



**IFM-GEOMAR**



# The Significance of the Cape Verde Observatory for German Institutions and Programs

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**German Marine Research Consortium, Berlin**

Cape Verde Observatory Workshop, Mindelo, São Vicente, January 8-10, 2007

## Cape Verde Observatory – Press Releases, January 2007

...to establish a new and innovative observatory to monitor the links between climate change and ocean-atmosphere interactions in the tropical Atlantic ...

... the observatory is designed to measure changes in the chemical, biological and physical composition of the ocean and the air immediately above ...

... we know more about the polar regions than about the processes at the interface of ocean and atmosphere in the tropical oceans that cover 1/3 of the Earth's surface ...

## Cape Verde Observatory – Press Releases, January 2007

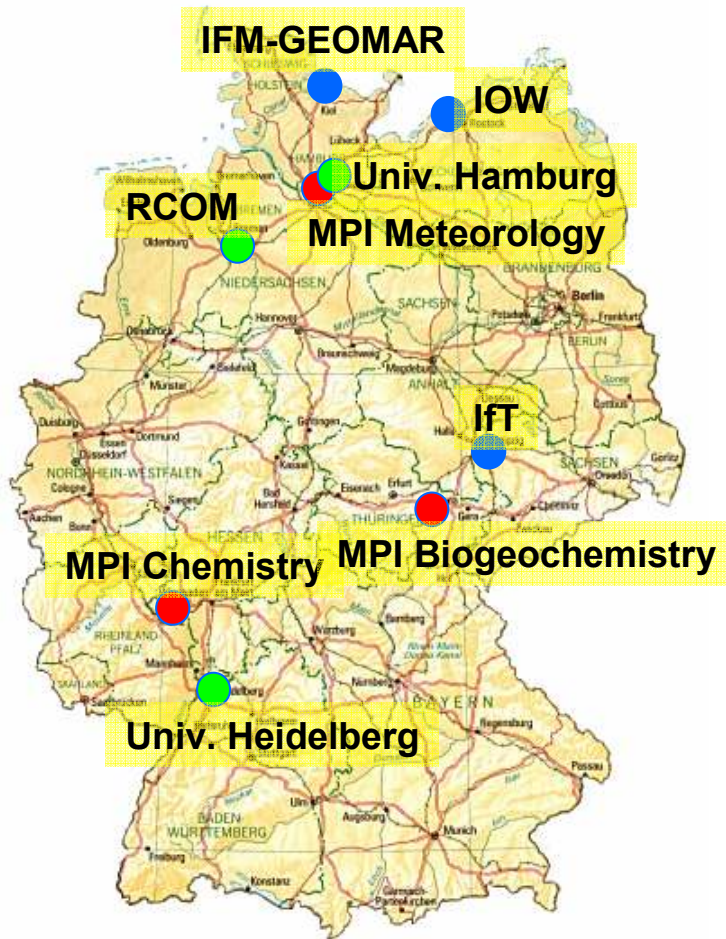
... 20 years ago, long-term CO<sub>2</sub> measurements on Hawaii have demonstrated that climate change, that is now driving national and international policies, was already underway ... Philip Newton

... the tropical marine boundary layer acts as an engine room for the self-cleansing of the Earth's atmosphere, but we know very little about the actual processes involved ... Lucy Carpenter

...recent satellite studies show a large decrease in the biological productivity of the tropical Atlantic ... major changes are going on in this region and therefore direct observations on the ground and at the sea-surface are critical ... Doug Wallace

...the knowledge gained at the Cape Verde observatory will not only benefit Africa, but also Europe and the rest of the world ...

