

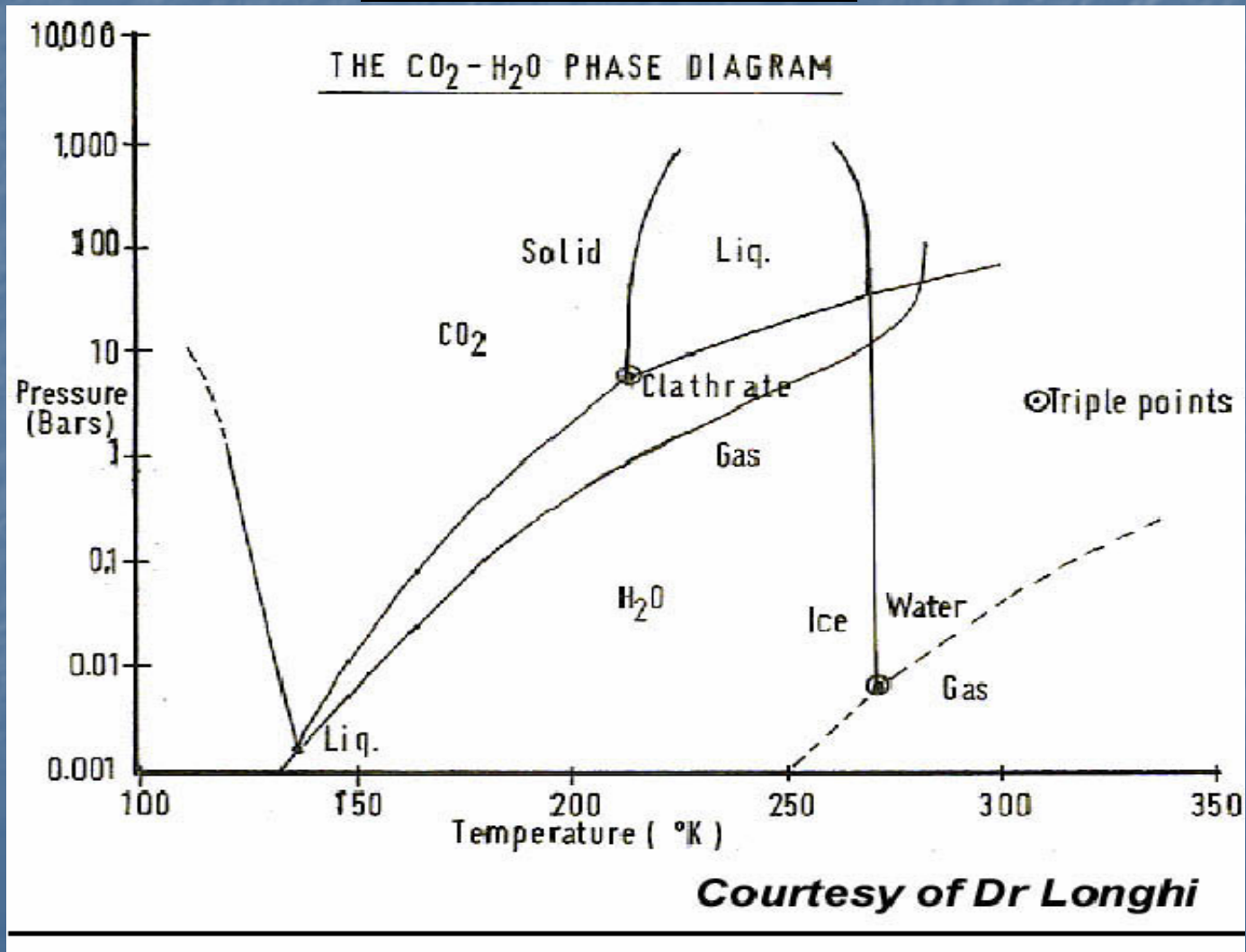
# **Glacial Clathrate Storage: A Potential Large Volume Carbon Store**

