

EU-project HYPOX: some examples of monitoring activities and results obtained

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EU-project HYPOX

EC grant 226213

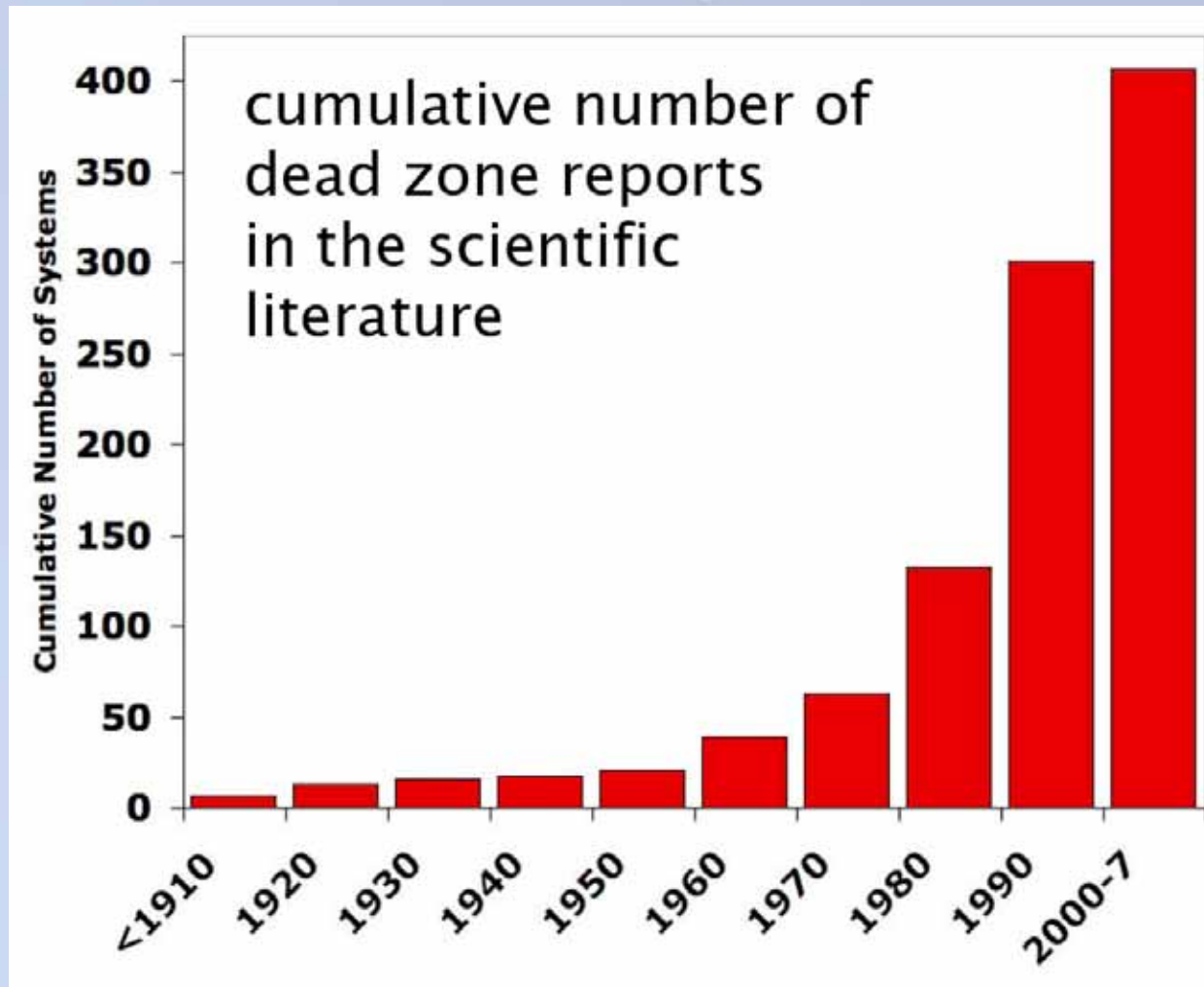
»In situ monitoring of oxygen depletion in hypoxic ecosystems of coastal and open seas, and land-locked water bodies«

'hypoxic': low in oxygen

Apr. 2009 – Mar. 2012



Why study hypoxia?



hypoxia, eutrophication & global warming

high nutrient supply

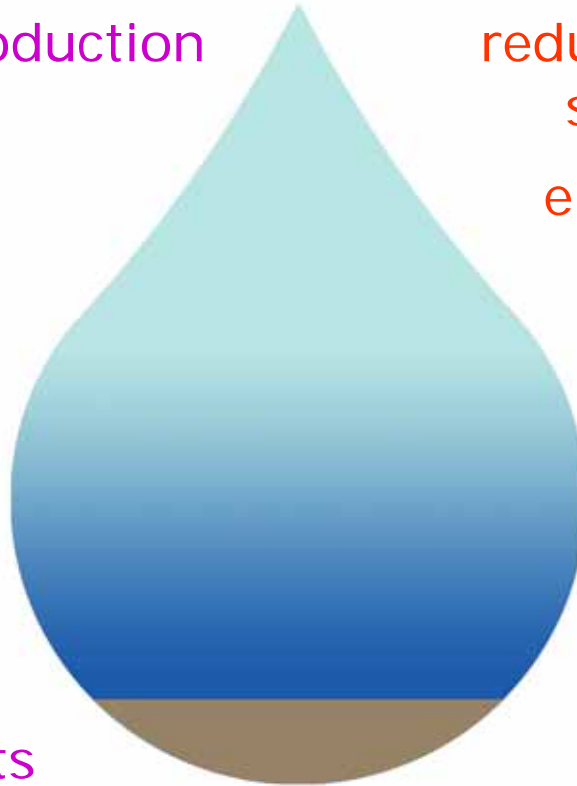
increased primary production
and organic matter
export

high remineralization
rates and O_2 demand

anaerobic processes
and release of
greenhouse gases

warming

nutrient release
from anoxic sediments



warming of surface waters

reduced O_2 solubility and
supply to deep waters

enhanced stratification
and reduced vertical
mixing

increased metabolic
rates and
 O_2 demand

changes in wind
fields and wind-
driven mixing

HYPOX objectives

- conducting O₂ monitoring pilot studies in diverse ecosystems
- investigating fundamentals of hypoxia causes and consequences

Content *missing* in this presentation

- targeted field campaigns to understand hypoxia causes and consequences
- investigations of past hypoxia (biomarkers, noble gases, sedimentary record, indicator species...)
- assessment of hypoxia impacts on ecosystems (conceptual models)
- technical developments

Instead...

- introduction to HYPOX monitoring sites
- some information on HYPOX strategies (monitoring, modeling, dissemination)

Introduction to HYPOX monitoring sites



Map design: Sabine Luedeling, www.medieningenieure.de

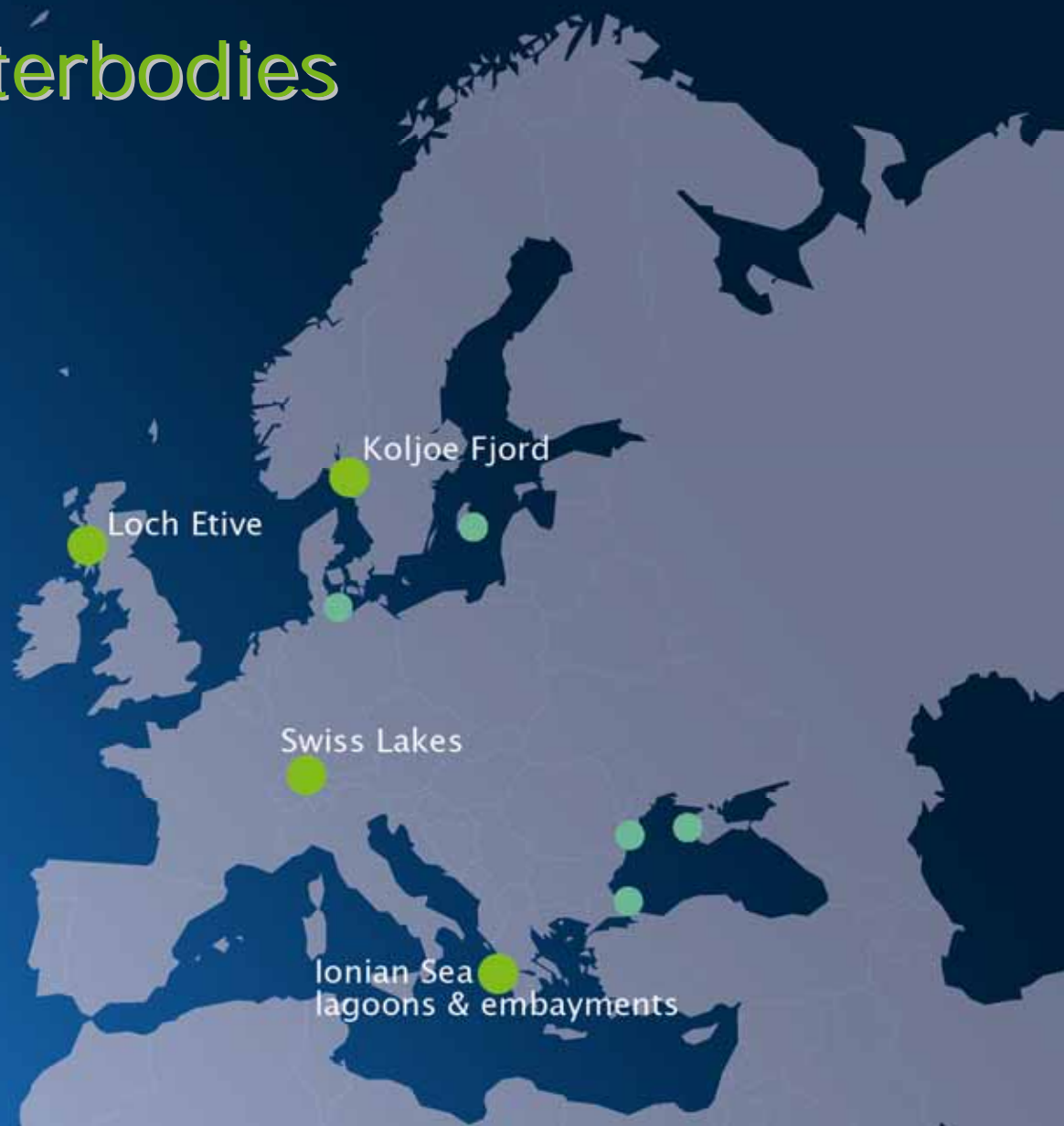
Site classification

Open / coastal seas



Site classification

Land-locked waterbodies



Restricted lateral exchange: Hypoxia in fjord like systems




Stratification reduces vertical exchange: Hypoxia at chemoclines of anoxic basins



Global change impacts on deep water formation and winter turnover: O₂ decline in lakes and the open ocean

Swiss Lakes

A map of Europe with a green dot in Switzerland labeled 'Swiss Lakes'. The map is dark blue with white outlines of the continents. The green dot is located in the central part of Europe, specifically in Switzerland.

Eutrophication-boosted O_2 demand: Seasonal hypoxia in coastal waters




How HYPOX works:
an overview of approaches and
achievements based on examples

Adjusting monitoring strategies to site characteristics



Drifting observatories: when ship traffic and infrastructure impede moorings

A light blue map of Europe and the surrounding seas. Two green dots are placed in the Black Sea, one near the coast of Georgia and one near the coast of Turkey. The text 'Black Sea' is written in black next to the dots.