# German Research Institutions Working at/near Cape Verde Observatory



## Leibniz Institutions

**IFM-GEOMAR (Kiel)**

Ocean Site

**Inst. for Baltic Sea Research (Warnemünde)**

Ocean Site

**Inst. for Troposphere Research (Leipzig)**

Atmospheric Site

## Max Planck Institutions

**MPI for Chemistry (Mainz)**

Atmospheric Site

**MPI for Biogeochemistry (Jena)**

Atmospheric Site

**MPI for Meteorology (Hamburg)**

Ocean Site

## University Institutions

**Research Centre Ocean Margins (Bremen)**

Ocean Site

**Inst. Environmental Physics (Heidelberg)**

Atmospheric Site

**Centre Marine & Atmosph. Scienc. (Hamburg)**

Ocean Site

Centre for Marine and  
Atmospheric Sciences,  
Hamburg (ZMAW)



**IFM-GEOMAR**

Leibniz Institute of Marine Sciences  
at the University of Kiel

**IU<sup>B</sup>**)

**KMSM**

German Marine Research Consortium

Marum



**Leibniz Institute of  
Marine Sciences  
Kiel**

**Leibniz Institute for  
Baltic Sea Research  
Warnemünde**

**DFG Research Center  
Ocean Margins  
Bremen**

**Center for Marine &  
Atmospheric Sciences  
Hamburg**

**Max Planck Institute  
for Meteorology  
Hamburg**

**5 out of 12 KDM members  
participate  
in the Cape Verde  
Initiative**

## Mission

to understand the physical, chemical, biological, and geological processes in the ocean and their interaction with the seafloor, the polar regions, the coastal zones, and the atmosphere



**IFM-GEOMAR**



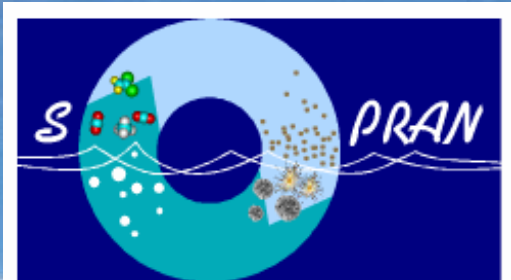
**Leibniz Institute of Marine Sciences  
at the University of Kiel**





## **Over-Arching Research Themes at IFM-GEOMAR**

- Role of the Ocean in Global Change
- Human Impact on Marine Ecosystems
- Living and Non-Living Marine Resources
- Plate Tectonic Processes and Geo-Hazards

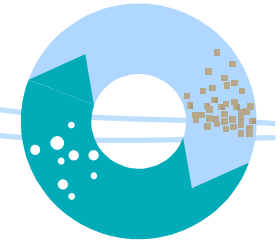


## Surface Ocean PRocesses in the ANthropocene

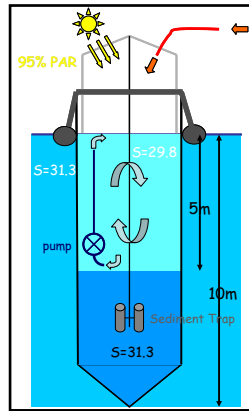
SOPRAN addresses :

- *how changing atmospheric composition affects the surface ocean ecosystem*
- *how climate-related changes in surface ocean processes alter oceanic emissions to the atmosphere*
- *how the mechanisms and rates of ocean-atmosphere material exchanges interact*

**Funding Agency:** BMBF  
**Coordinator:** Douglas Wallace, IFM-GEOMAR, Kiel  
**Starting Date:** February 1, 2007  
**Funding:** € 6.5 mio over 3 years  
**(11 institutions, 41 investigators, 23 sub-projects)**



## SOPRAN Infrastructure

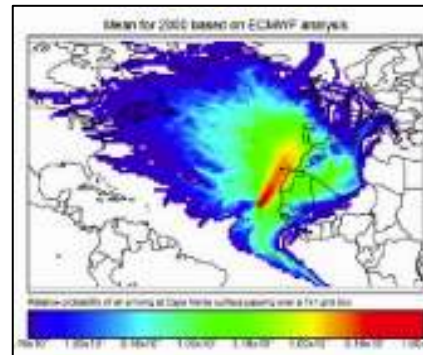


### Offshore Mesocosms: Baltic

Ship Time: Baltic  
Tropical Atlantic



### Cape Verde Observatory



### FINO 2

VOS in the Baltic



# TENATSO Project



- Tropical Eastern North Atlantic Time-Series Observatory
  - Funding Agency: European Union
  - Coordinator: IFM-GEOMAR (Doug Wallace)
  - Starting Date: October 2006 (2 years)
  - Funding: 550 T€

to support the establishment of the Cape Verde Observatory in the eastern tropical Atlantic