**David Sevier  
August 2005**

# Advantages of using Clathrates for storing carbon

- Low energy to create
- Low energy to reverse formation reaction
- Easy to form

# Phase Diagram of Clathrate Formation



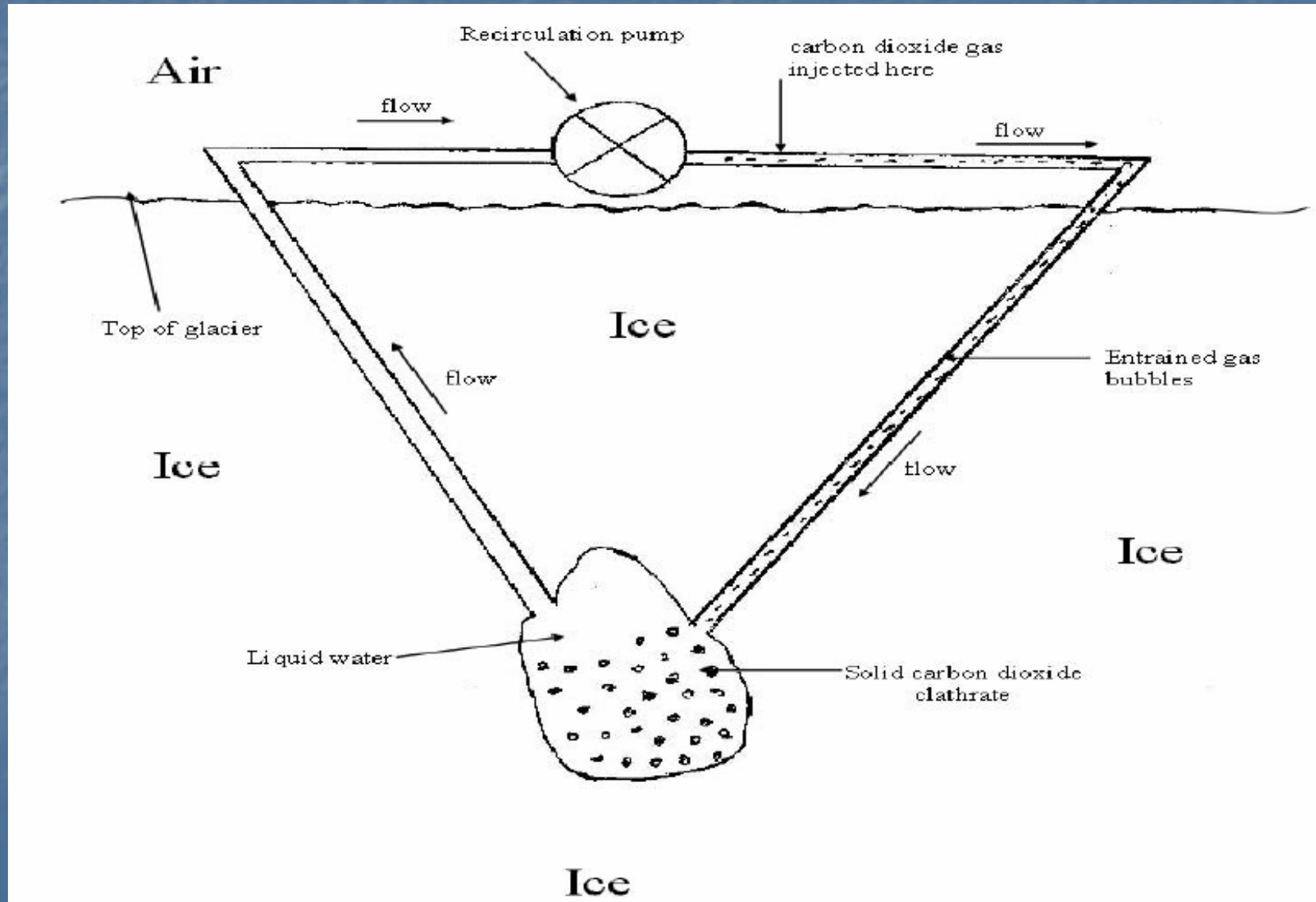
# Problems using oceans and aquifers for storing carbon clathrates

- Limitations on volumes
- Concerns over potential CO<sub>2</sub> releases
- Environmental concerns – esp. Oceans

# Glacial Clathrate Storage: a better carbon store

- Clathrates naturally form in Glaciers
- Storage times up to 1 million years
- Stability of Clathrates within Glaciers
- Practically unlimited storage of CO<sub>2</sub>
- Low environmental impact
- Low energy requirement to create store
- Stored carbon is recoverable
- Low capital investment required

