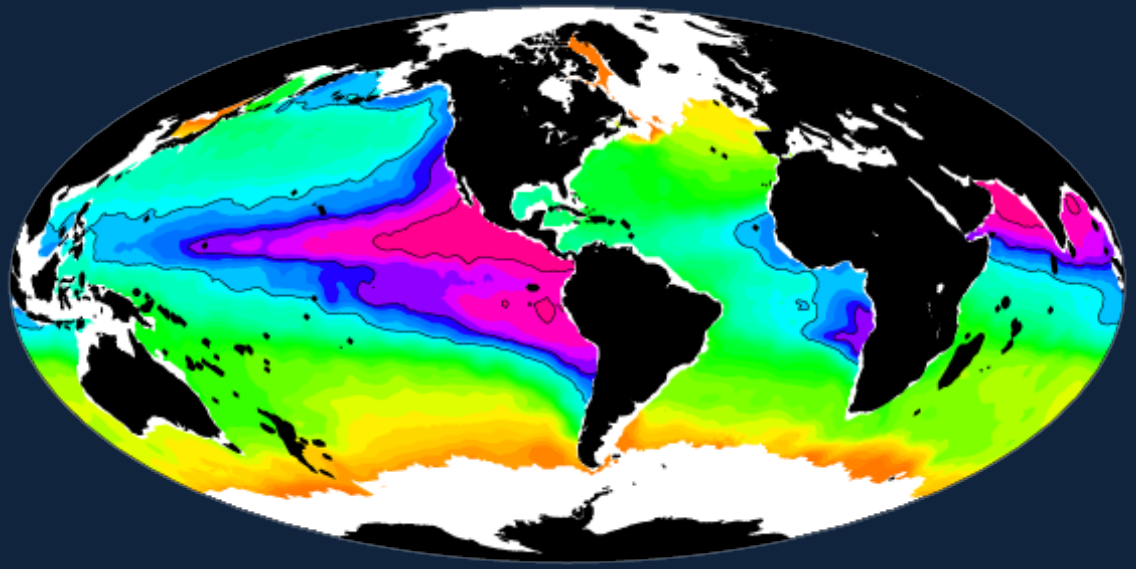

PREFACE-PIRATA-CLIVAR Tropical Atlantic Variability Conference
UPMC, Paris, France
November 28, 2016

SFB 754

Collaborative Research Center 754 | SFB 754

Potential impact of Atlantic climate modes on the ventilation of the oxygen minimum zone in the eastern tropical north Atlantic

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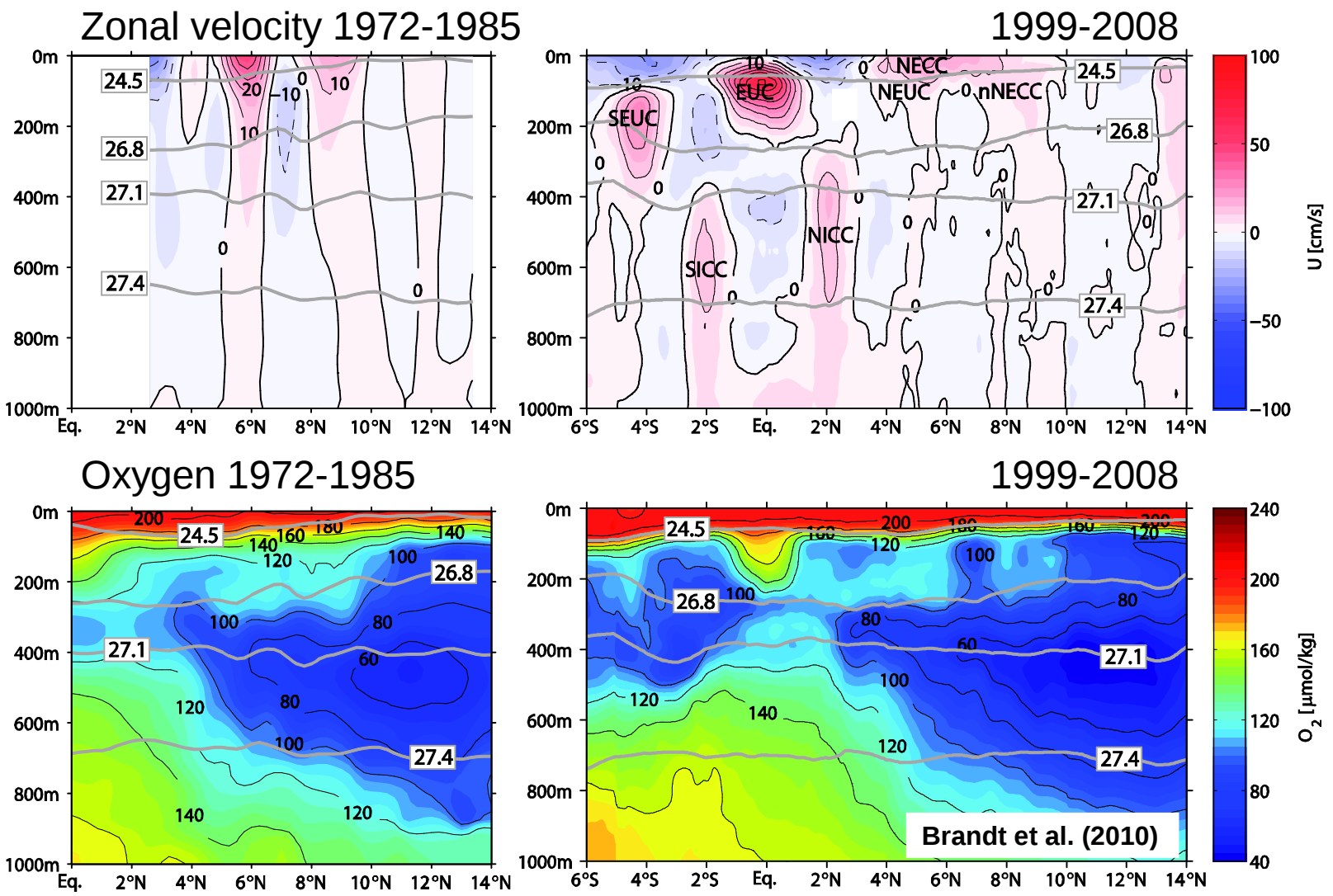
[1]GEOMAR Helmholtz Centre for Ocean Research Kiel, Germany
[2]Christian-Albrechts-Universität zu Kiel, Germany