# Climate-Biogeochemistry Interactions in the Tropical Oceans



## Proposal for Priority Research Program (SFB)

German Science Foundation DFG: up to 12 years of funding

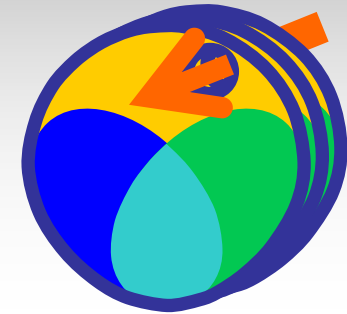
Pre-review: 2006

Proposal submission: March 2007

Review: June 2007

Proposed start: January 2008

Coordinator: Doug Wallace, IFM-GEOMAR, Kiel

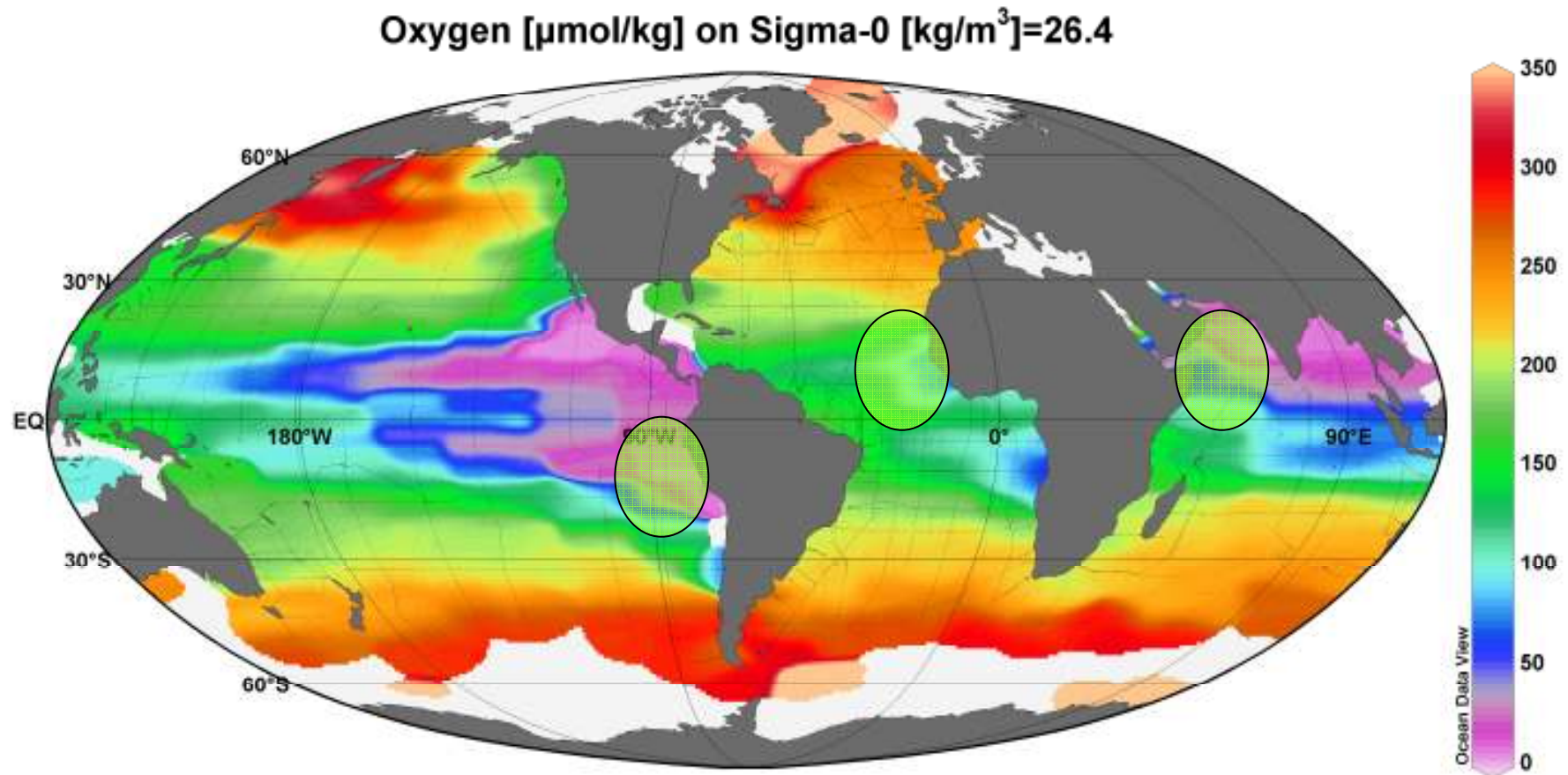


## Main Scientific Objectives

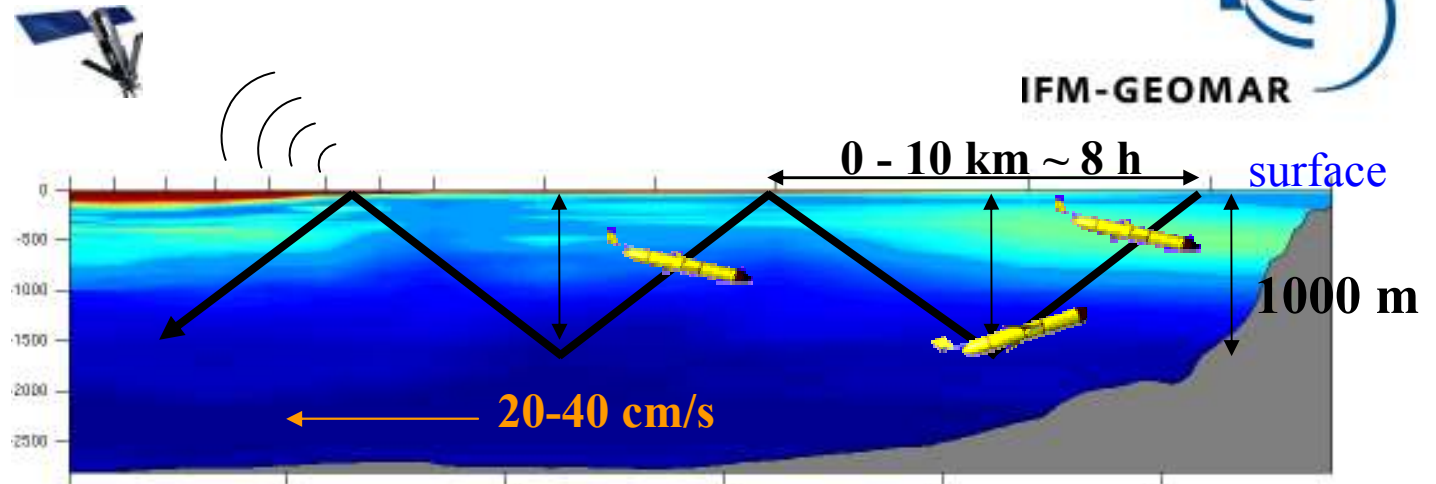
