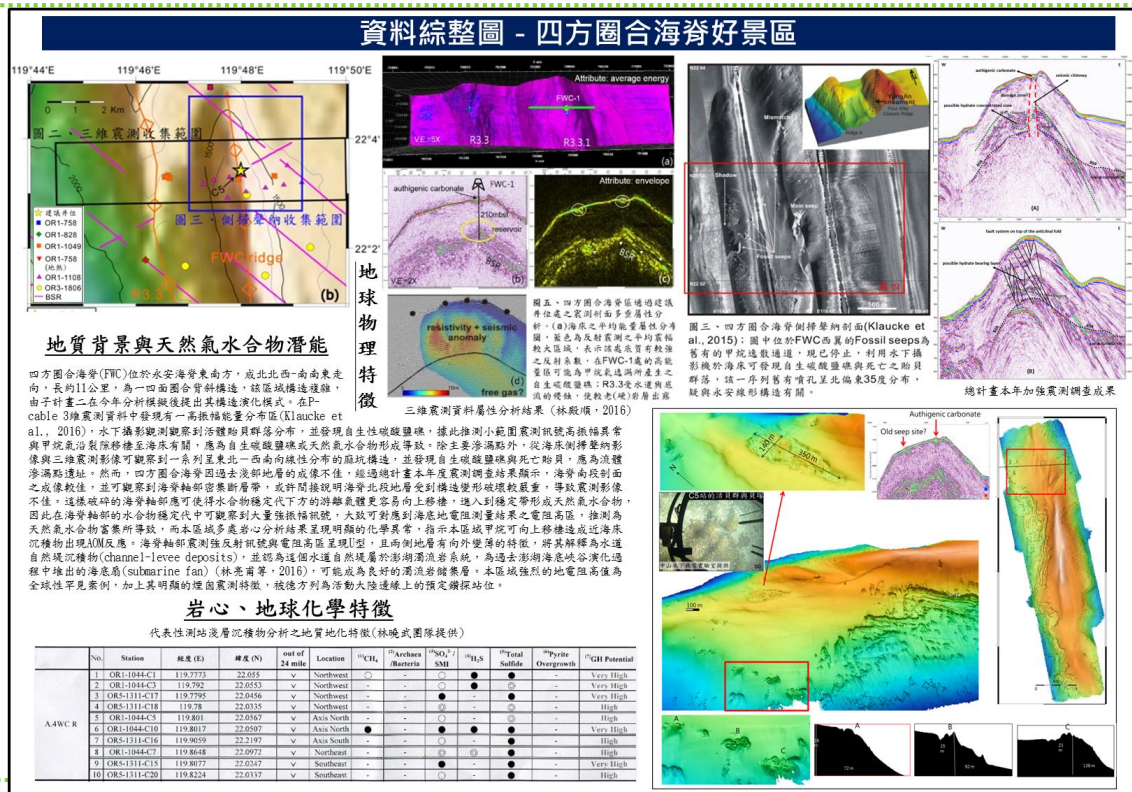
國立臺灣大學海洋研究所

計畫主持人

劉家瑄

本計畫發展出來的技術對油氣探勘有直接的助益。此外，海床高解析調查技術的提升也對海底偵查、海洋災防、海底文物調查都有應用價值。

為能在台灣西南海域採獲天然氣水合物樣本，本計畫整合各子計畫成果以及過去經濟部地質調查所計畫期間所收集之地球物理與地球化學資料，配合震測資料解釋與AUV超高解析水深資料以及ROV海床影像，建立四區的水合物淺鑽調查好景區資料綜整圖。



(1) 引進先進技術對滲漏型天然氣水合物系統進行精密海床調查與採樣

- 臺美聯合探測航次，利用自主式水下無人載具(AUV)與遙控式水下載具(ROV)收集到11筆超高解析度水深資料、9區塊海床影像、31根沉積物岩心、11個岩石以及7個生物樣本。
- 推動臺德合作Sonne-MeBo海床淺鑽探測航次。

(2) 天然氣水合物儲集層分析與滲漏天然氣對環境之影響

- 新收集探勘好景區之總長926公里震測資料，提供底質油氣辨識與流體移棲模型建立。
- 建立四方圈合海脊與永安海脊的2維溫度場模型，了解含天然氣流體如何有效的在傾斜的地層裡移棲與其通量。另建立四方圈合海脊的構造演化模式，了解其結構尺度、角度和幾何形狀隨時間的演變。
- 建立震測頻譜藍化的進階處理技術，以利用井測資料來提高震測資料解析度的能力。
- 利用AMS與碳十四定年，建立區域地層連比框架，並發現甲烷氣釋放事件可對比時間為9.3、16.8、20.4、26.4及30.0 ka。
- 擇定四個探勘好景區(南永安海脊、四方圈合海脊、福爾摩沙海脊、指標海脊)，並更新綜整圖。
- 五篇SCI論文與6篇國際會議論文發表。