Introduction:
The oxygen minimum zone in the eastern tropical North Atlantic

SFB 754

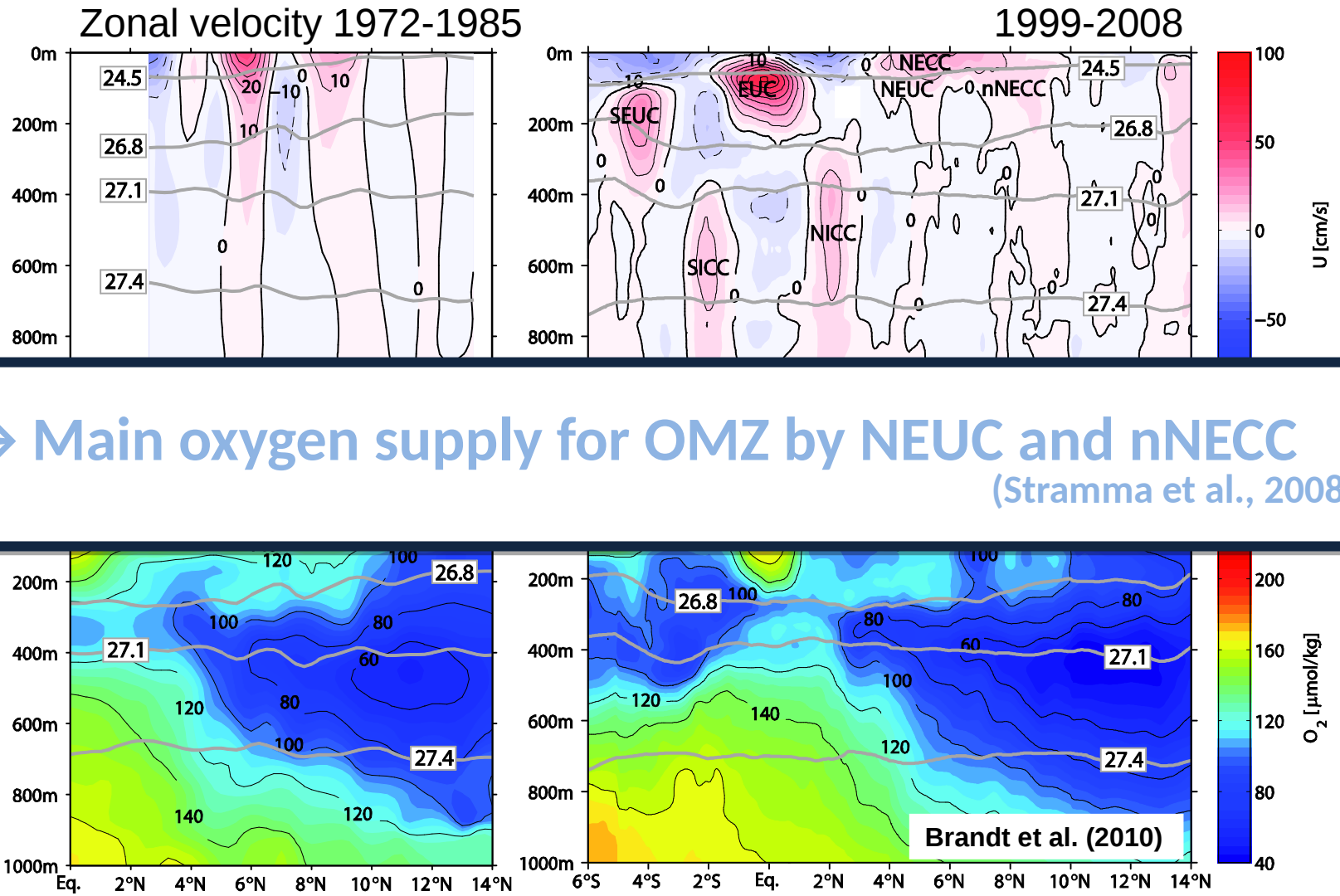
23°W section



Introduction:
The oxygen minimum zone in the