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SUBMARINE GAS HYDRATES EXPLORATION OFF CHILE

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CHILE

History of the Project

- Chile has very few hydrocarbon resources.
- Almost zero efforts carried out by Chilean institutions in marine (seafloor) geology, geophysics and geochemistry.
- What to do?

– Small number of *mgg* Chilean researchers.
– FONDEF: Chilean fund.
– Intensive international cooperation.

FONDEF Project on Gas Hydrates

- Objectives:
- To locate and quantify hydrates off central Chile.
- To evaluate geological and environmental effects of natural occurrence of hydrates.
- To develop a legal framework for a future exploitation of gas hydrates.
- ***To develop a first group of Chilean <u>marine</u> geophysicists, geologists and geochemists.***

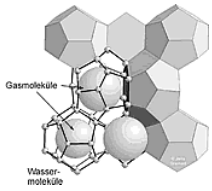
Chilean Participants

- **Pontificia Universidad Católica de Valparaíso**
- **Universidad de Chile**
- **Chilena Naval Hydrographic and Oceanographic Service (research vessel Vidal Gormaz)**
- Chilean Oil Company
  (funds, data, facilities)
- GEODATOS-geophysical company (facilities)
- Chilean Geological Survey (data, facilities)

International Cooperation

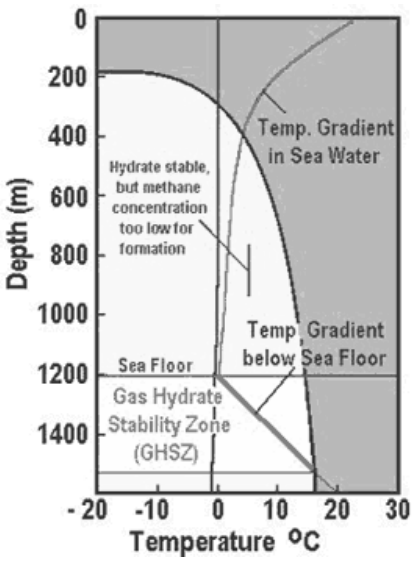
- **U. Aarhus** (seismics)
- **U. Bergen** (gravimetry)
- **U. Bremen** (heat flow)
- **GEOMAR-U. Kiel** (multibeam bathymetry)
- **U. Toronto** (transient electromagnetics)
- **Louisiana State University** (interpretation)
- **University of Texas at Austin** (interpretation)
- ***BGR*** *German Geological Survey (lots of data)*
- ***Naval Research Laboratory***
  (geochemistry, DTAGS, heat flow)
- ***Office of Naval Research*** *(funds, logistics)*
- ***University of Tokyo*** *(geochemistry)*

What are Gas Hydrates?

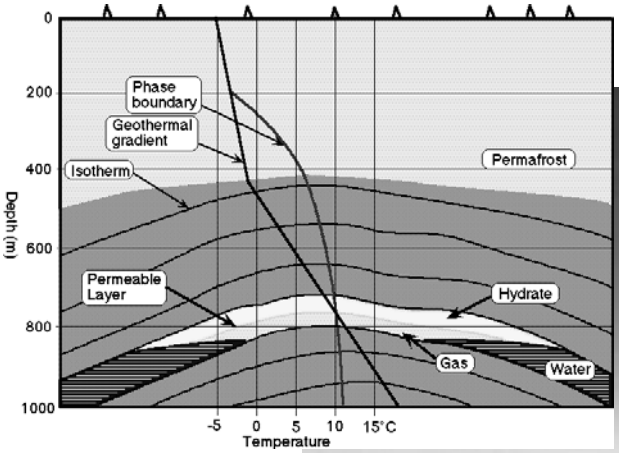


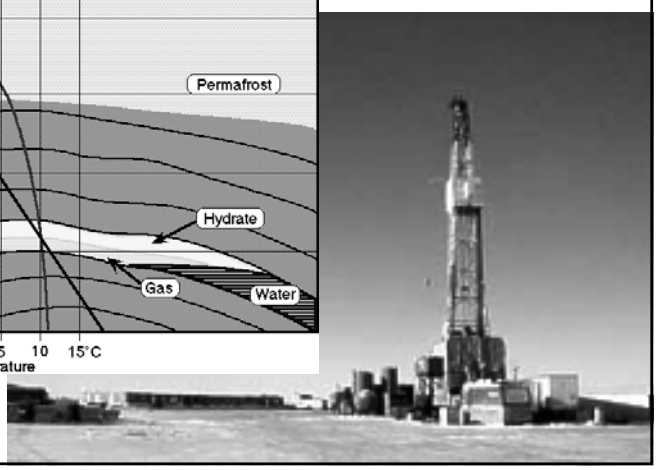
Necessary Conditions for Gas Hydrates

- Water
- Methane (ethane, propane, CO_2 or H_2S)
- Relatively low temperature
- Relatively high pressure



