



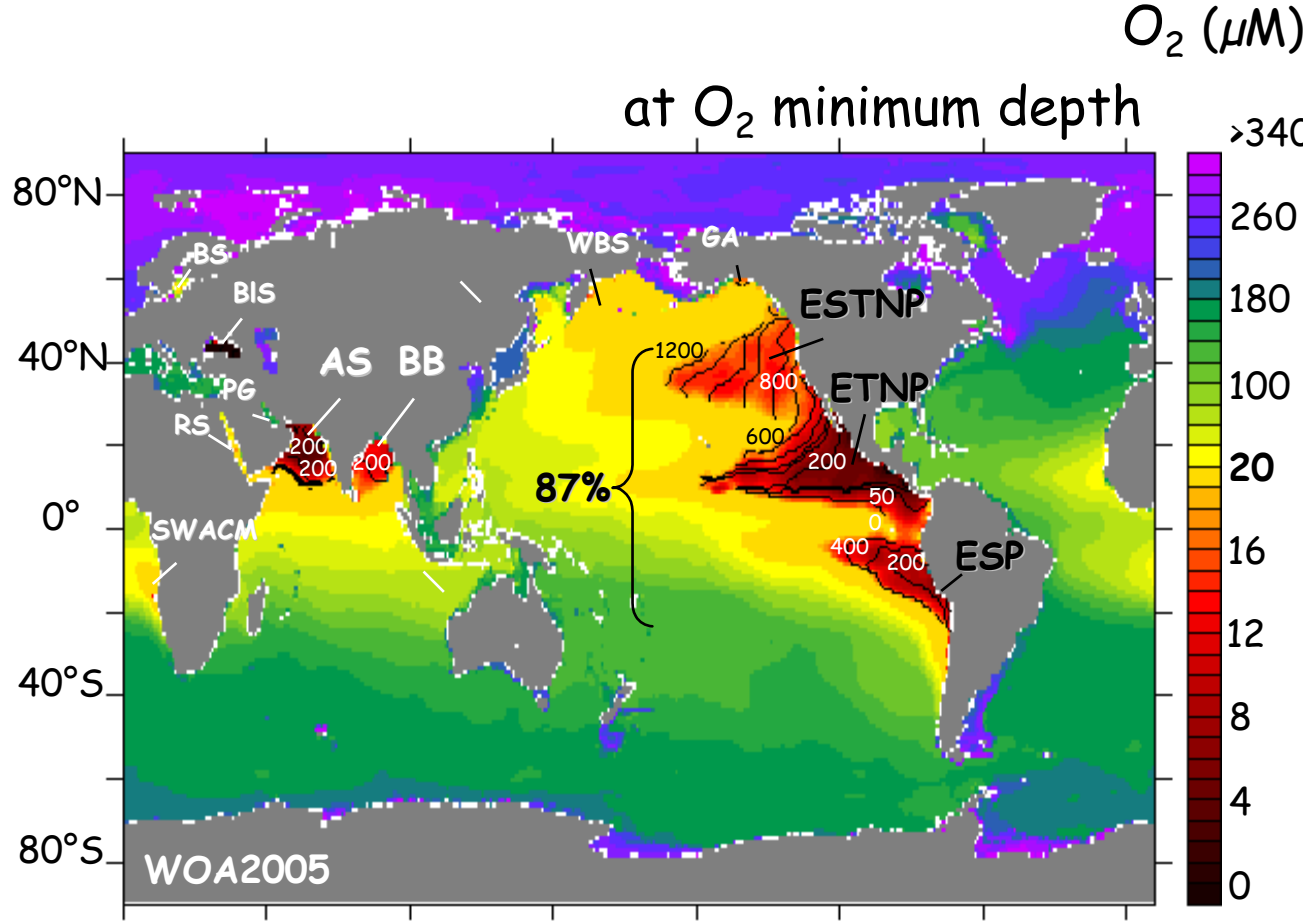
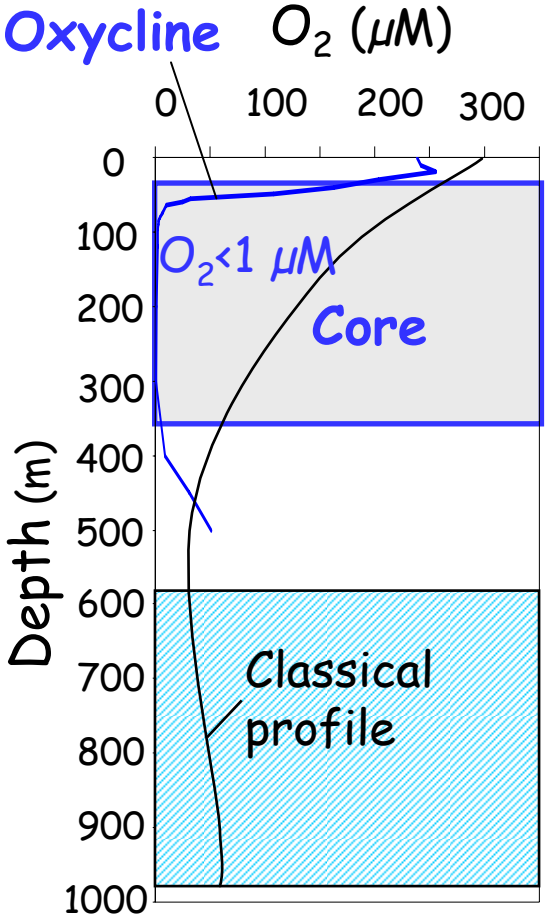
The AMOP project:
« Biogeochemical Activity of the Minimum of Oxygen in the eastern Pacific »