Taiwan-US and Taiwan-Germany collaborative research on high resolution seafloor observation and precision sampling of gas hydrate reservoir systems offshore Southwestern Taiwan

Execution Unit

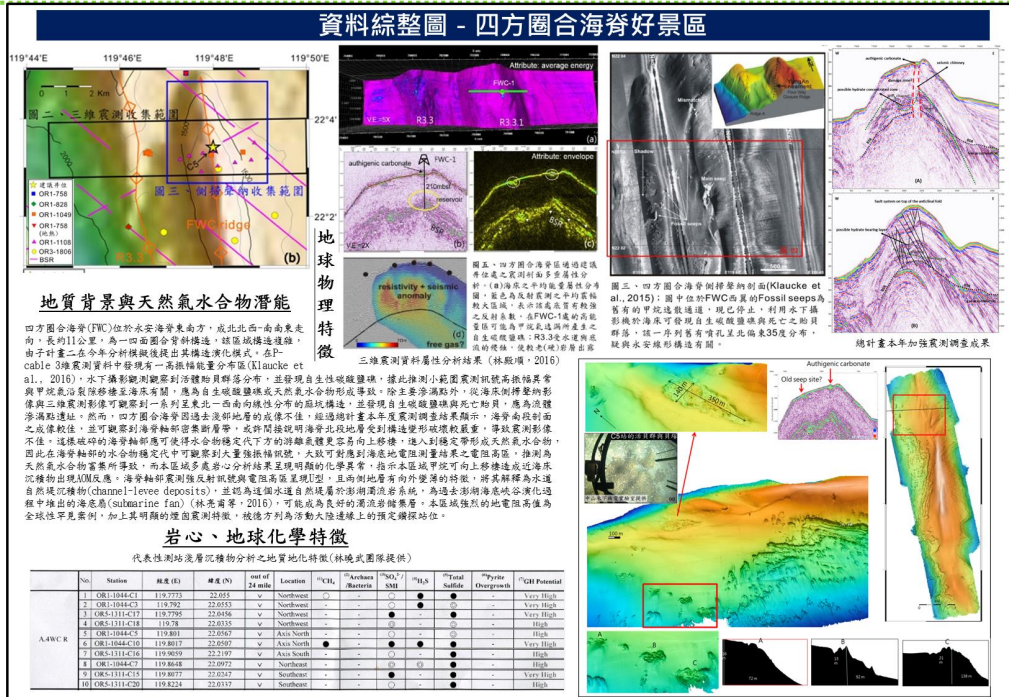
National Taiwan University, Institute of Oceanography

Project Director

Char-Shine Liu

The technology developed in this project provides the geologic information to estimate the petroleum and gas hydrate exploration directly. In addition, instruments and experiences of high resolution seafloor observation and precision sampling assist to investigate marine geohazards and underwater cultural heritages.

In order to acquire gas hydrate samples and assess their property in the area of offshore southwest Taiwan, this project integrates the results of vary previous investigations of the Central Geological Survey and new data which collected in this project, including multichannel seismic data, AUV high-resolution bathymetric data, ROV seabed videos to identify the most promising prospects for achieving sampling investigations. Four prospects of gas hydrate have been established for Mebo drilling.



Introducing and utilizing advances technology and instrument on high resolution seafloor investigation and precision sampling in the gas hydrate seepage sites offshore SW Taiwan

- Taiwan-US collections AUV and ROV joint survey have acquired 11 ultra-high resolution bathymetric datasets, 9 ROV dive videos, 31 push cores, 11 rock samples and 7 biological samples successfully. In addition, specific comet-shaped depressions and carbonate mounds are discovered by the MBARI AUV.
- Preparation for the planned 2018 Taiwan-Germany collaborative cruise on seafloor shallow drilling using the German MeBo system.

Gas hydrate reservoir characterization and thermo-modeling of gas hydrate related fluid seepages

- A total length of 926 km of seismic profiles have been acquired, processed and interpreted to provide gas hydrate exploration and to build the fluid evolution model.
- Structural evolution model of the Four-Way Closure Ridge has been developed, and two-dimensional hydrothermal coupling of the Four-Way Closure Ridge and Yung-An Ridge have been successfully simulated in order to understand on how gas-containing fluid can effectively migrate along the slope, and their effect on the two-dimensional temperature field.
- A new processing technique, seismic spectral bluing, has been establish and applied to the P-cable 3D seismic data to improve the seismic spatial resolution in the Formosa Ridge.
- The stratigraphy of large-scale methane releasing events and their chronological framework have been established based on previous collected cores from the northern slope of the South China Sea, and from the area offshore of SW Taiwan. The results show that the methane releasing events could occur at 9.3, 16.8, 20.4, 26.4 and 30.0 ka.
- Four gas hydrate prospects, Pointer Ridge, Formosa Ridge, Four-Way-Closure Ridge and Southern of Good-Weather Ridge, have been selected and prepared for 2018 Mebo drilling investigation.
- Five research papers were published in SCI journals and six conference papers were presented at international meeting in 2017.