eastern tropical North Atlantic

SFB 754

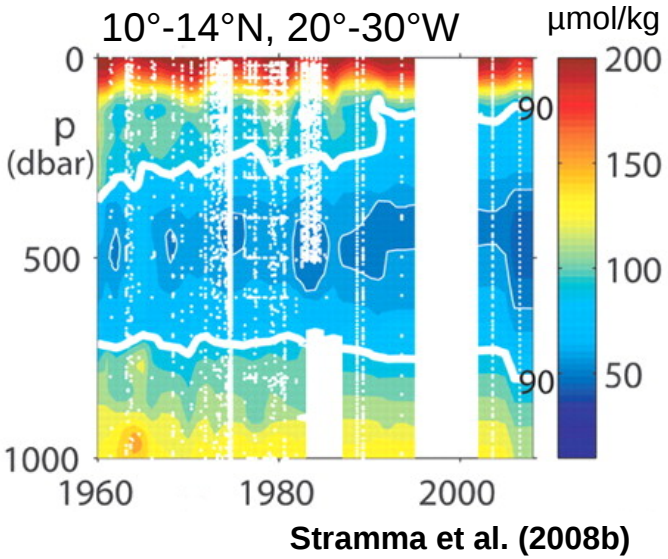
23°W section



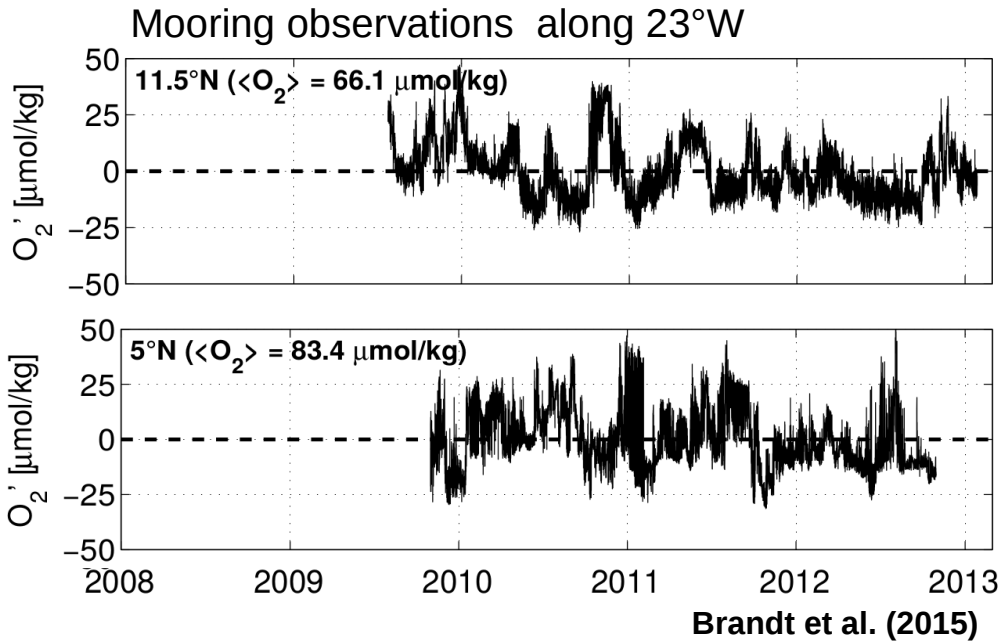
→ Main oxygen supply for OMZ by NEUC and nNECC