MESSOYAKAH (Siberia)
MALLIK (Canadá)
HOT ICE # 1 (Alaska)





Ideas Para Explotación

Estimulación térmica

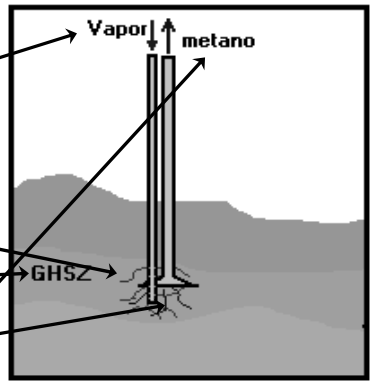
Ingreso de vapor

Aumento de Tº

Disociación Hidratos

Liberación Metano

Extracción Metano



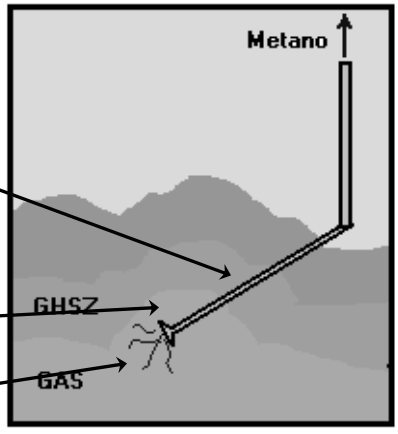
Ideas Para Explotación

Despresurización