- how climate affects the ocean circulation and the re-supply of dissolved oxygen to the ocean interior
- AND
- what effects have oxygen levels on the cycling of major nutrients

# Study Area: The Tropical Oceans.

Regions of strong atmosphere-ocean coupling where the “oxygen switch” is thrown...



# Autonomous Ocean Glider Deployment



- Profile the upper 1000m
- Communicate results in real time
- Last up to 6 month
- Carry a host of electrical sensors

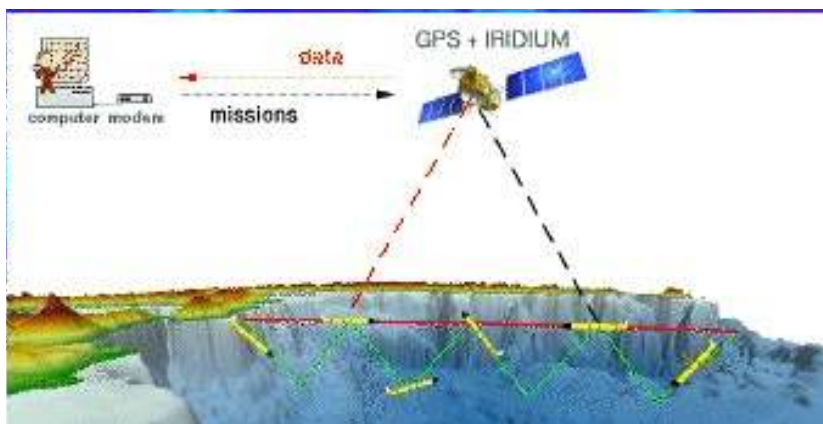
**The next big revolution in regional oceanography!**