(Stramma et al., 2008a)

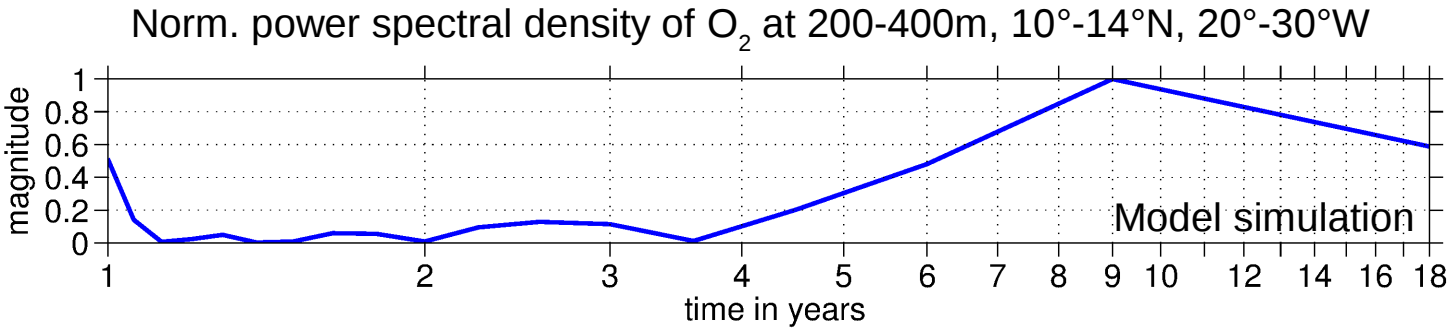
Oxygen variability



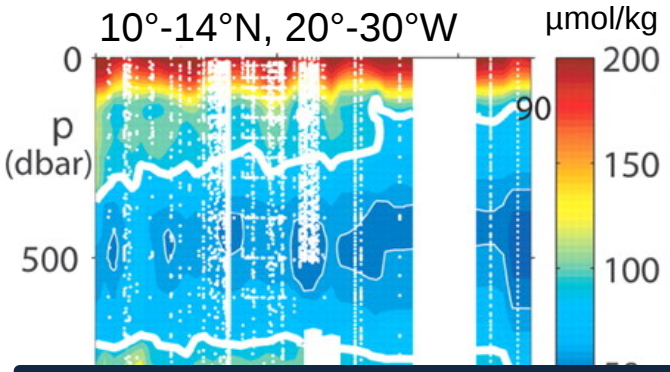
Stramma et al. (2008b)

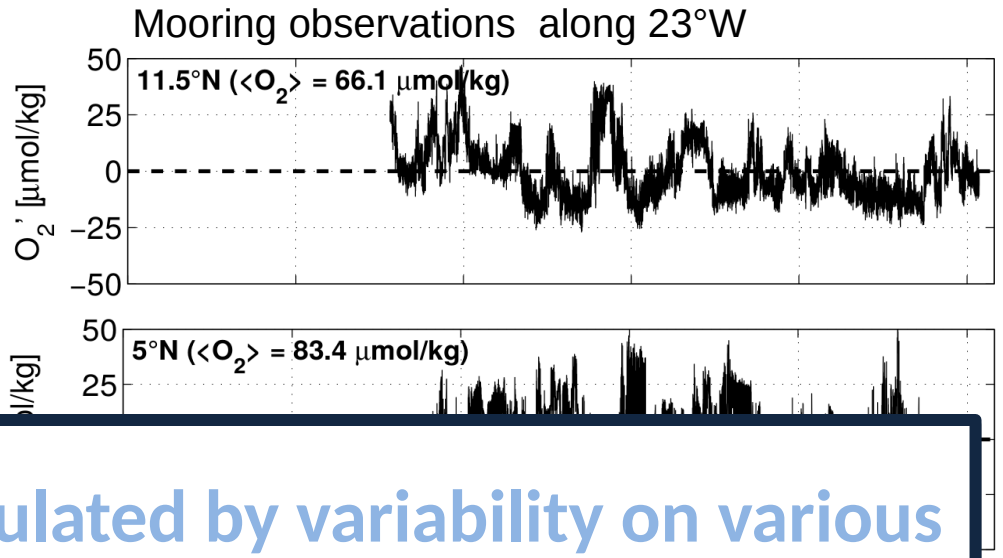


Brandt et al. (2015)