Black Sea

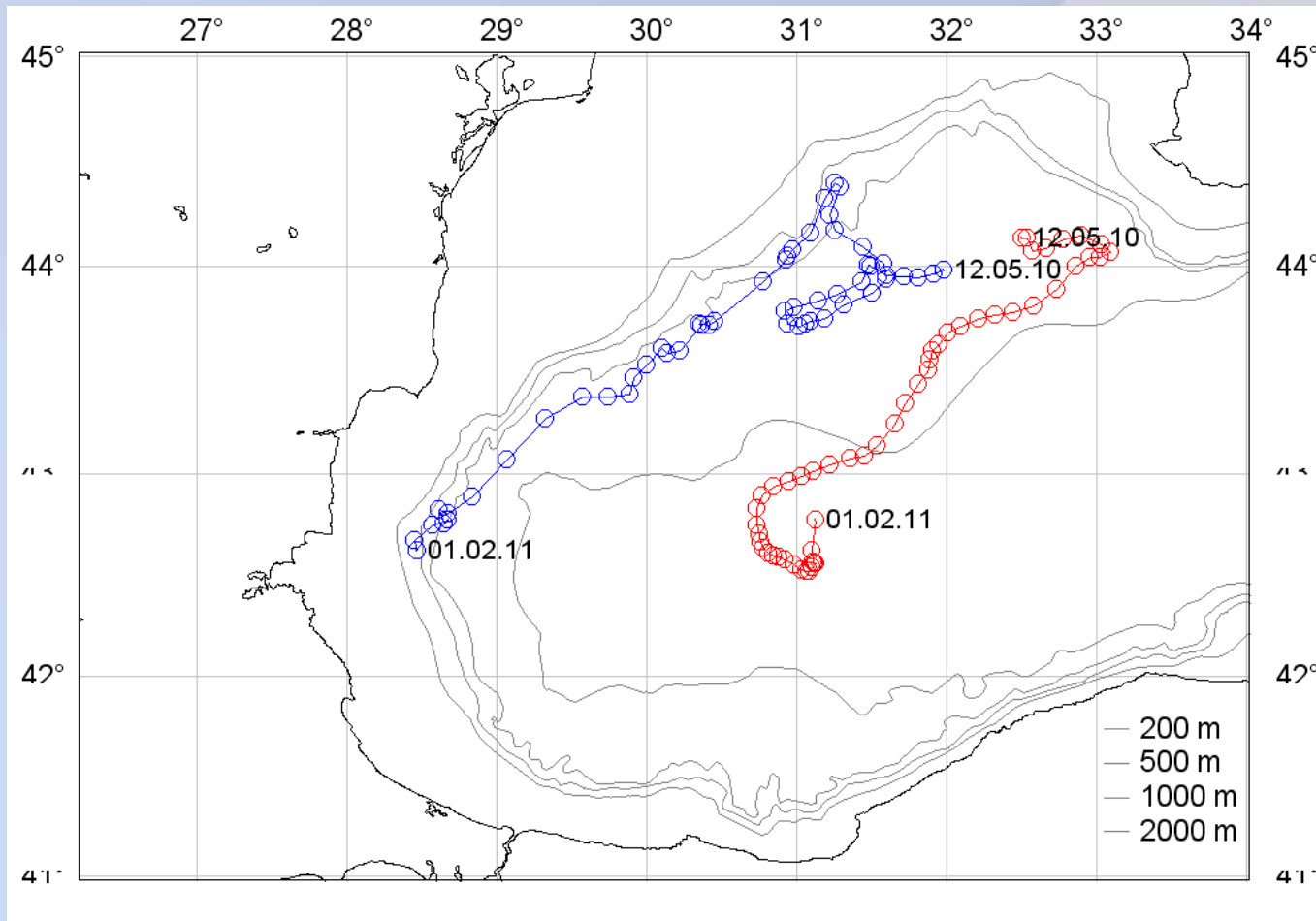
Drifting observatories: when ship traffic and infrastructure impede moorings

Black Sea



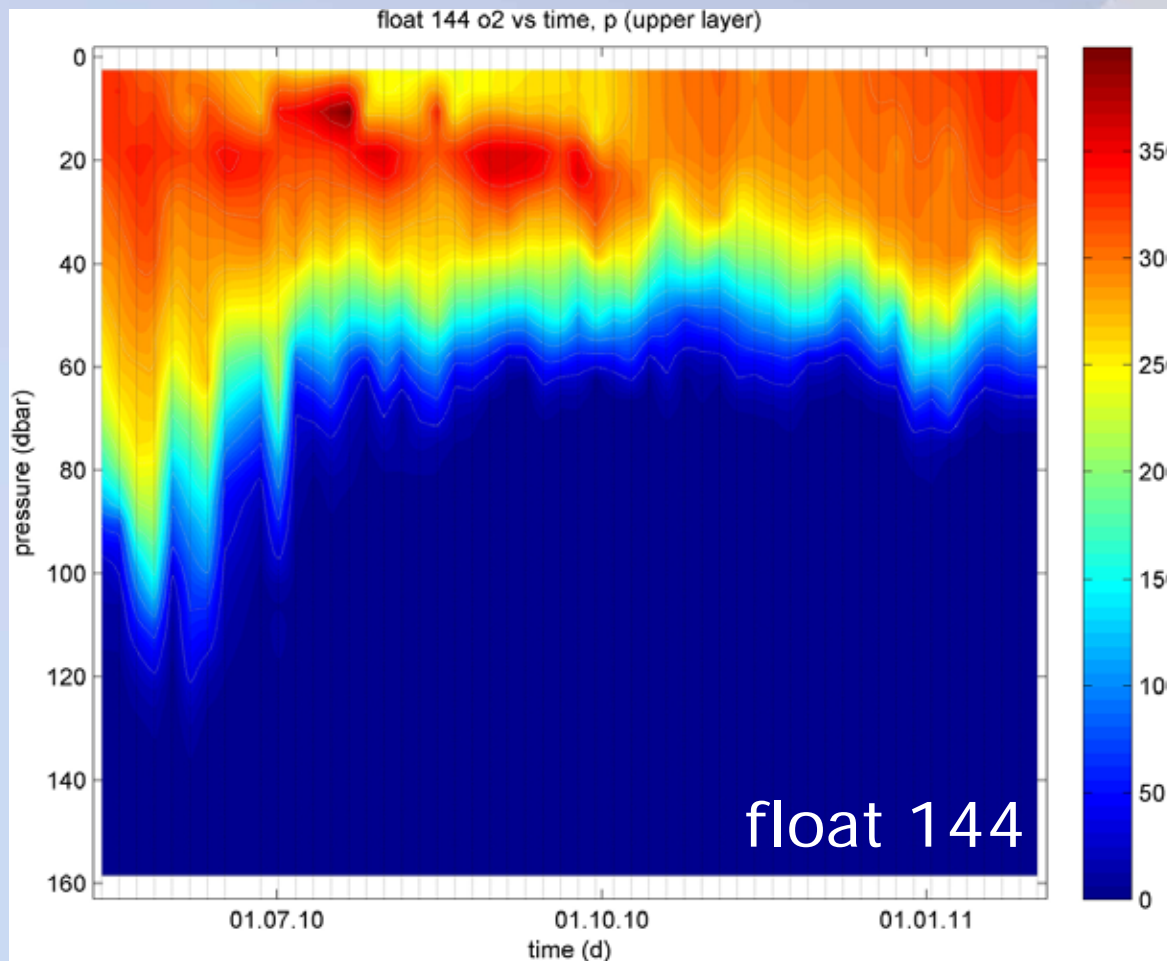
Drifting observatories: when ship traffic and infrastructure impede moorings

Black Sea



Drifting observatories: when ship traffic and infrastructure impede moorings

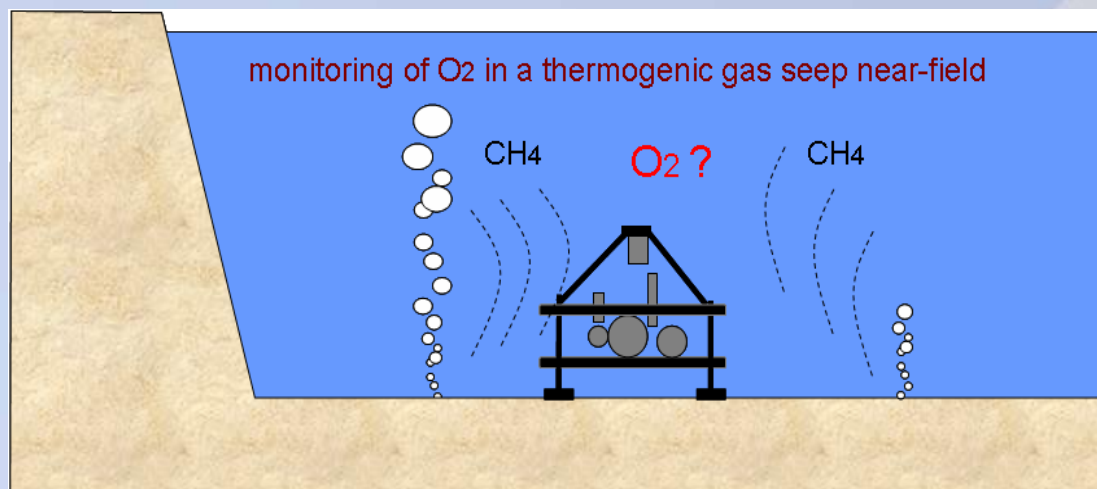
Black Sea



Short / medium term moorings: during or between consecutive cruises



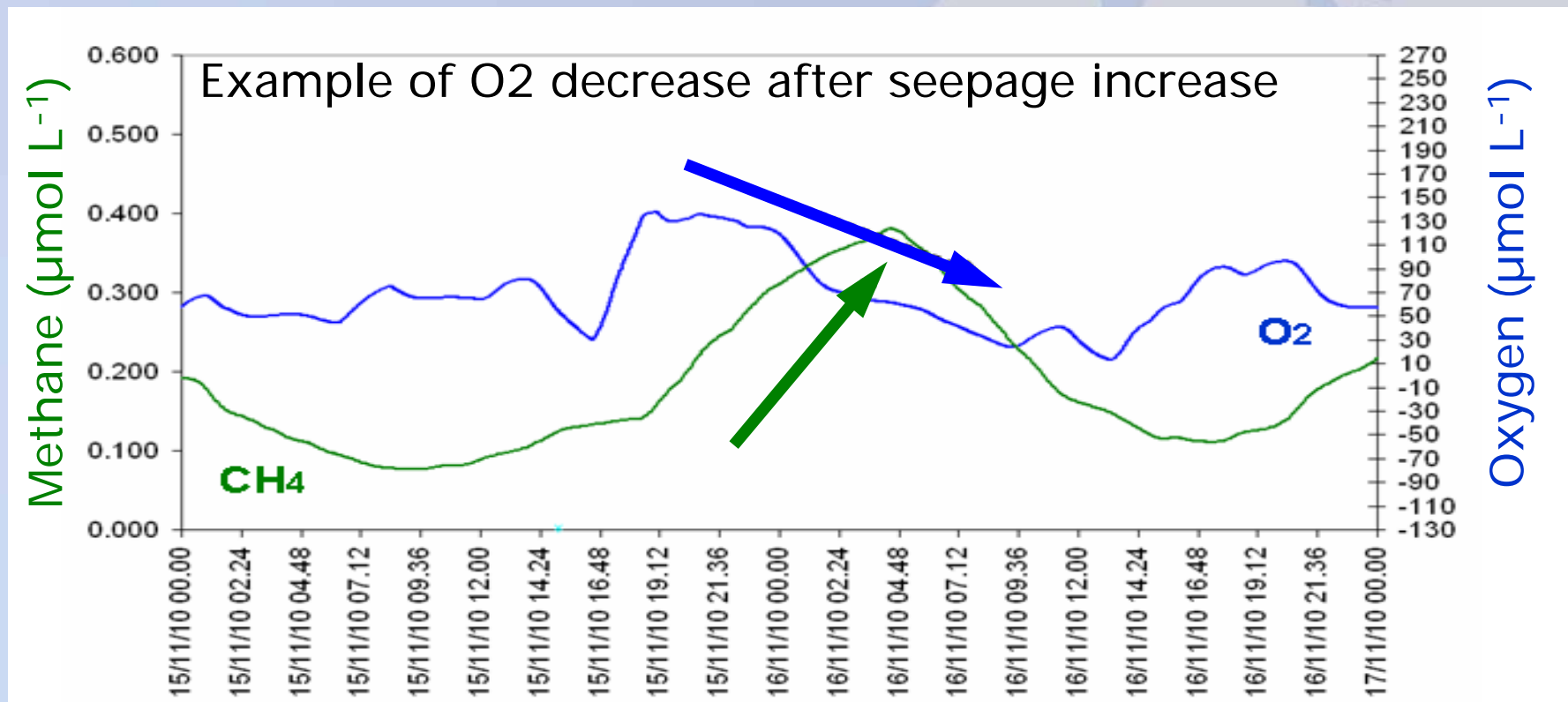
Short / medium term moorings: during or between consecutive cruises Example: Katakolo Bay, Greece



Romanian Shelf ● Crimean Shelf ●
Ionian Sea lagoons & embayments ●

Image & photograph courtesy of G. Etiope & G. Marinaro INGV

Short / medium term moorings: during or between consecutive cruises Example: Katakolo Bay, Greece



