

## **Importance of Ocean Data Collection**

### **Acoustic Thermometry and Ocean Monitoring**

Acoustic Thermometry is a technique proposed by Walter Munk to measure ocean temperature over long distances, providing insights into global temperature. The Heard Island Feasibility Study (HIFT) demonstrated the feasibility of this method.

- Acoustic Thermometry measures water temperature via sound wave propagation.
- HIFT conducted in 1991 validated long-distance acoustic measurements.
- ATOC experiment expanded to monitor ocean properties and marine life.

### **Engineering Challenges in Ocean Observatories**

The deployment of ocean observatories faces significant engineering challenges, including funding, maintenance, and power supply issues. Programs like ARGO illustrate the difficulties in collecting comprehensive ocean data.

- Most observatories are funded by small institutions with limited resources.
- Maintenance requires expensive ship operations for short visits.
- ARGO collects 100,000 temperature/salinity profiles annually but faces engineering challenges.

### **International Collaboration for Ocean Monitoring**

International initiatives like GOOS and the SMART program aim to address engineering challenges in ocean monitoring. These programs focus on improving power and communication infrastructure for ocean observatories.

- GOOS and JTF work to enhance global ocean monitoring capabilities.
- SMART technology aims to connect observatories to existing telecommunications infrastructure.
- Collaboration is essential for overcoming engineering challenges.

### **GEMS Ocean Initiative**

The Global Environment Monitoring System for the Oceans and Coasts (GEMS Ocean) aims to improve ocean monitoring and data collection. The initiative focuses on administrative issues but requires technological advancements for real progress.

- GEMS Ocean is endorsed by the UN Ocean Decade (2021-2030).
- The initiative emphasizes the need for technological solutions to monitoring challenges.
- Collaboration with existing programs is essential for success.

## **Arctic Ocean Monitoring and Challenges**

The Arctic Ocean is undergoing significant changes due to climate change, necessitating improved monitoring efforts. Acoustic thermometry can provide valuable data in this challenging environment.

- The Arctic is experiencing unprecedented transitions toward an ice-free state.
- Acoustic thermometry has been successfully tested in Arctic conditions.
- A multidisciplinary observatory is needed for continuous data collection.

## **Proposed Global Environment Measurement System (GEMS)**

The proposed GEMS aims to create a comprehensive system for monitoring the Earth's oceans and climate. It emphasizes international collaboration, data integration, and public outreach.

- GEMS will focus on ocean health and climate change monitoring.
- The system will integrate data from various sources for comprehensive analysis.
- Visualization tools will enhance public and policymaker engagement.

## **Five-Step Plan for GEMS Implementation**

A five-step plan outlines the development and deployment of the GEMS initiative, starting with planning and preparation, followed by prototype deployment and Arctic operations.

- Step 1: Planning (6 months) to develop a detailed strategy.
- Step 2: Preparation (6 months) for technology and funding.
- Steps 3-5 involve prototype deployment, Arctic operations, and global expansion.