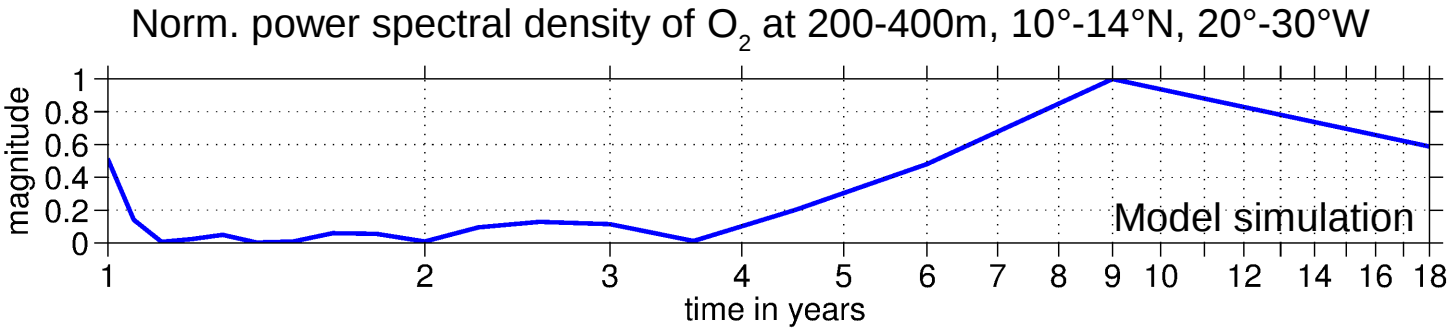


Oxygen variability



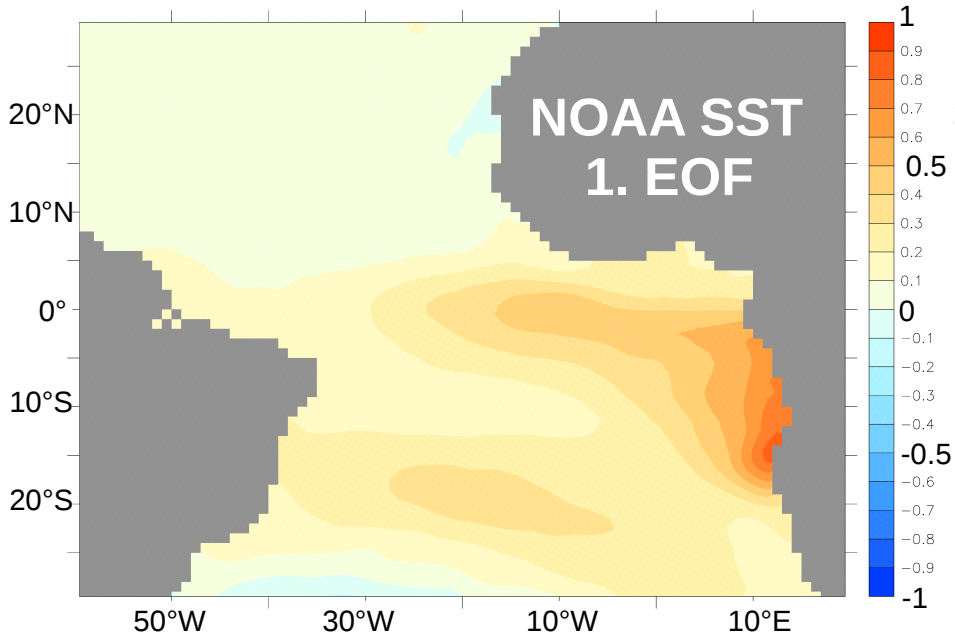


→ Long-term trend modulated by variability on various time scales



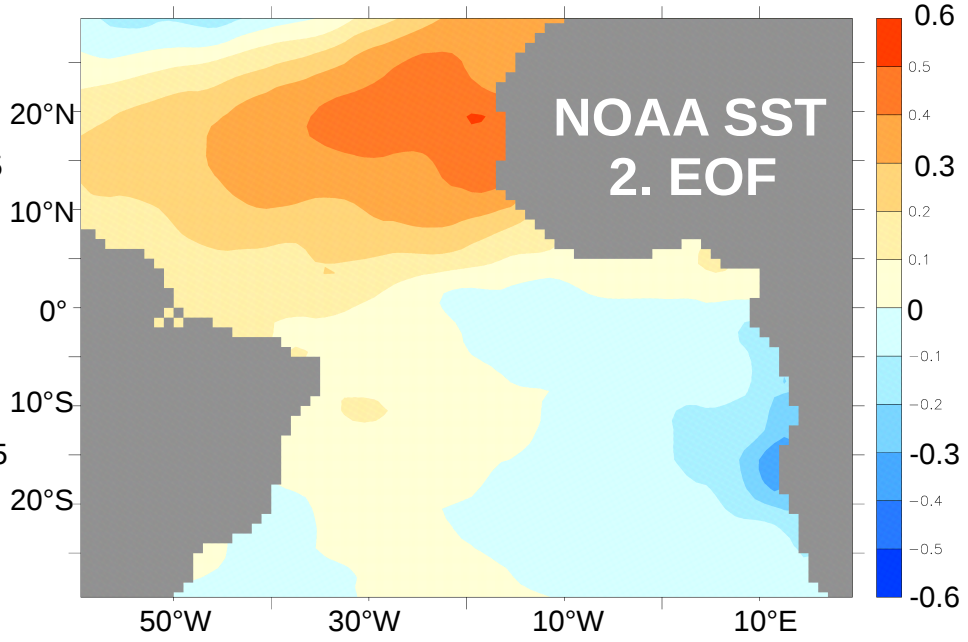
Introduction:
The Atlantic zonal and meridional mode

Atlantic zonal mode (AZM)



- Peaks in June to August
- Interannual time scale
- Mainly governed by ocean dynamics