Proposed by Aurélien Paulmier and Véronique Garçon

IFM-Geomar, Kiel, Germany

LEGOS, Toulouse, France

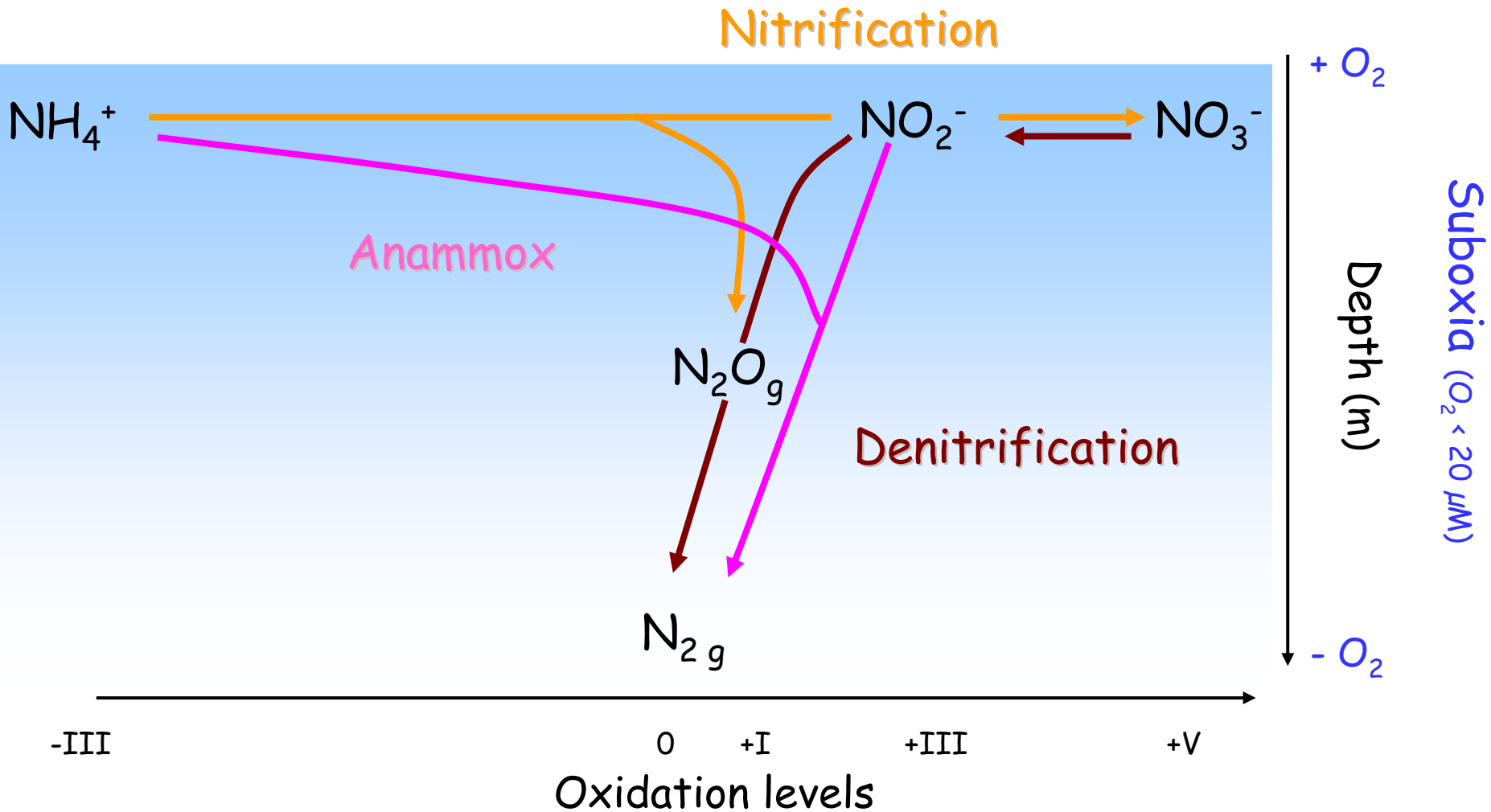
What, where and why the OMZs ?