# IFM-GEOMAR “Glider Swarm” Operations (2009-2010)

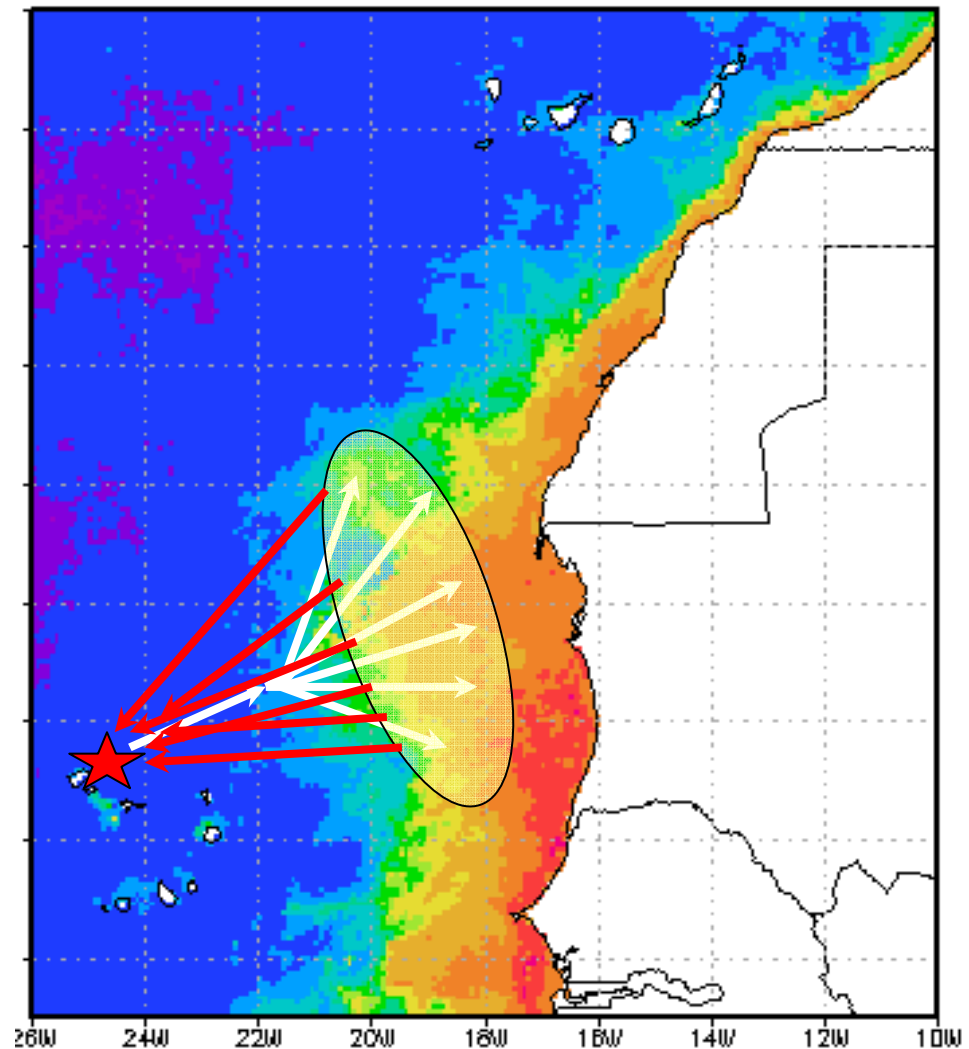


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- I Deployment
- II Transit
- III Swarming
- IV Optimal sensing
- V Return / Recovery