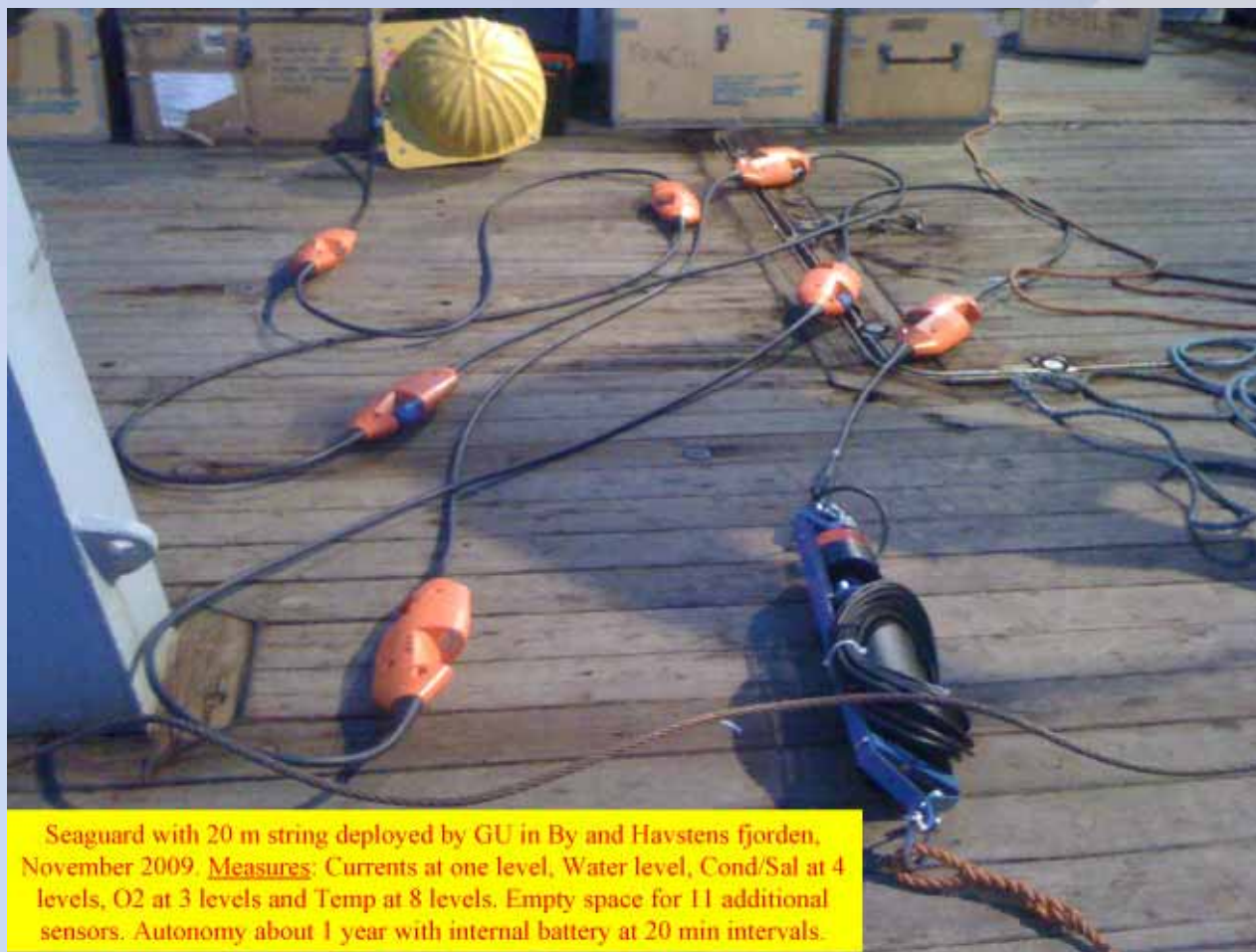
G. Etiope & G. Marinaro INGV, unpublished data

Long term / cable moorings: at accessible & established sites



Long term / cableed moorings: at accessible & established sites

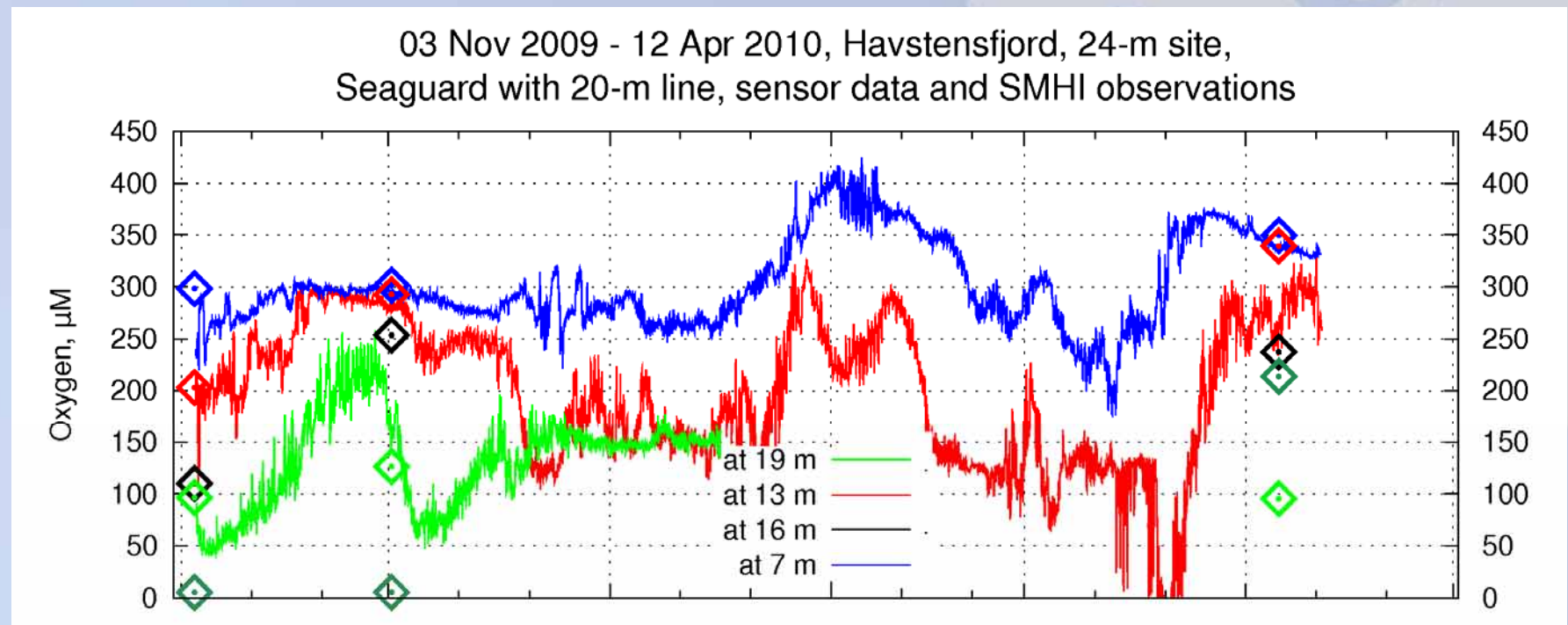
Example: Havstensfjord near Koljoe Fjord



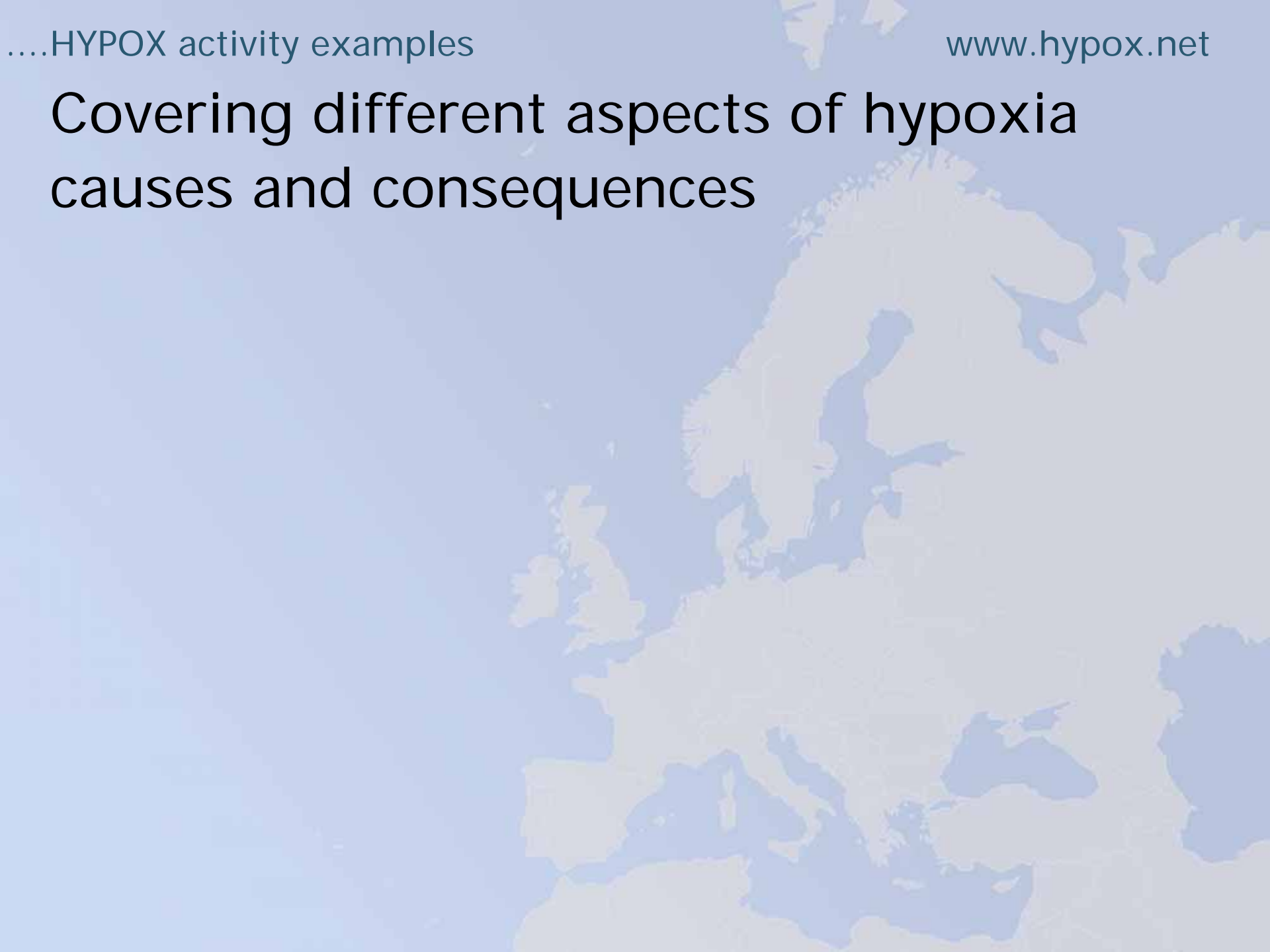
Seaguard with 20 m string deployed by GU in By and Havstens fjorden, November 2009. Measures: Currents at one level, Water level, Cond/Sal at 4 levels, O₂ at 3 levels and Temp at 8 levels. Empty space for 11 additional sensors. Autonomy about 1 year with internal battery at 20 min intervals.