Paulmier and Ruiz-Pino, Progress in Oceanography, 2008

Key-role for: **climate** (N_2O);
ecosystems («Respiratory barrier»; N loss)

OMZ and NITROGEN cycle



Bacterial processes specific to the OMZ

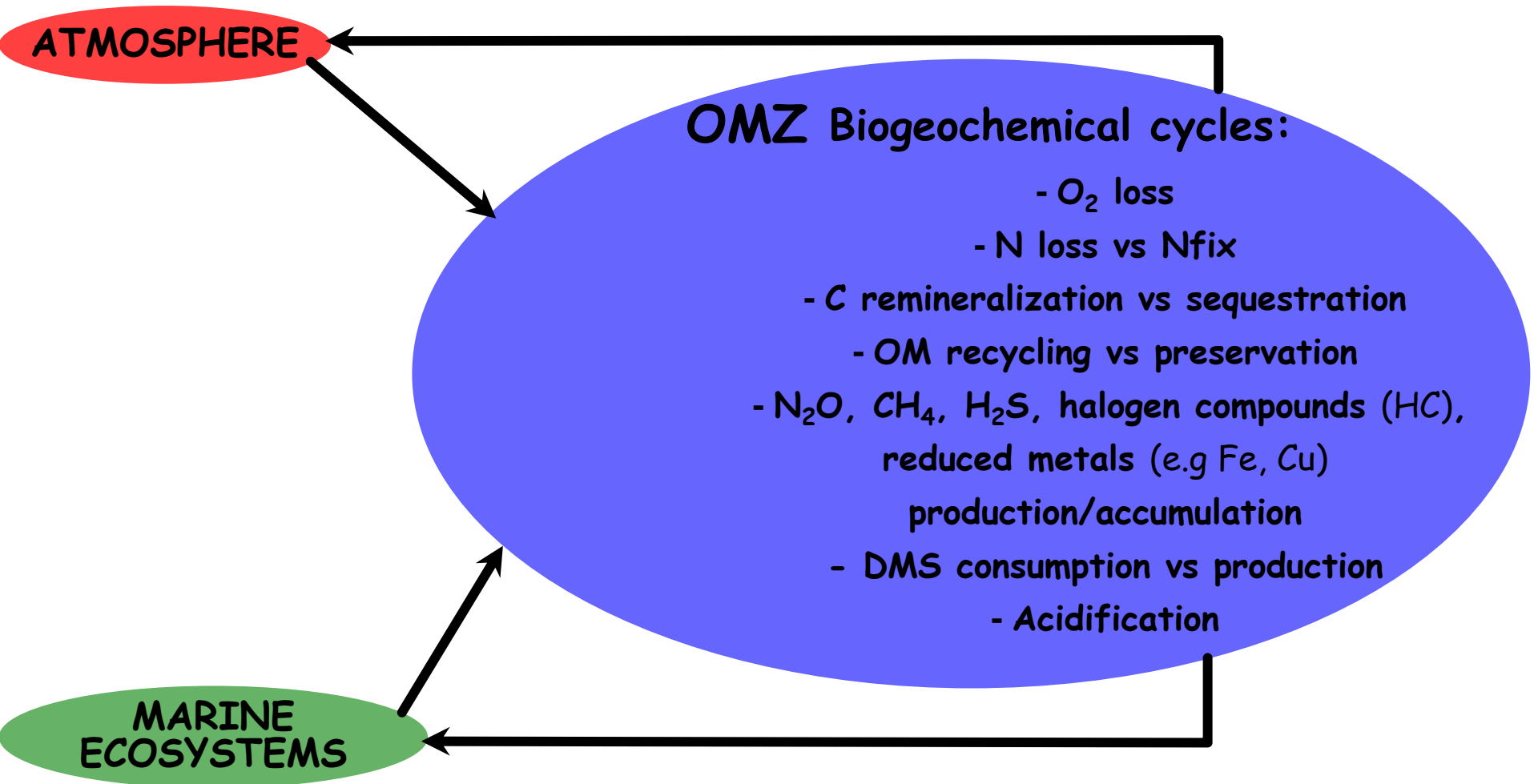
SOLAS and IMBER QUESTIONS

ATMOSPHERE

OMZ Biogeochemical cycles:

- O₂ loss
- N loss vs Nfix
- C remineralization vs sequestration
- OM recycling vs preservation
- N₂O, CH₄, H₂S, halogen compounds (HC),
reduced metals (e.g Fe, Cu)
production/accumulation
- DMS consumption vs production
- Acidification

MARINE ECOSYSTEMS



SOLAS and IMBER QUESTIONS