[mg/m<sup>3</sup>] (Mar2005–Apr2005)  
Chlorophyll a concentration

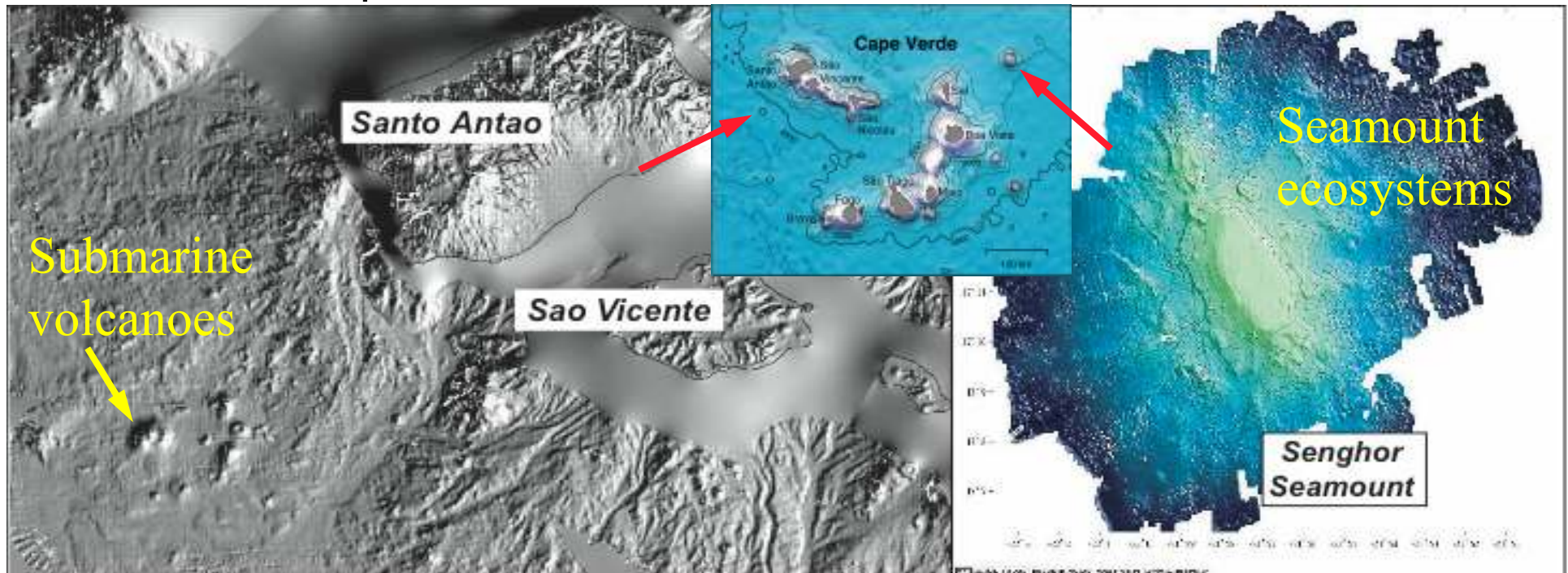


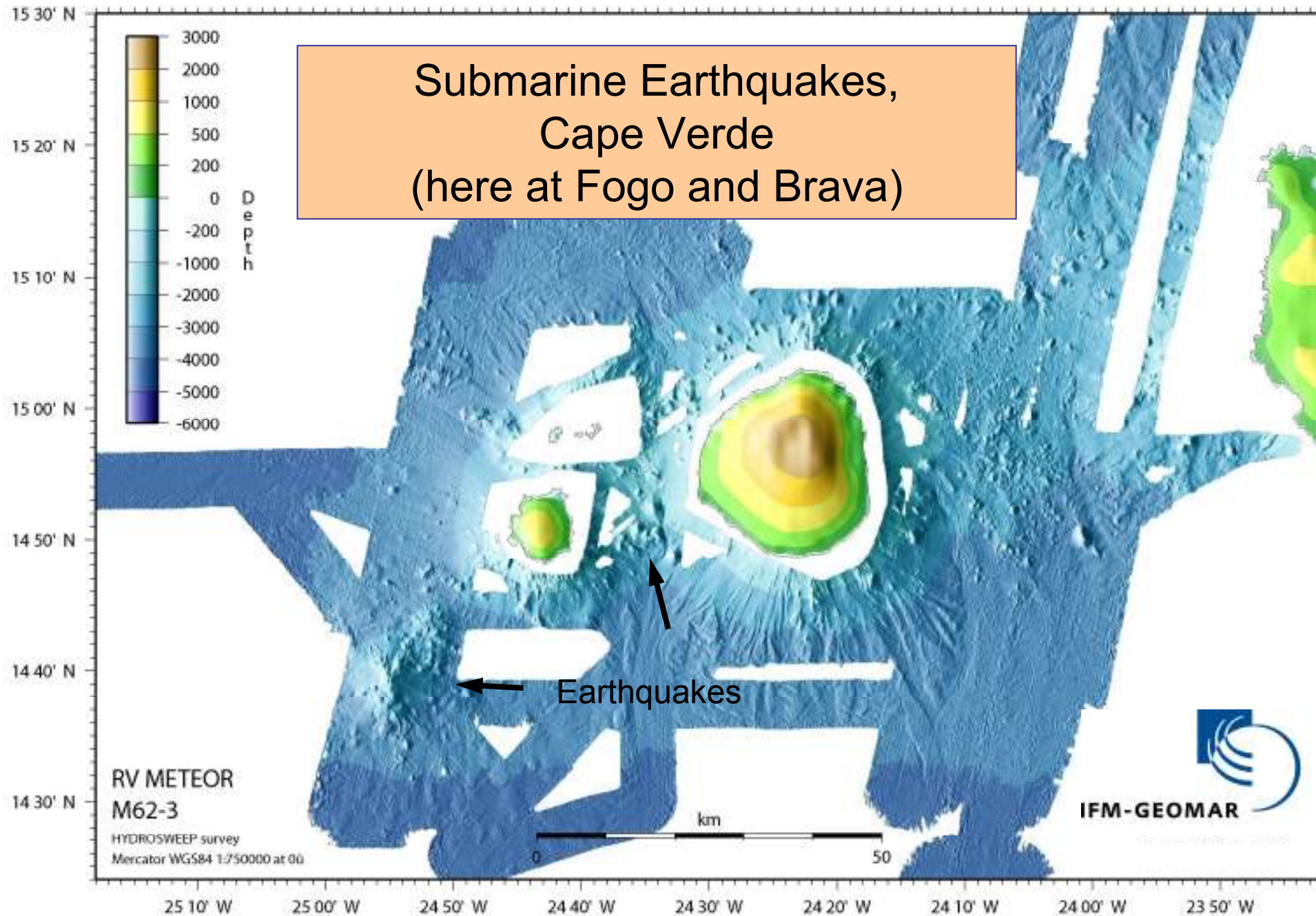
# Bio- and Geodiversity at Seamounts, Cape Verde

Two “back-to-back” RV “Meteor” cruises in June-August 2009

- M79/3 Geochemistry, volcanology and geosphere-biosphere interactions (PI: Hansteen, IFM-GEOMAR)
- M79/4 Structure and function of seamount ecosystems (PI: Christiansen, Univ. Hamburg)

Cooperation with INMG, INDP, ISECMAR





A satellite image showing a large, dense plume of yellowish-brown dust originating from the Sahel region of Africa and extending over the Atlantic Ocean. The dust plume is visible as a thick, textured layer of yellow and orange, contrasting with the blue of the ocean and the green of the land. The text is overlaid on this image.

**Saharan Mineral Dust Experiment  
SAMUM II  
DFG Forschergruppe**

**2007-2009**

**Coordinator: Jost Heintzenberg, IfT Leipzig  
Funding: 1.7 mio €**

## **Final Remarks**

- **combined long-term atmospheric and marine measurements are a key issue of advanced global change research**
- **Cape Verdes provide ideal conditions for both an open ocean and a land-based observatory**
- **international cooperation has already been established, 9 German institutions involved**
- **education and training programs need to be expanded to insure an appropriate involvement of Cape Verdean scientists**