Long term / cable moorings:
at accessible & established sites

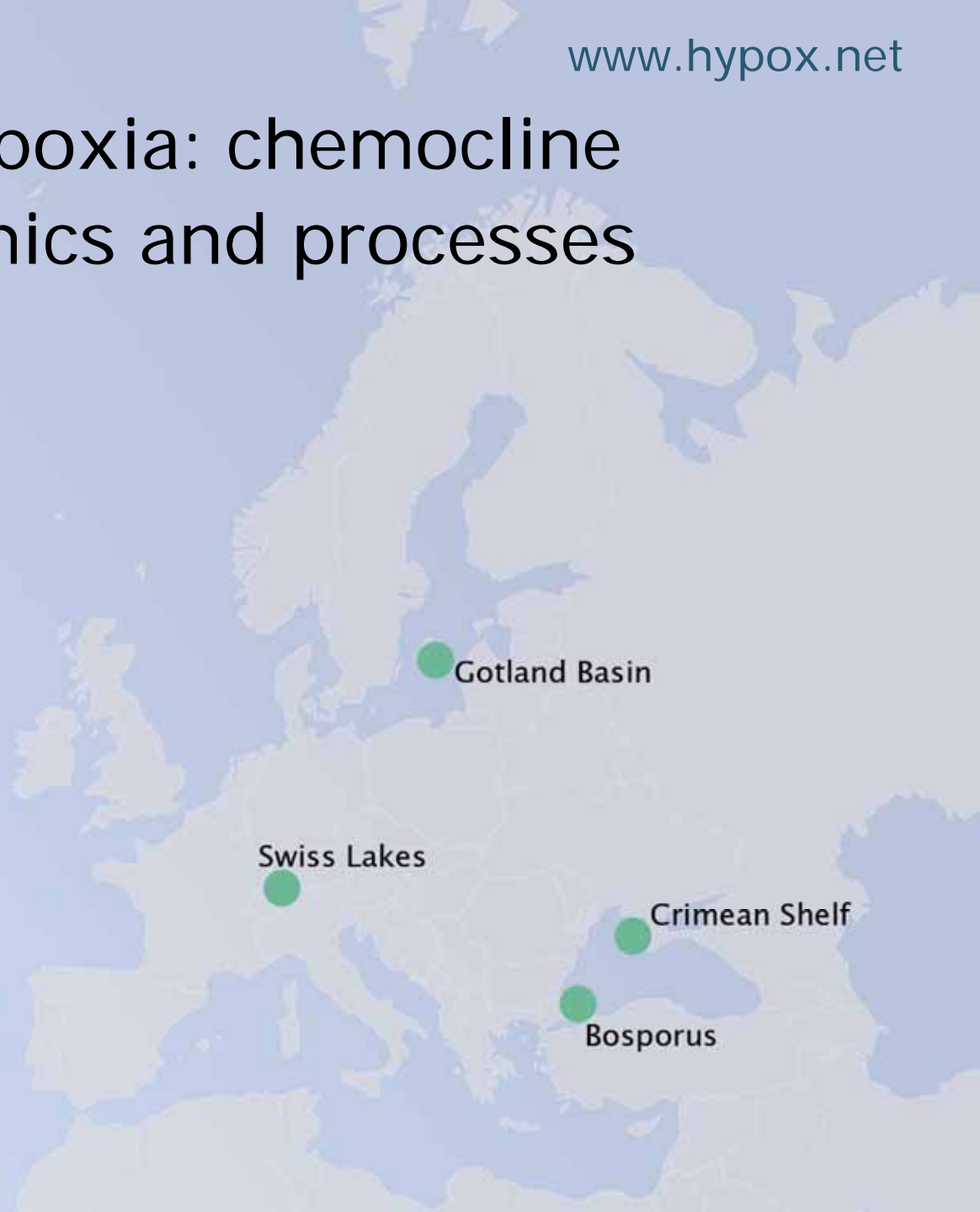
Example: Havstensfjord near Koljoe Fjord



Covering different aspects of hypoxia causes and consequences



Watercolumn hypoxia: chemocline structure, dynamics and processes



Watercolumn hypoxia: chemocline structure, dynamics and processes

Example: Gotland Basin

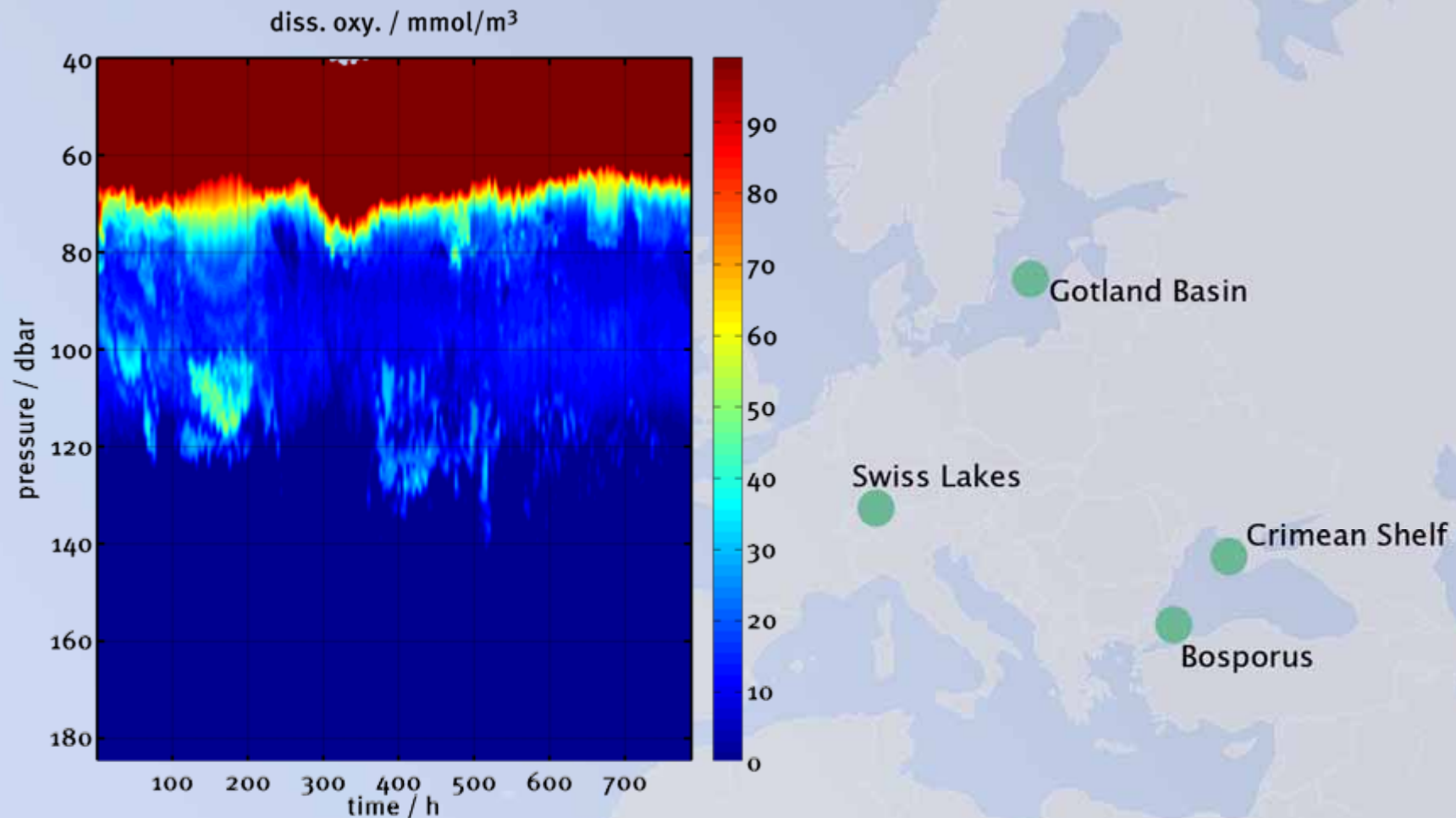


Crimean Shelf

porus

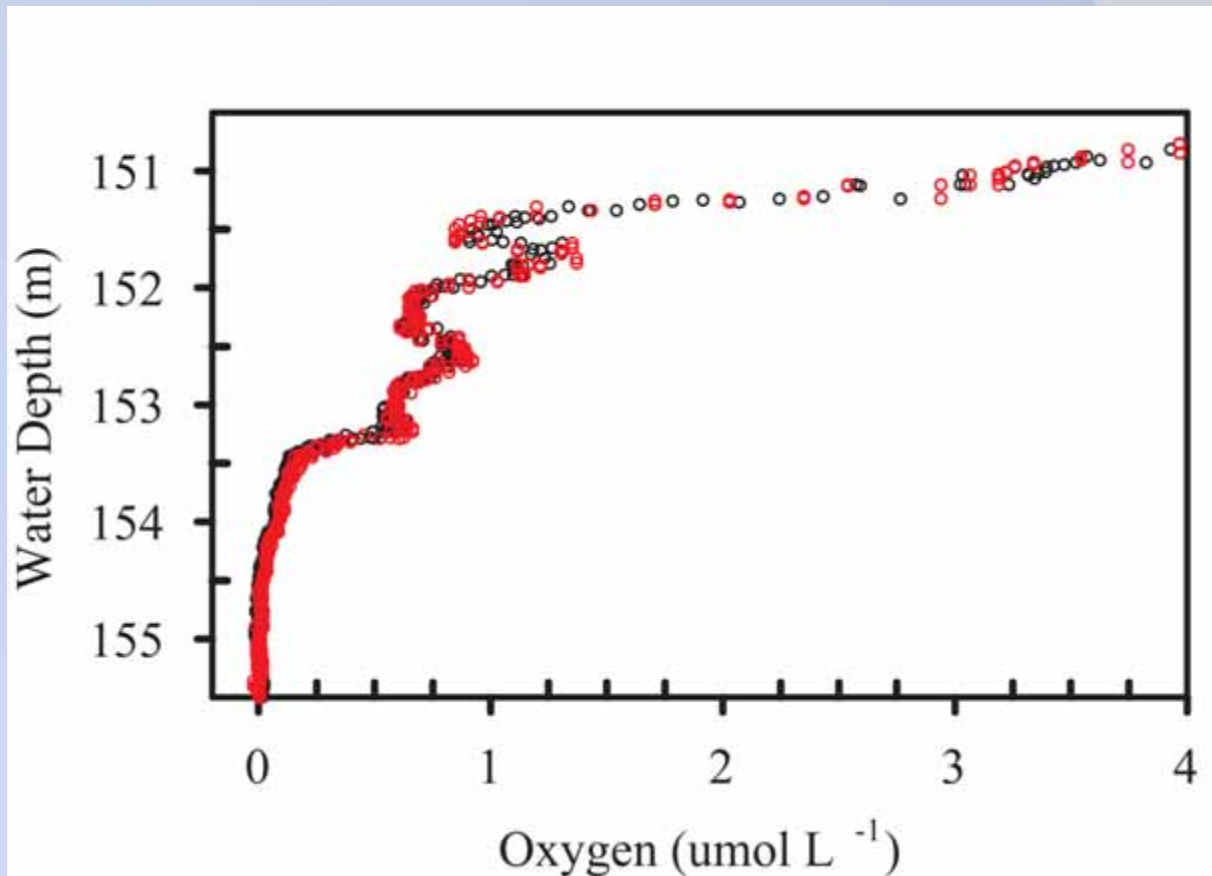
Watercolumn hypoxia: chemocline structure, dynamics and processes

Example: Gotland Basin



Watercolumn hypoxia: chemocline structure, dynamics and processes

Example: Lake Zug, Switzerland



Gotland Basin

Crimean Shelf

Bosporus

High resolution oxygen profile, M. Kirf Eawag, unpublished data

Bottom water hypoxia: oxygen dynamics & benthic community response



A map of the Black Sea region, showing the coastlines of Europe and Asia. Three green dots are placed in the Black Sea, indicating areas of hypoxia. The dots are labeled 'Romanian Shelf', 'Crimean Shelf', and 'Bosporus'.