S3 GHG: coupled/decoupled source/sink of CO_2 (direct/indirect), N_2O , CH_4

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MARINE ECOSYSTEMS

S3: CO_2 flux and other long life-time species

SOLAS and IMBER QUESTIONS

S1 Clouds formation/albedo: aerosols (DMS, HC acids/oxides)
Control of O_3 (stratospheric: N_2O ; tropospheric: HC) and O_2 (long-term)

ATMOSPHERE

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MARINE ECOSYSTEMS

S1: Biogeochemical interactions and ocean-atmosphere coupling

SOLAS and IMBER QUESTIONS

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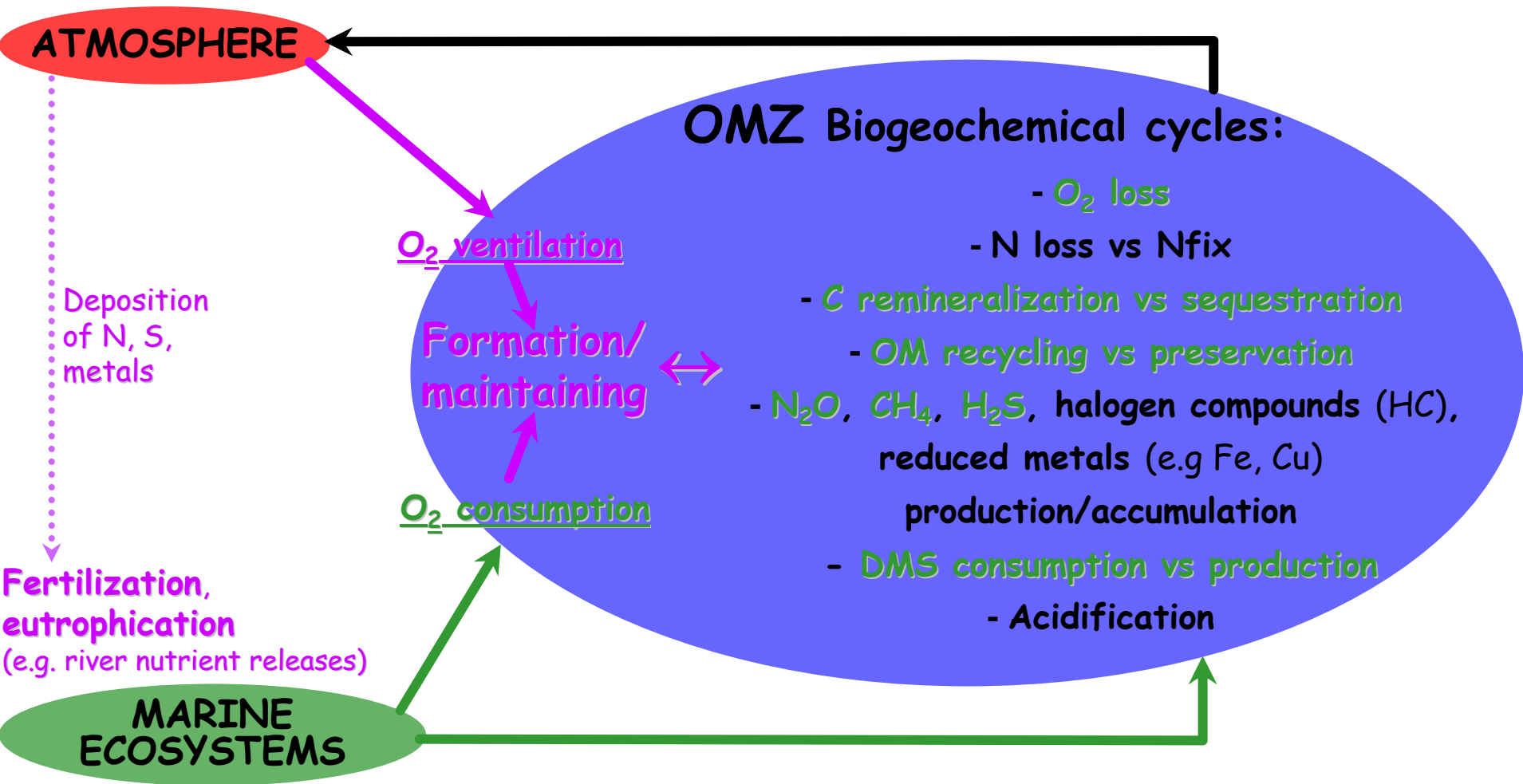
MARINE ECOSYSTEMS