Perforaciones Horizontales

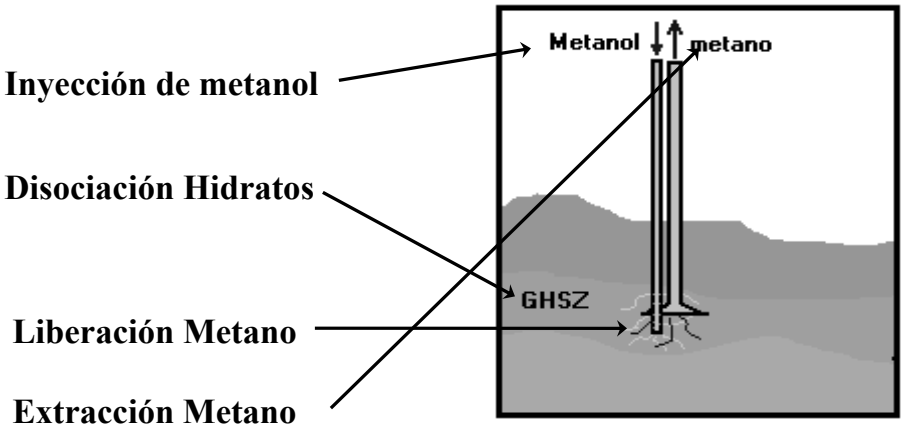
Despresurización

Extracción Metano

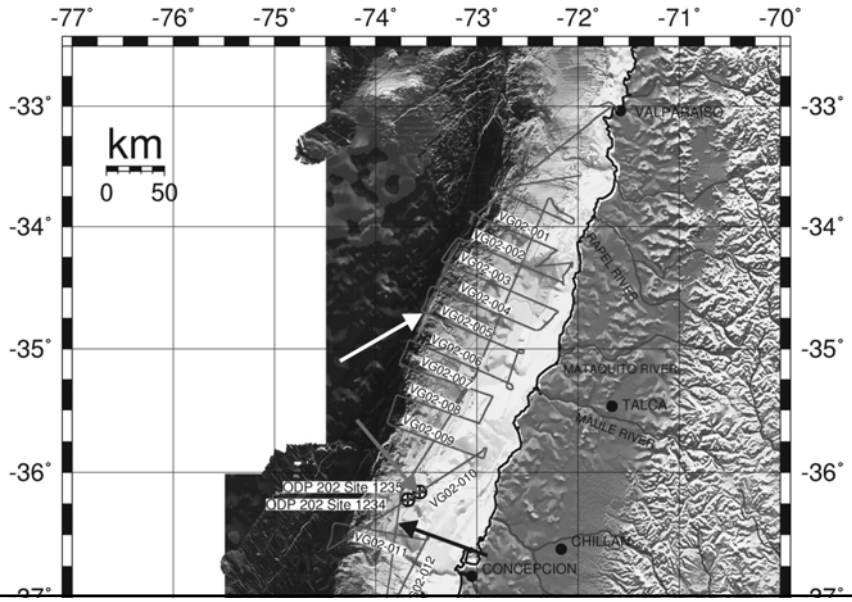


Ideas Para explotación

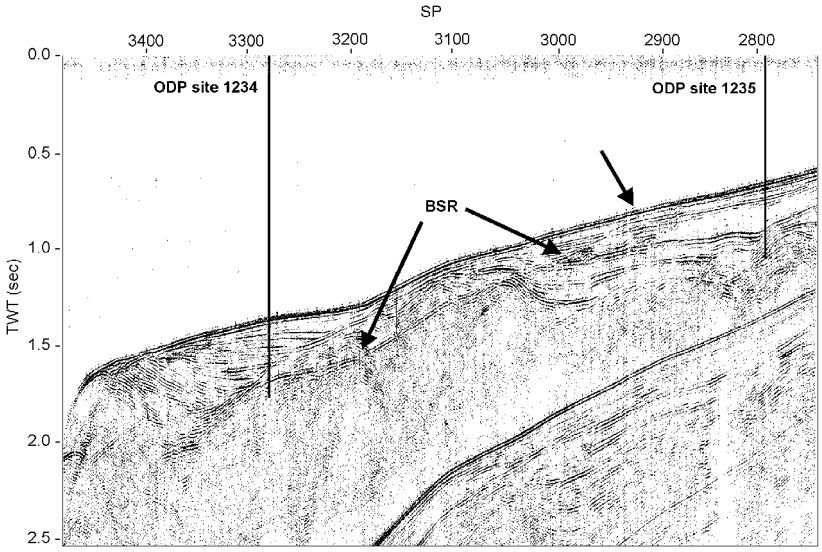
Inyección de inhibidores



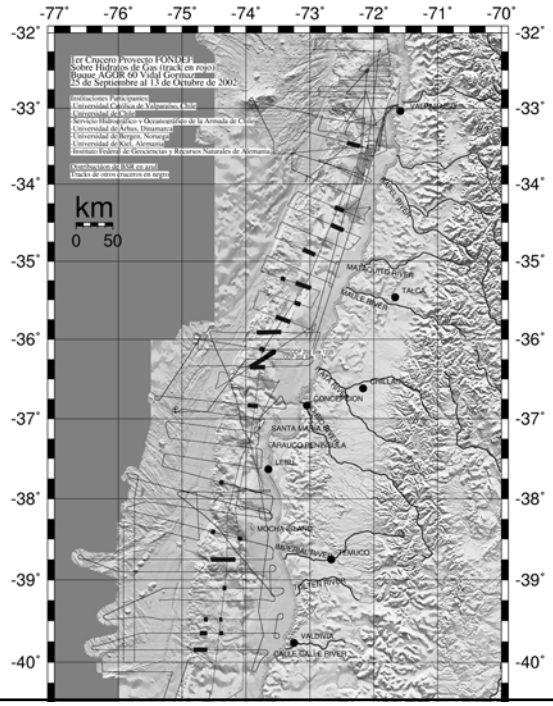
SPOC and VG02 Cruises