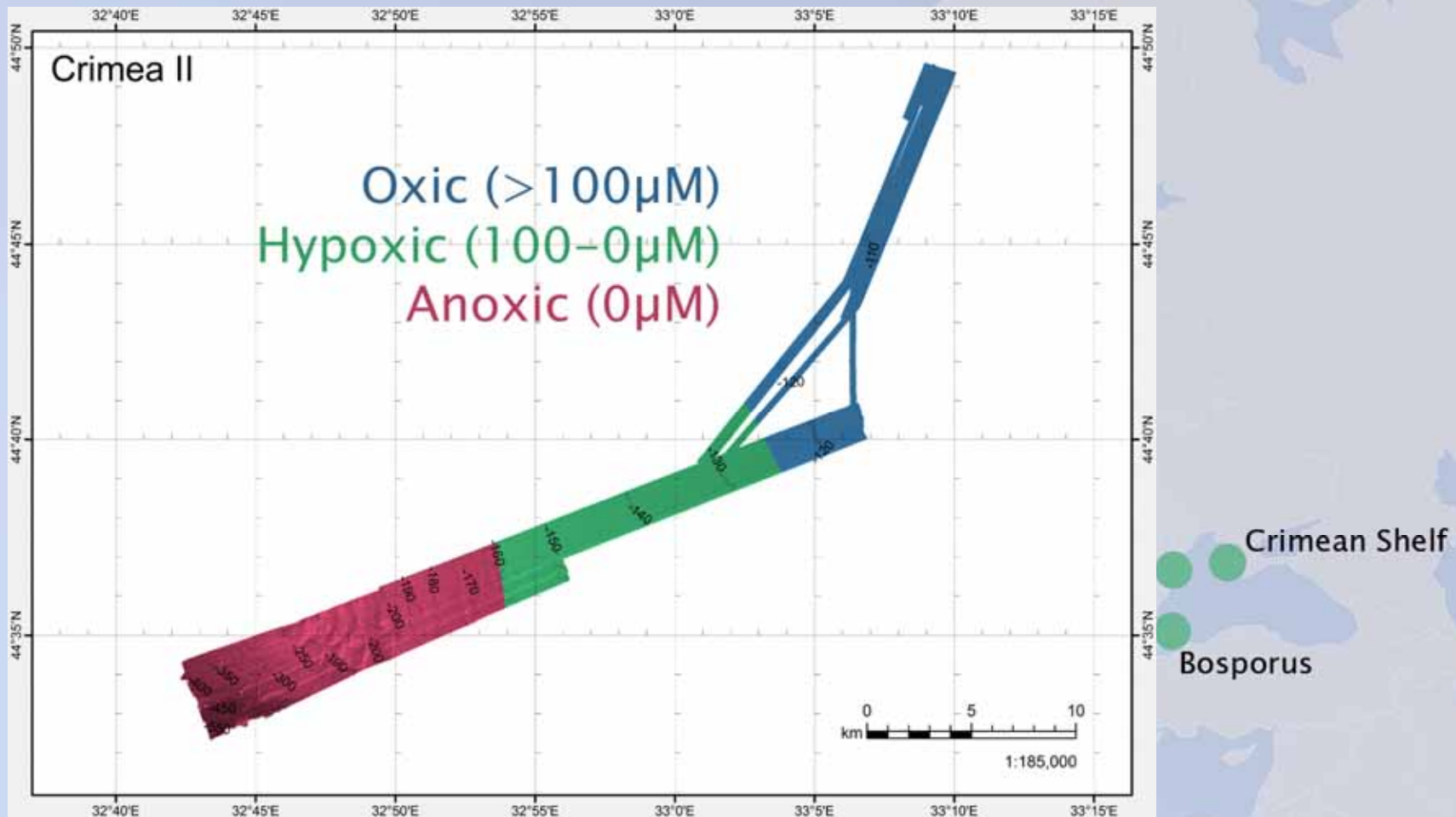
Romanian Shelf

Crimean Shelf

Bosporus

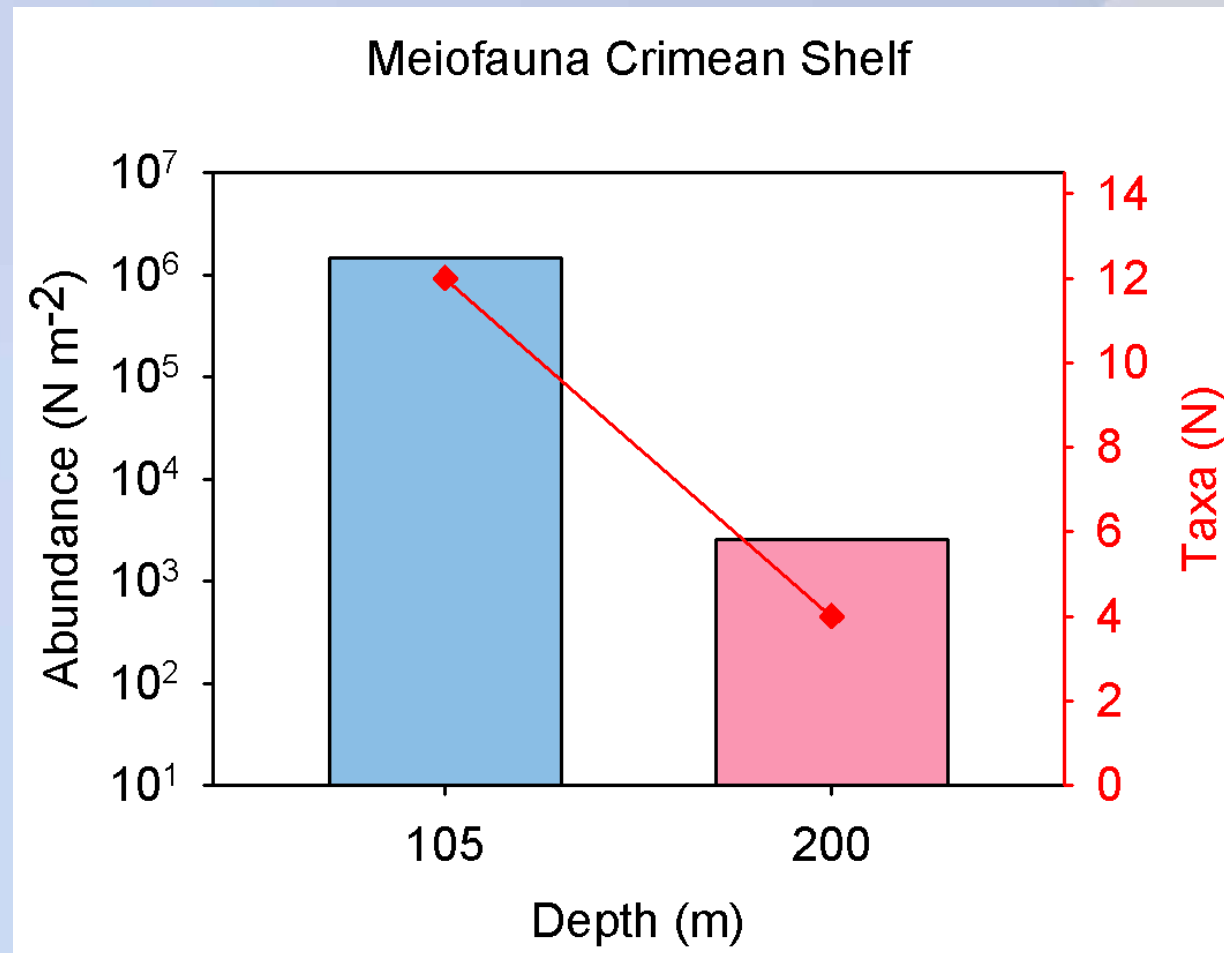
Bottom water hypoxia: oxygen dynamics & benthic community response

Example: Crimean Shelf



Bottom water hypoxia: oxygen dynamics & benthic community response

Example: Crimean Shelf



n Shelf

Crimean Shelf

Bosporus

Monitoring hypoxia hot spots



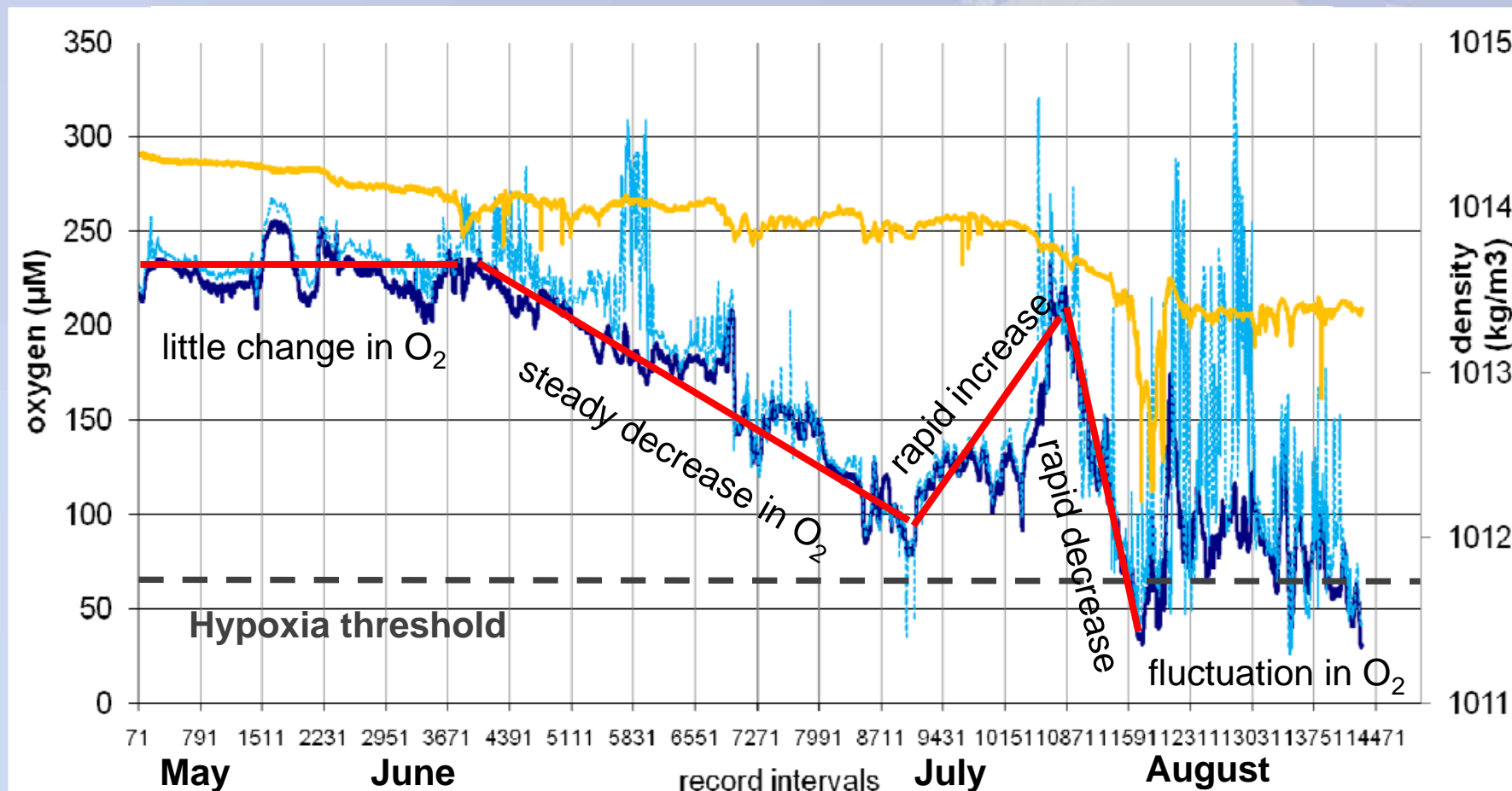
The background of the slide is a light blue map of Europe and the surrounding seas. Two green dots are placed on the map to indicate specific locations of interest. The first dot is located in the Black Sea, near the Romanian coast, and is labeled 'Romanian Shelf'. The second dot is located in the Ionian Sea, near the Italian coast, and is labeled 'Ionian Sea lagoons & embayments'.