Atlantic meridional mode (AMM)

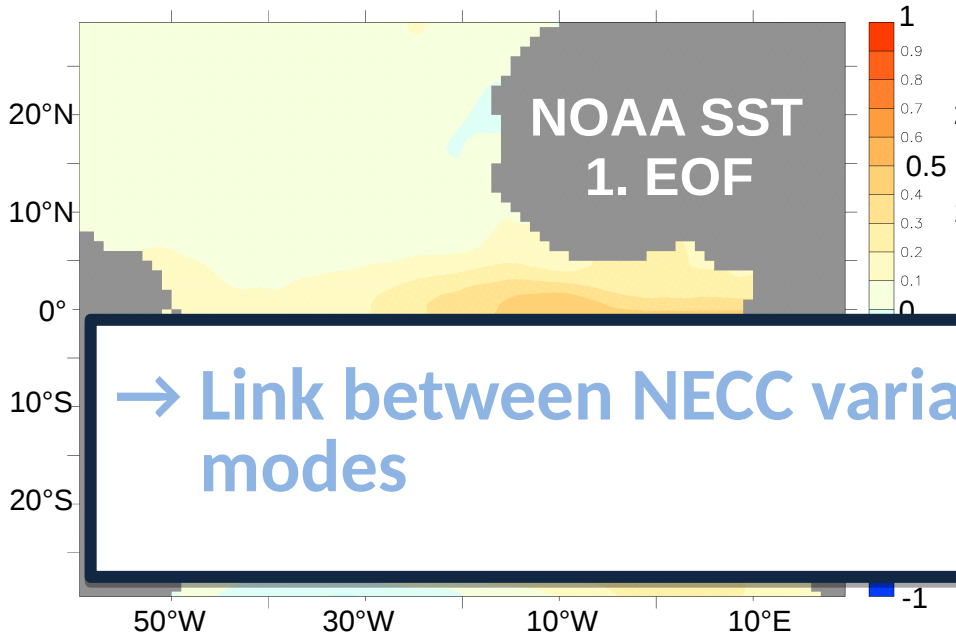


- Peaks in March to May
- Decadal time scale
- Mainly governed by thermodynamics

Introduction:
The Atlantic zonal and meridional mode

SFB 754

Atlantic zonal mode (AZM)



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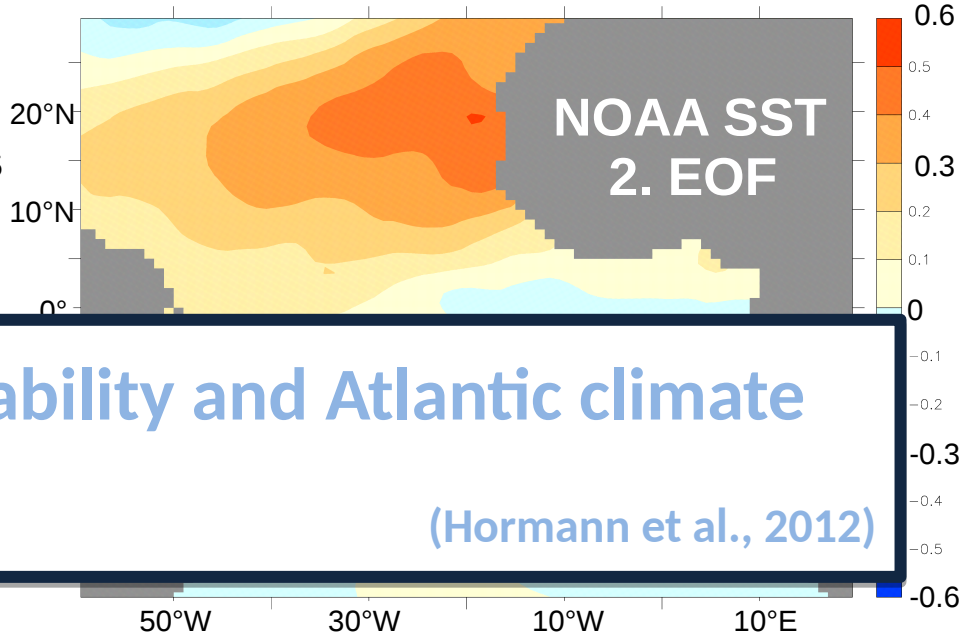
Atlantic meridional mode (AMM)