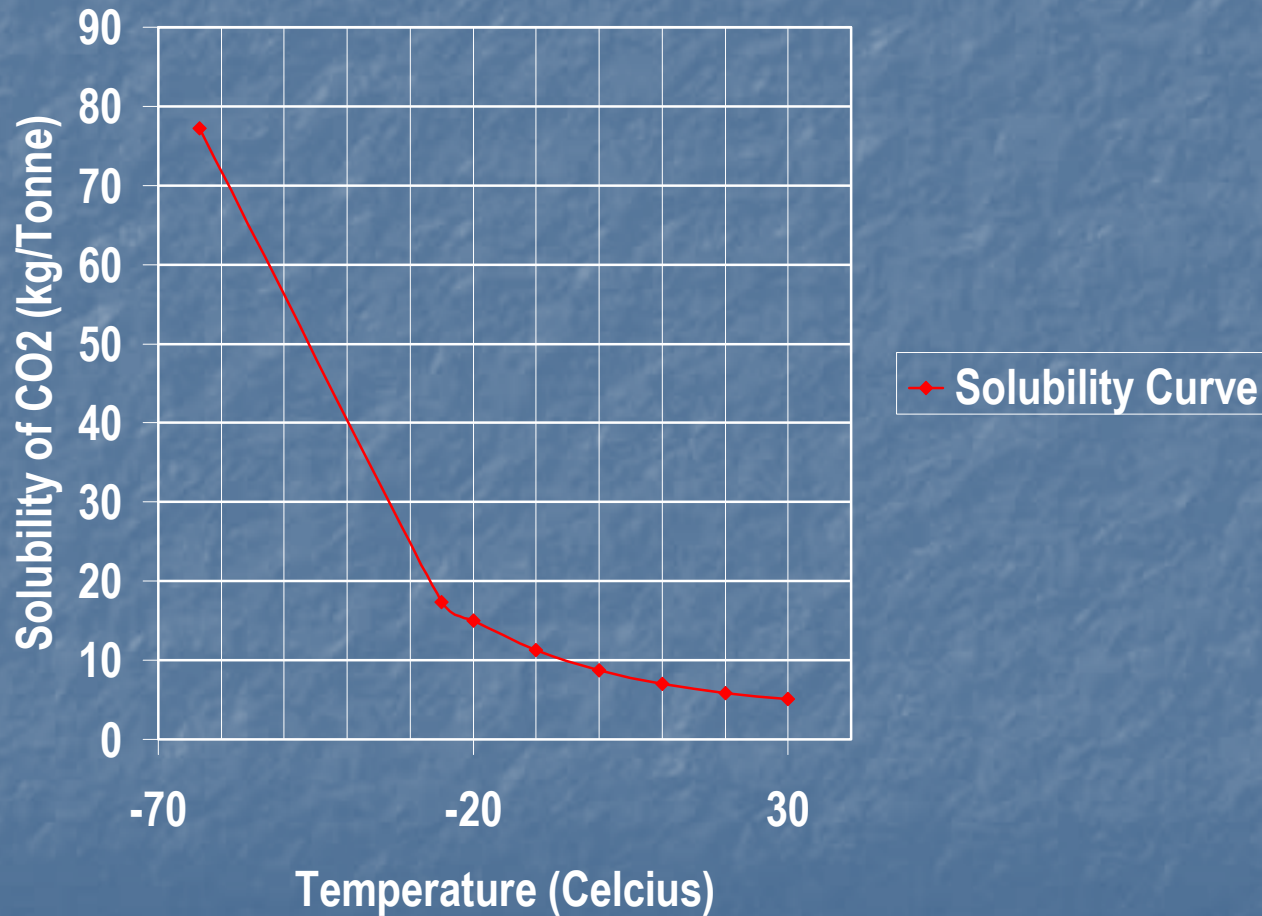
# Flowing Bubble Clathrate Formation



# Capturing CO<sub>2</sub> from the atmosphere: It's easier with cold air

- Low energy requirement in Arctic conditions
- CO<sub>2</sub> solubility climbs sharply in cold air

# Solubility of CO2 in Ethanol



# We have the technology!

- Cooling tower technology
- Can be modified to run with absorbers
- Cost-effective using composite ice
- Ice-drilling technology exists

# We have enough energy to stop climate change

- Emissions of CO<sub>2</sub> c.  $2.28 \times 10^{10}$  tonnes per annum
- Coal required to capture and store world emissions of carbon dioxide: 1.1 billion tonnes per year.
- World coal reserves: 909,064 million tonnes
- Only 0.13% of proven coal reserves required annually
- Cost of Coal required \$66.6 Billion (US)

Conclusion:

**“We should continue to burn fossil fuels, but capture and store CO<sub>2</sub> emissions from the atmosphere.”**