Romanian Shelf

Ionian Sea
lagoons & embayments

Monitoring hypoxia hot spots

Example: Romanian Shelf



Monitoring hypoxia hot spots

Example: Romanian Shelf



Photo A. Teaca, GeoEcoMar

Modeling in HYPOX: hypoxia development and ecosystem response

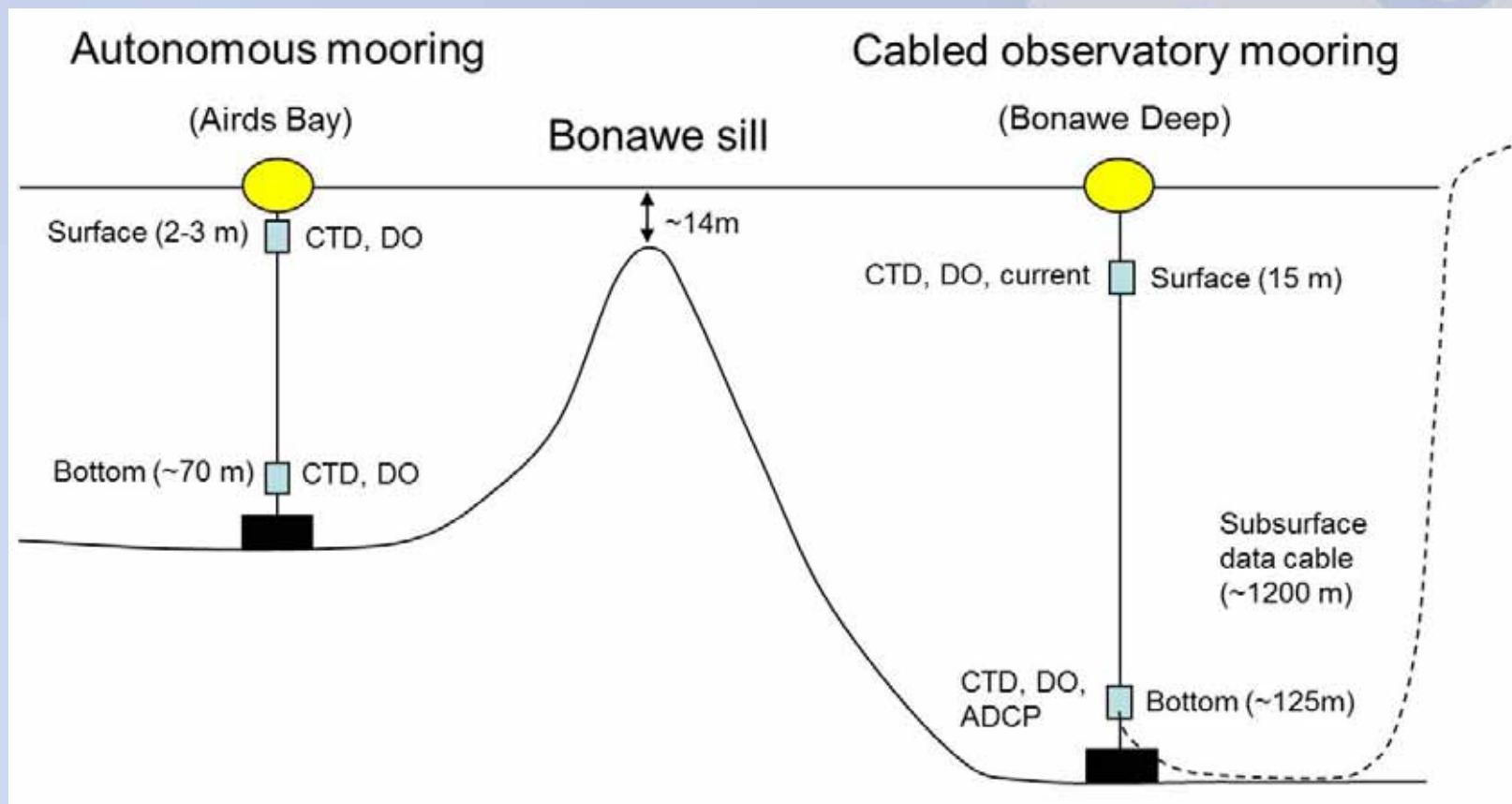


Numerical models: turning observations into predictions & generalizations



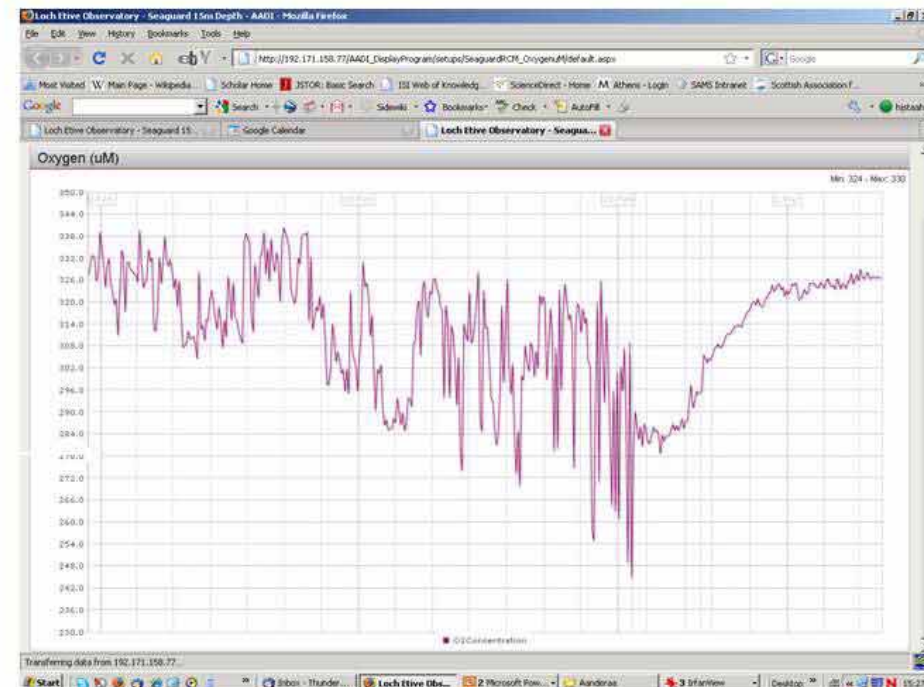
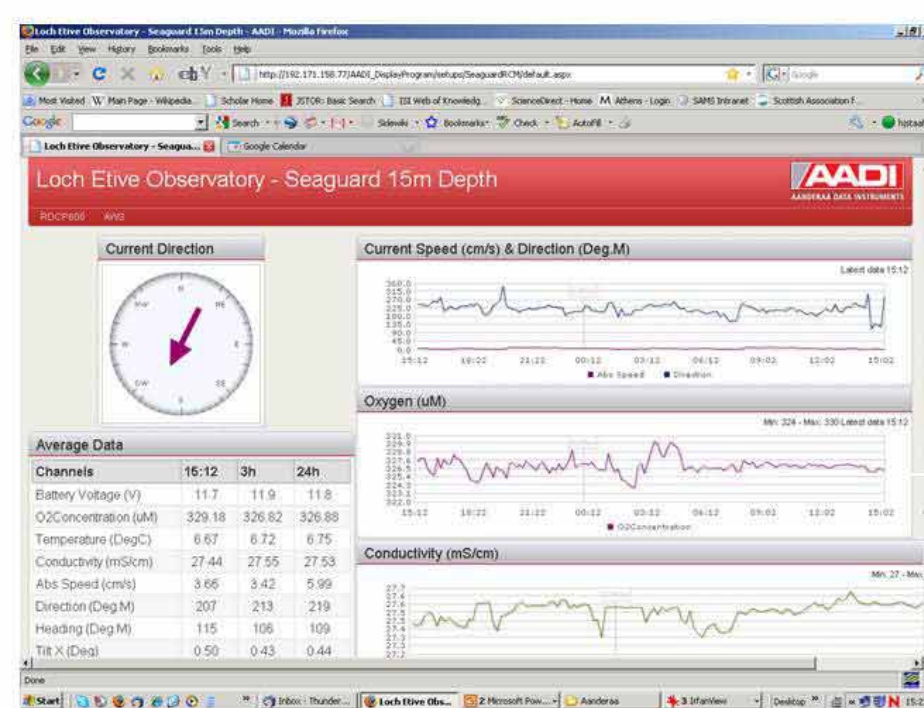
Numerical models: turning observations into predictions & generalizations

Example: Loch Etive (observatory)



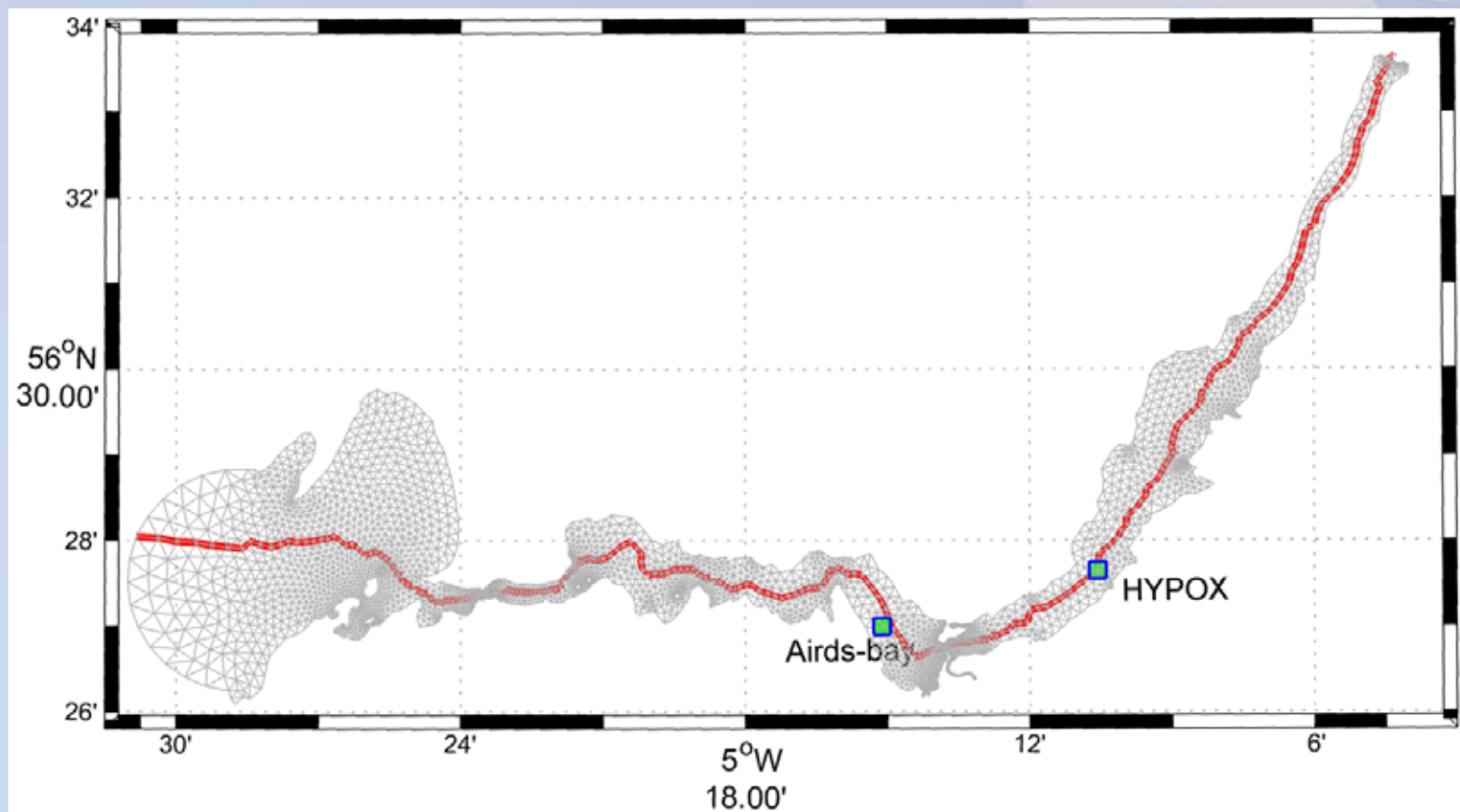
Numerical models: turning observations into predictions & generalizations

Example: Loch Etive (observations)



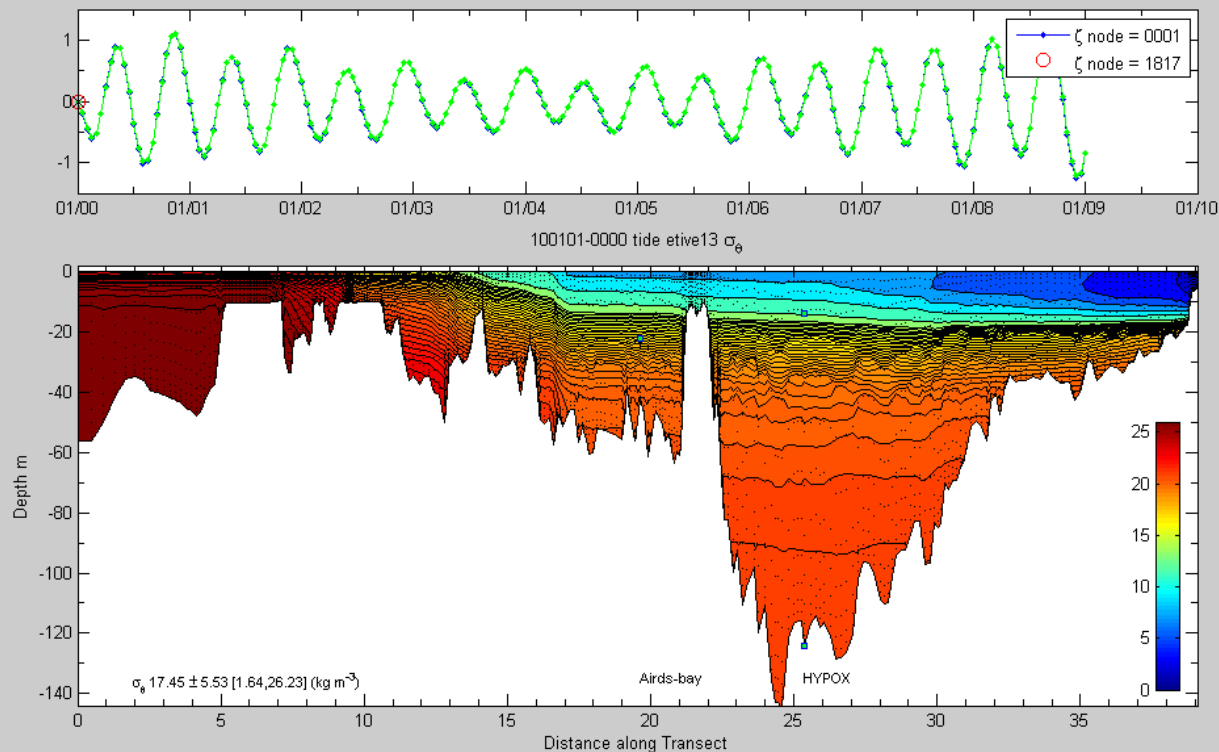
Numerical models: turning observations into predictions & generalizations