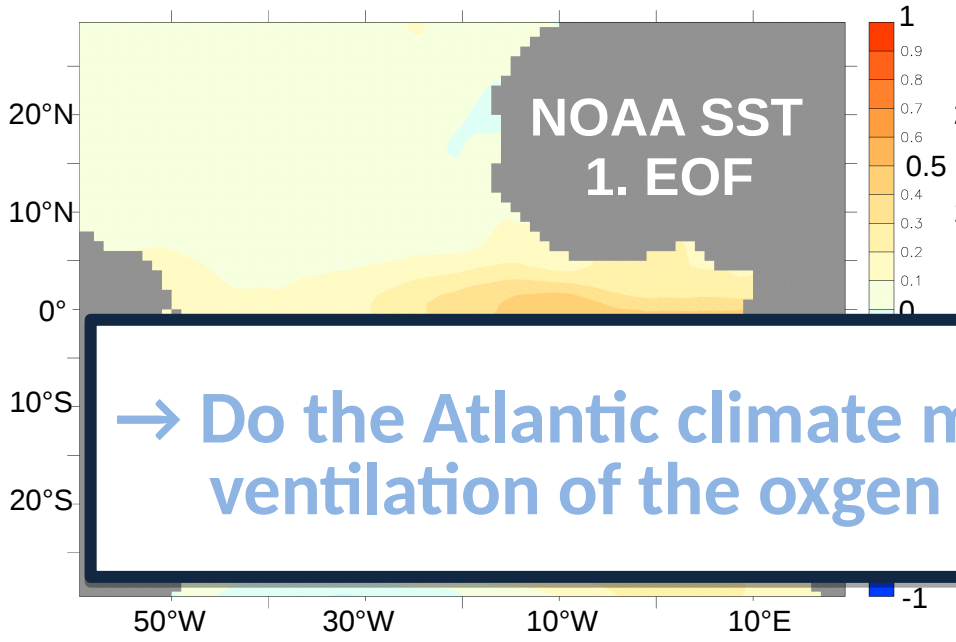
- Peaks in March to May
- Decadal time scale
- Mainly governed by thermodynamics

→ **Link between NECC variability and Atlantic climate modes**

(Hormann et al., 2012)

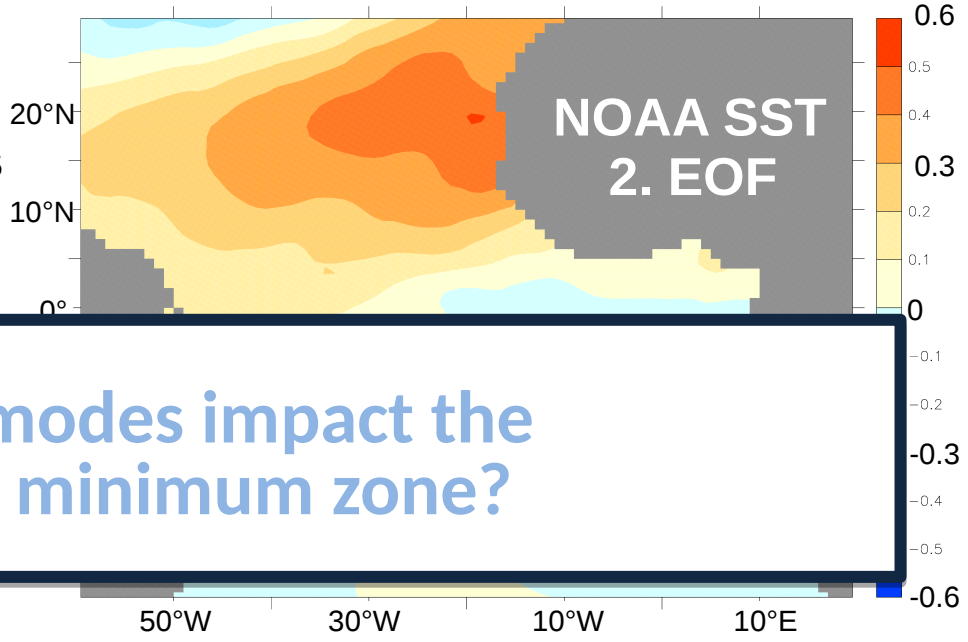
Introduction:
The Atlantic zonal and meridional mode