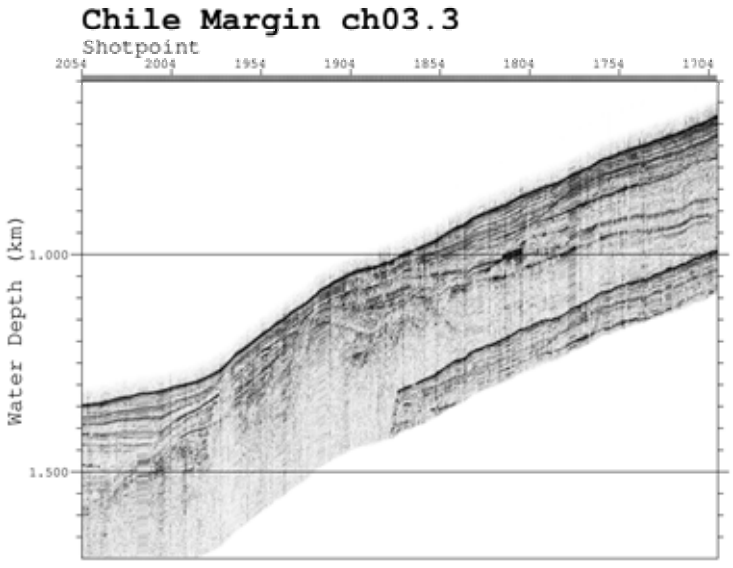
Cruise VG02, Seismic Line 10

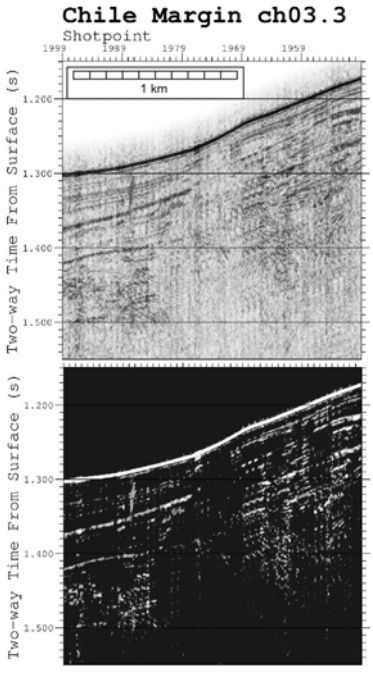


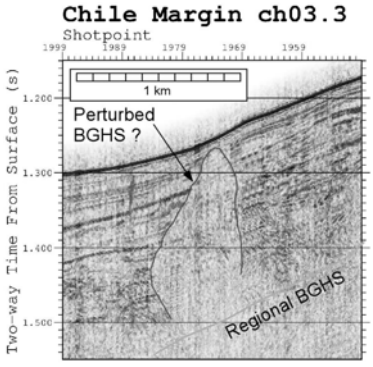
Cruise VG02: Preliminary BSR Map



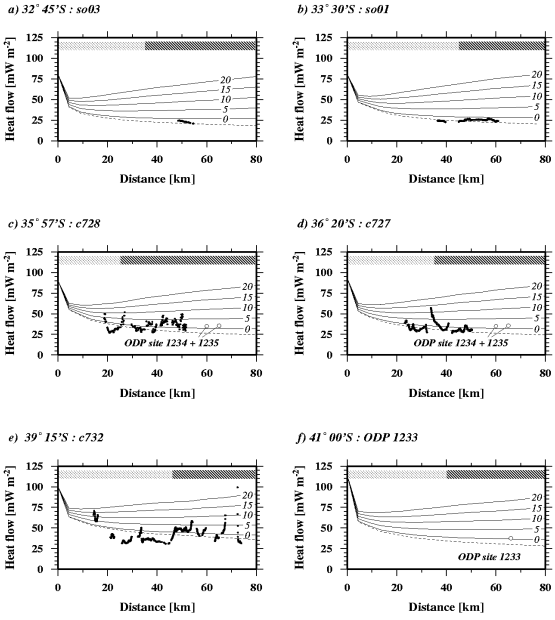
Deep-Towed Acoustic Geophysical System





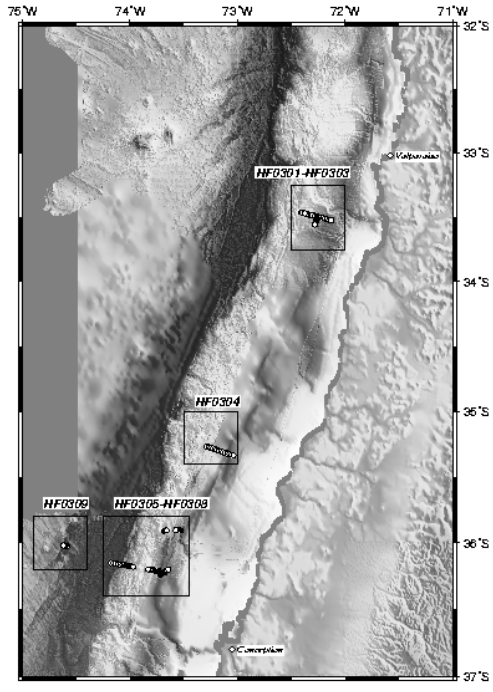


BSR Derived Heat Flow