Example: Loch Etive (modeling domain)



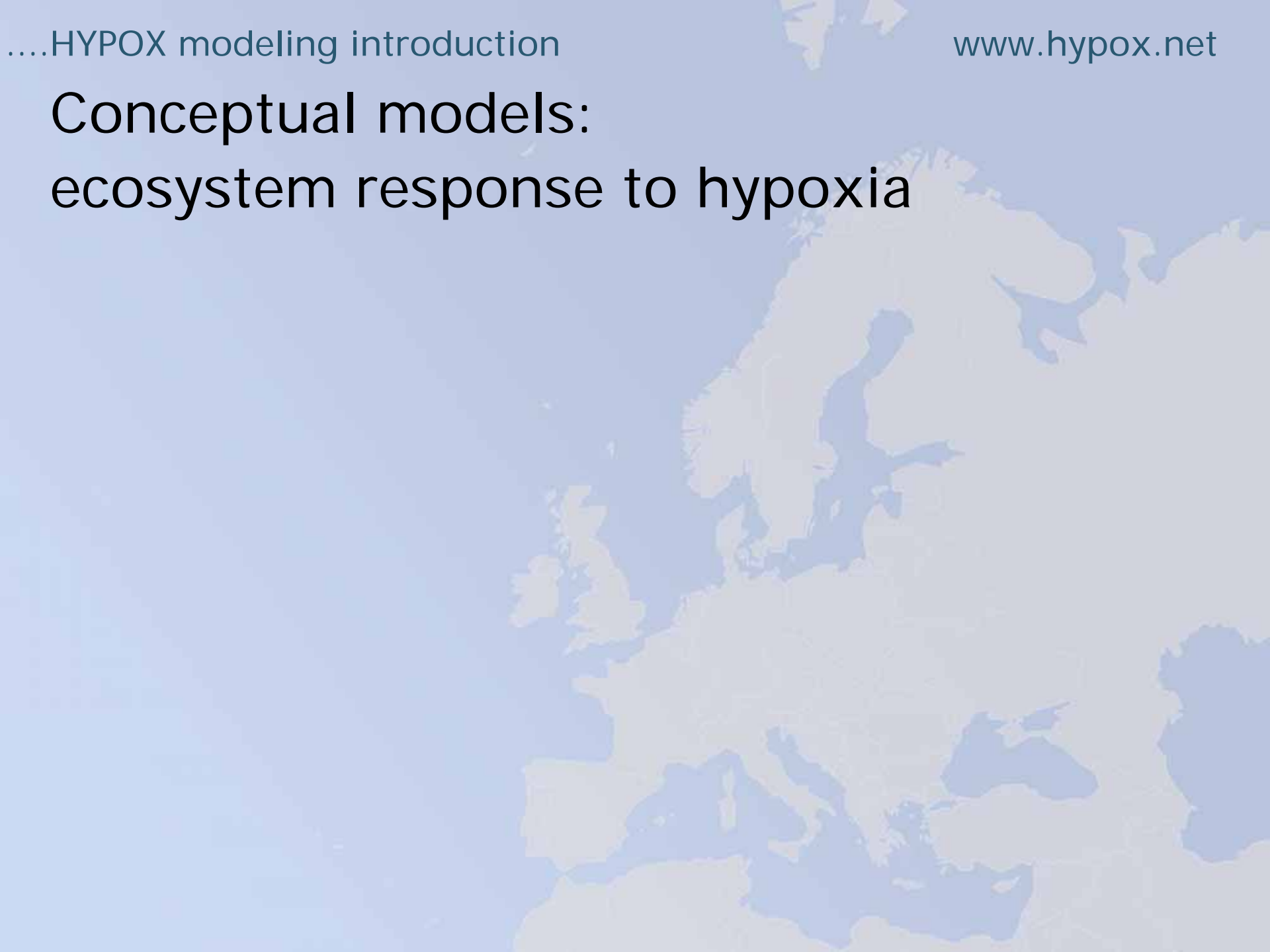
Numerical models: turning observations into predictions & generalizations

Example: Loch Etive (modeling results)

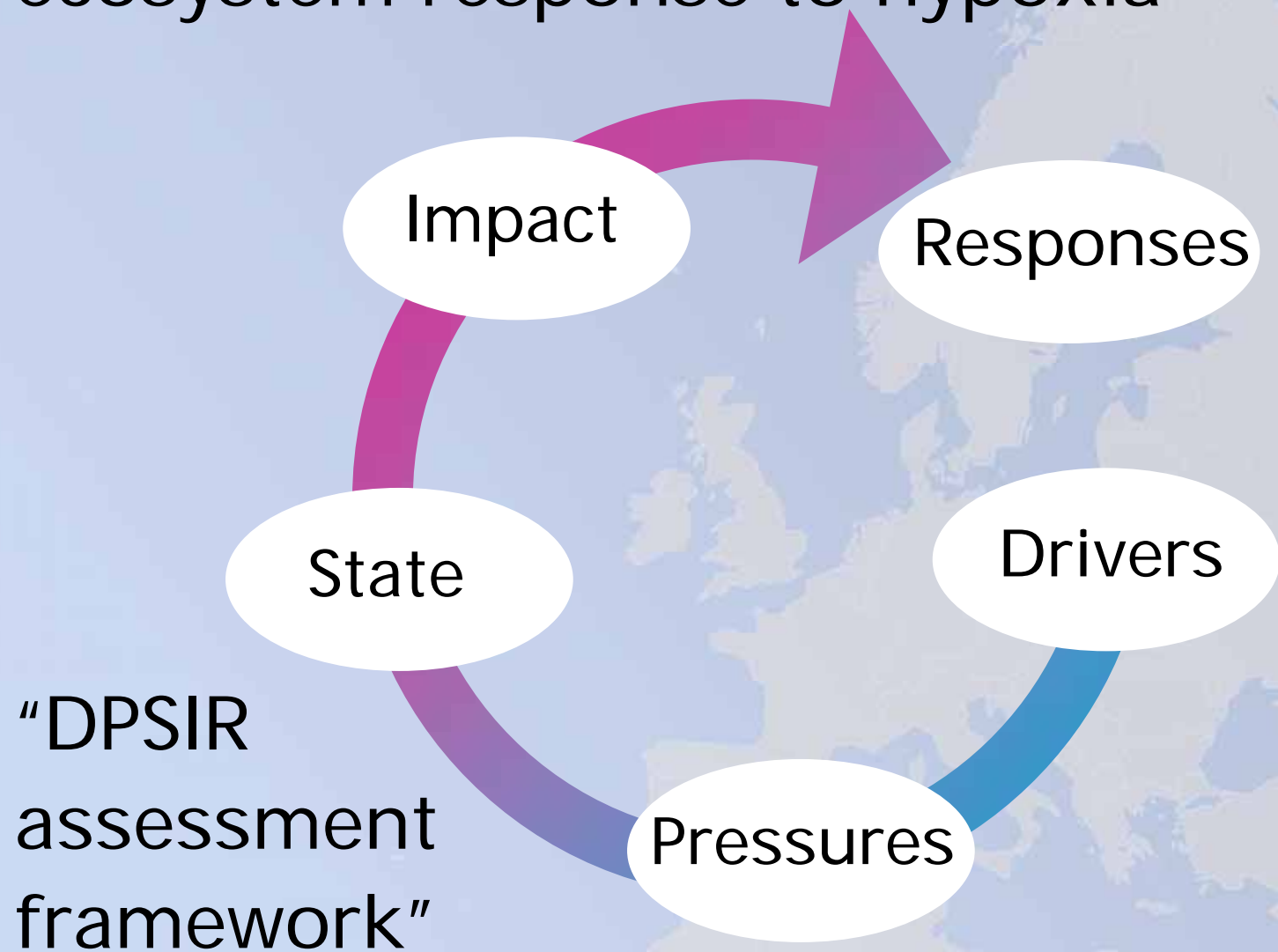


FVCOM run with unstructured grid. Courtesy of D. Aleynik, SAMS

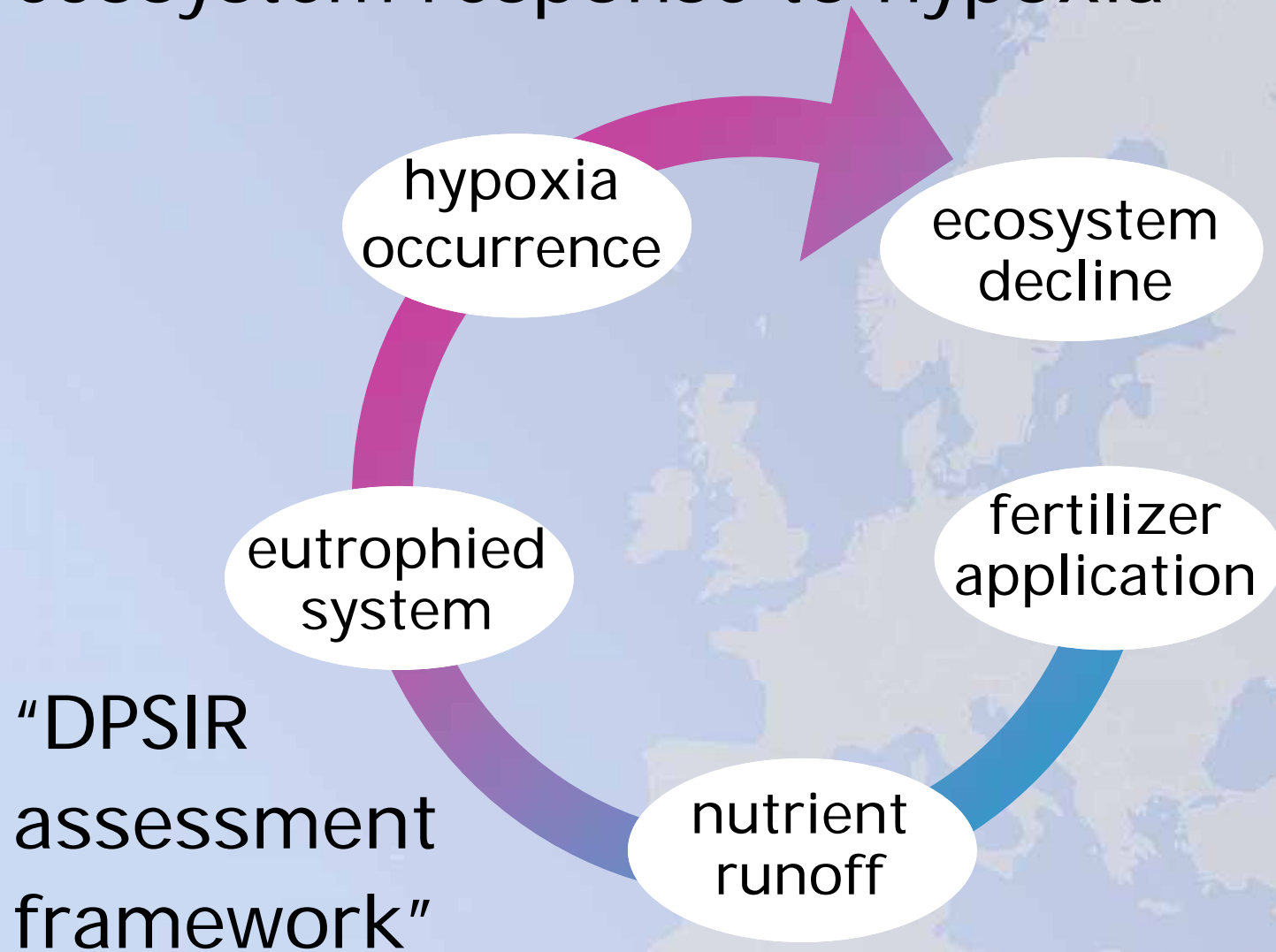
Conceptual models: ecosystem response to hypoxia