I1/I4 Productivity/fisheries, trophic changes/shift, ↓ biodiversity

I1: Interactions between biogeochemical cycles and marine ecosystems

I4: Societal responses

SOLAS and IMBER QUESTIONS



I2: Sensitivity to global change
I3: Feedback on the Earth System

2 new experimental/modelling projects in the OMZs of the Eastern Tropical Pacific

OBJECTIVE:

to understand the biogeochemical/bacterial OMZ activity

→ AMOP (2009-2013), focused on:

- *the Eastern North Tropical Pacific (México): largest; anthropic releases/acidification, no anammox observation*
- *the oxycline ("OMZ engine"), C-N-O interaction, O₂ and OM (characterization/degradation: LMGEM) sensitivity, isotopic measurements (proxy calibrations: EPOC)*

→ SFB754/Germany (2009-2012/2020), focused on:

- *the Eastern South Tropical Pacific (Peru): most re-studied*
- *N cycle, anammox (MPI) and Nfix (IFM-Geomar)*
- *Ultra low O₂ measurement/experiment (STOX, $\delta^{18}O_2$), molecular "3D map" (DNA, RNA, FISH)*

SOLAS-IMBER PERSPECTIVES

→ **SOLAS-AMOP project** (White paper for a 2011-2015) on the interaction between the **OMZ** and the atmosphere in the Eastern Pacific:

OBJECTIVES:

- 1) *Is it possible to quantify the overall role of the OMZs on the climatic change, taking into account GHGs, clouds formation and atmospheric O_3 and O_2 control?*
- 2) *What are the responsible mechanisms, e.g. the switch from O_2 -respiration to anaerobic respiration (via NO_3 , NO_2 , N_2O , SO_4 , methanogenesis, IO_3 , Fe(III), Mn(III)(IV), ...) for the production of the different GHGs?*

APPROACH:

- 1) *Data acquisition and analysis;* 2) *Parameterizations and large scale validation*

→ **Hypoxia project** (IMBER-SCOR-IOC for 2011-2015) on the whole Eastern Pacific (from Canada to Chile):

- 1) *Analysis of the historical data (e.g. Calcofi, Imecocal)*
- 2) *Observations network adapted to the OMZ (autonomous platforms with biogeochemical microsensors)*

→ **Fast-Track Initiatives SOLAS-IMBER** (2010-2011)