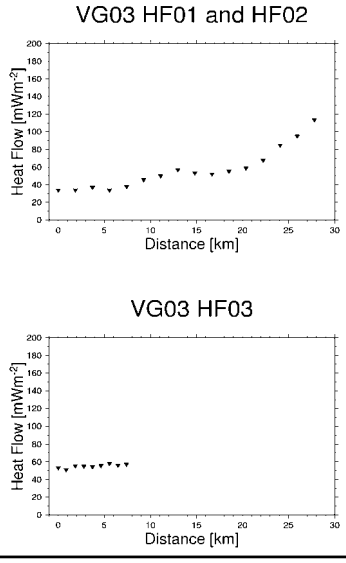


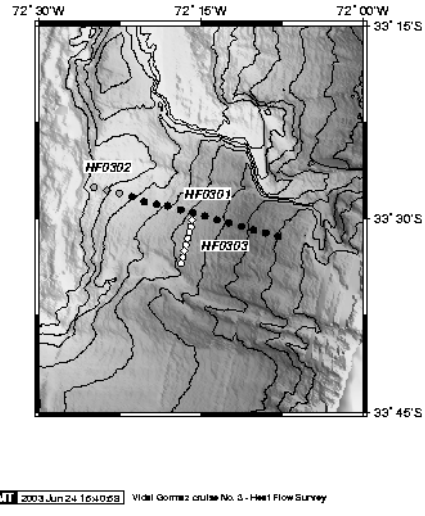
VG03
Heat Flow

Grevemeyer,
Kaul,
Heesemann

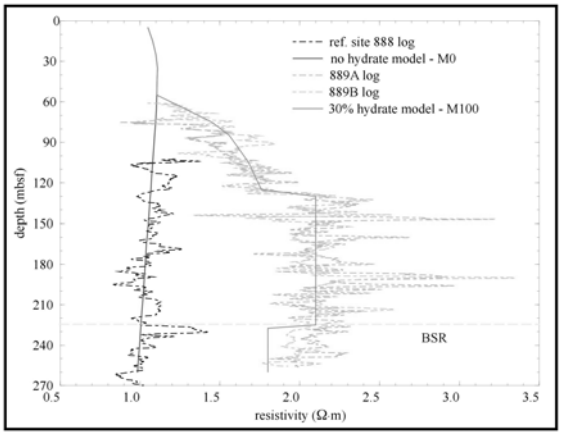


VG03: HF01, HF02 and HF03





Transient Electgromagnetics



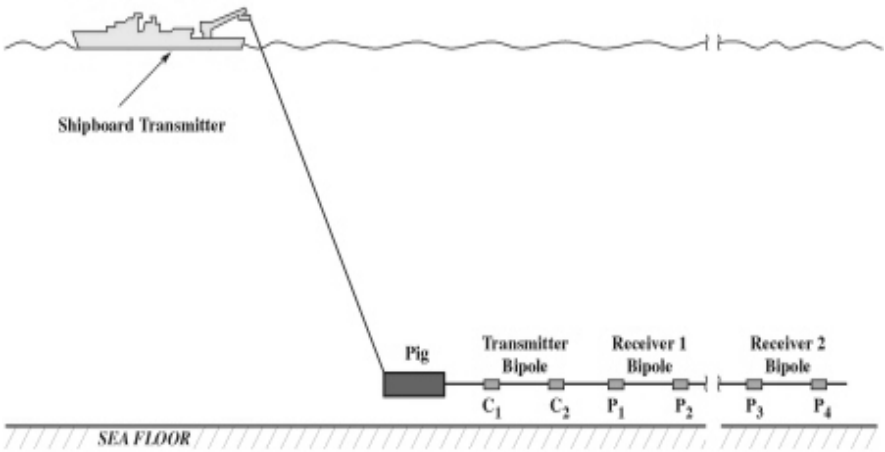


Figure 1: The geometry of the seafloor dipole-dipole array