Conceptual models: ecosystem response to hypoxia



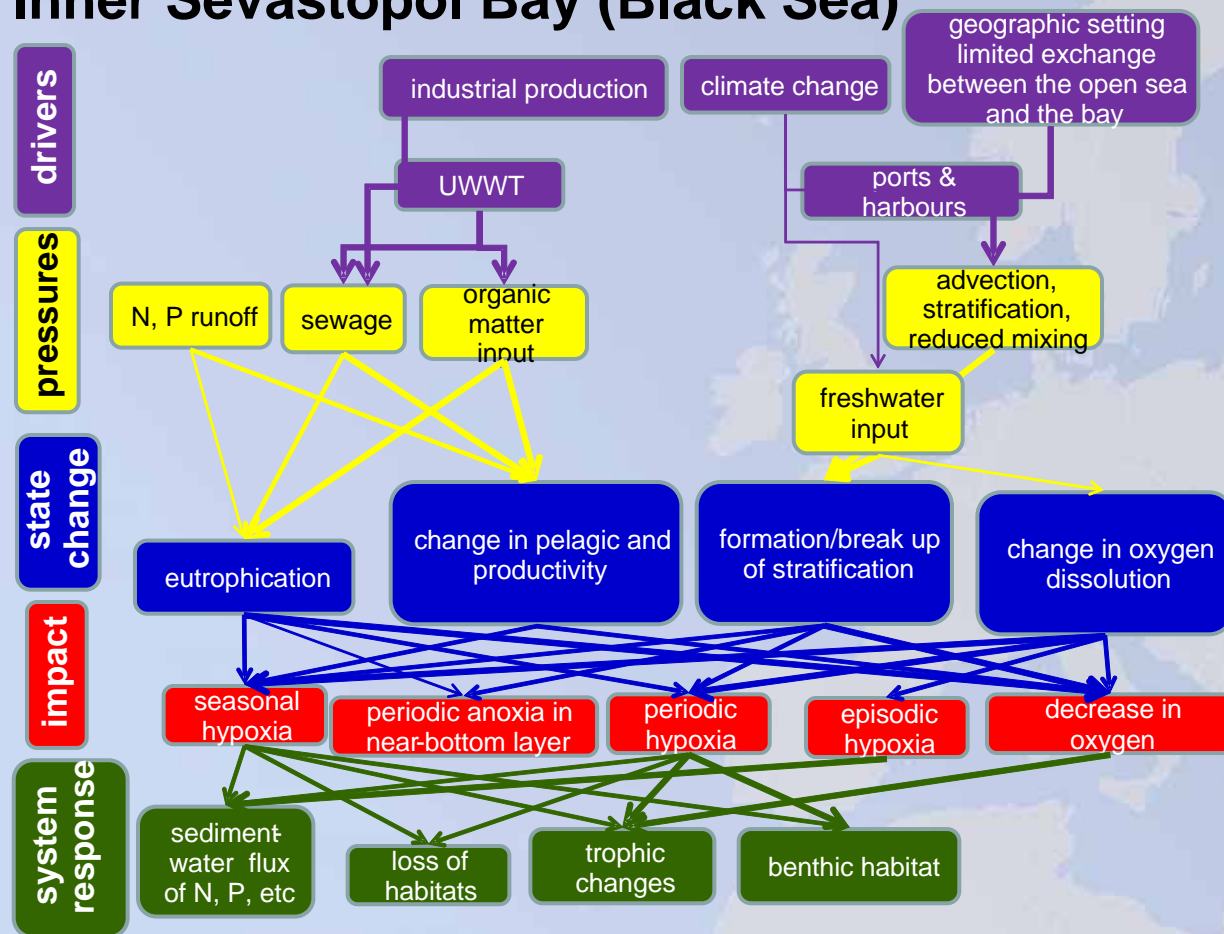
Conceptual models: ecosystem response to hypoxia



Conceptual models: ecosystem response to hypoxia

Example: Sevastopol Bay

Inner Sevastopol Bay (Black Sea)



Dissemination of results




Open access archiving: data publishing network "Pangaea" (www.pangaea.de)




improved usability and advanced options: hypox data portal (www.hypox.net)

[Home](#)
[Contact](#)
[Imprint](#)



In situ monitoring of oxygen depletion in hypoxic ecosystems of coastal and open-seas, and land-locked water bodies.



[Portal Home](#) | [Hypox Sites](#) | [Data Catalogue](#)

Shelf and Open Seas

Black Sea

North-western Shelf

- Danube River plume
- St. George Transect, inshore endpoint
- St. George Transect, offshore endpoint

Crimean Shelf


- Tarkhankut region
- Omega (Kruglaya) Bay
- Sevastopol Bay (Inner and Outer Parts)

Bosporus Region

Baltic Sea

Gotland Deep

North Atlantic - Arctic Ocean transition / Fram Strait



Map Satellite Hybrid

Google 200 Image 200 TerraMetrics Terms of Use

Black Sea

Latitude: 43.240935
Longitude: 33.771973

The Black Sea is a 0.46 million km² large semi-enclosed brackish sea with a maximum depth of 2250 m. Via the Sea of Marmara, the Black Sea is connected to the Mediterranean through the Straits of Bosporus and Dardanelles. A limited exchange with the Mediterranean due to the shallow sill depths of the Bosporus and Dardanelles straits (35 and 65 m, respectively) and a substantial freshwater input, mainly through the Danube, Dniestro and Dniro ...

[more](#)

Land-locked Water Bodies

Loch Etive

- Upper basin
- Lower basin

Swedish Fjord

- Koljö Fjord
- Havstensfjord

Ionian Sea lagoons and embayments

- Messolonghi-Aetoliko Lagoon Complex
- Amvrakikos Gulf
- Katakolo bay

Swiss lakes

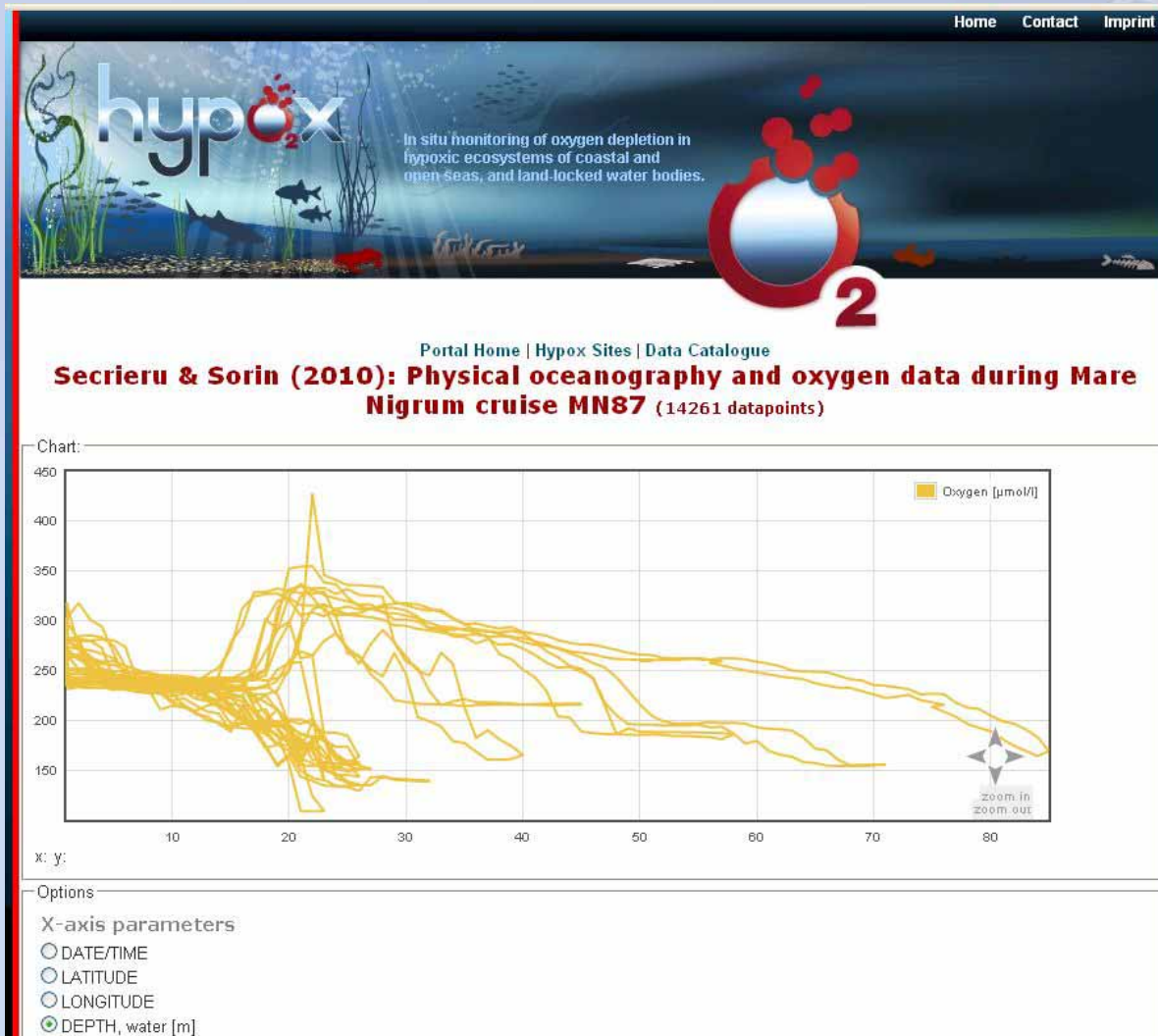
- Lake Lugano
- Lake Zurich
- Lake Rotsee

Archived data:

[Click here for more data...](#)

1. Secrieru, Dan & Sorin, Balan (2010): Physical oceanography and oxygen data during Mare Nigrum cruise MN87
2. Secrieru, Dan & Sorin, Balan (2010): Physical oceanography and oxygen data during Mare Nigrum cruise MN84
3. Secrieru, Dan (2010): Physical oceanography and oxygen data during Mare Nigrum cruise 09MN/01
4. Secrieru, Dan & Sorin, Balan (2010): Physical oceanography and oxygen data during Mare Nigrum cruise MN86
5. Holtappels, Moritz (2010): Physical oceanography during ARAR cruise in 2009
6. Friedrich, Jana (2010): Near-seafloor physical oceanography and oxygen time series in the Black Sea during summer 2010

improved usability and advanced options: hypox data portal (www.hypox.net)



Adding to the global system of systems: implementation in GEOSS

THE GLOBAL EARTH OBSERVATION SYSTEM OF SYSTEMS



Adding to the global system of systems: implementation in GEOSS

[Feedback for this page](#)[Back](#)[GEOSS Registry Publication Portal](#)

GEOSS Service Instance Details

Service Basic Information

Component Id:	urn:uuid:3549bbf7-0e82-429b-b6c7-af67e1b043f8 (Click to see Component details)
Service Id:	urn:uuid:5e3ce24e-4434-4781-bd8e-be7a22dfa652
Name:	HYPOX GEORSS
Abbreviation:	HYPOX GEORSS
Description:	HYPOX GEORSS: New data from the HYPOX Project: Presentation of oxygen monitoring data recorded in freshwater and oceans
Information URL:	www.hypox.net
Interface URL:	http://www.pangaea.de/tools/latest-datasets.rss?q=project%3Ahypox

Service Contact Information

Contact Name:	Robert Huber
Contact Email:	rhuber@wdc-mare.org

Service Time Period of Information Content

Begin Date:	Indefinite Start
End Date:	Ongoing

Referenced GEOSS Supportive Standards or Special Arrangements

- | | |
|---|---|
| Supportive Information: | Data Format |
| 1. Special Arrangement (click to view details): | Geospatial extensions for RSS and Atom |
| Supportive Information: | Communications and Telecommunications |
| 2. Standard (click to view details): | Hypertext Transfer Protocol (HTTP), Version 1.1 |

Date and Time of Last Update

2010-05-26T15:05:26Z

Approval Status

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HYPOX partners

EC grant 226213