Atlantic zonal mode (AZM)



- Peaks in June to August
- Interannual time scale
- Goverened mainly by ocean dynamics

Atlantic meridional mode (AMM)

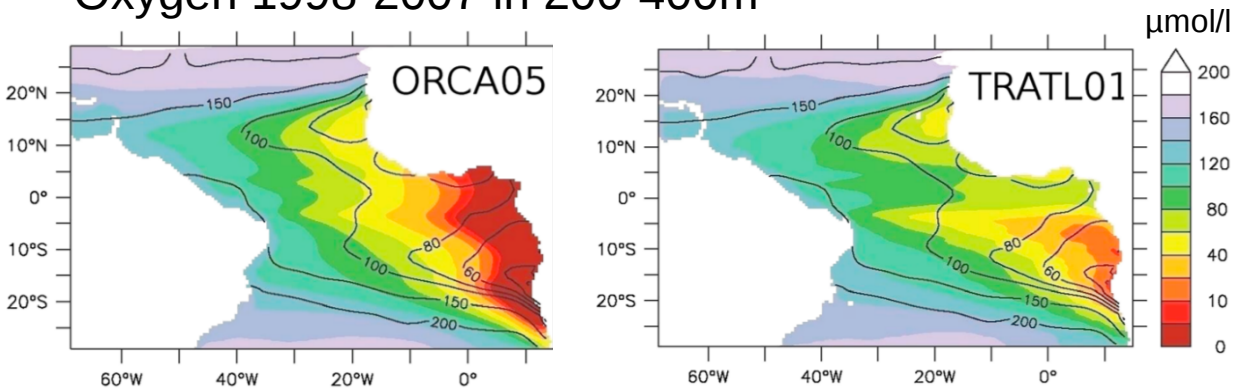


- Peaks in May to March
- Decadal time scale
- Goverened mainly by thermodynamics

→ **Do the Atlantic climate modes impact the ventilation of the oxgen minimum zone?**

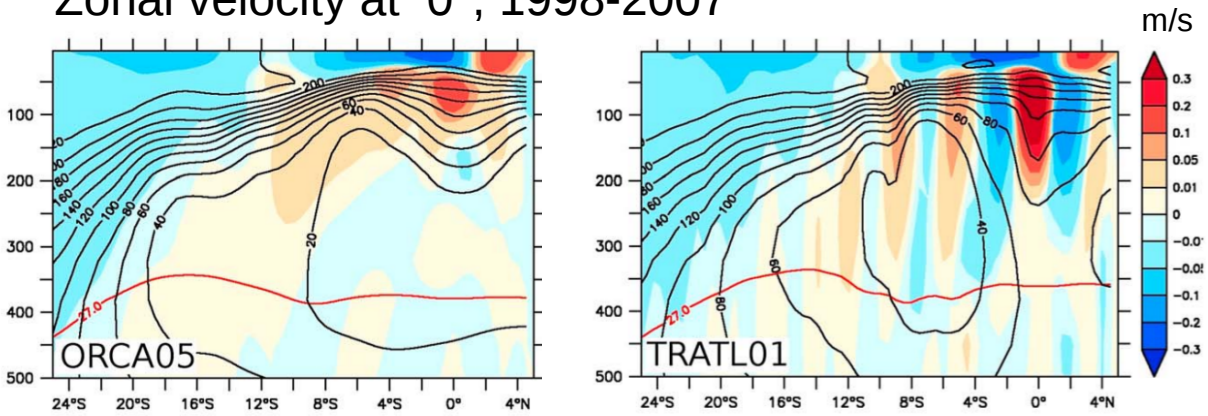
Data:
Model simulations

Oxygen 1998-2007 in 200-400m



Contours: O_2 in µmol/l of World Ocean Atlas

Zonal velocity at 0°, 1998-2007



Black contours: O_2 in µmol/l
Red countour: 27.0 kg/m^3 isopycnals

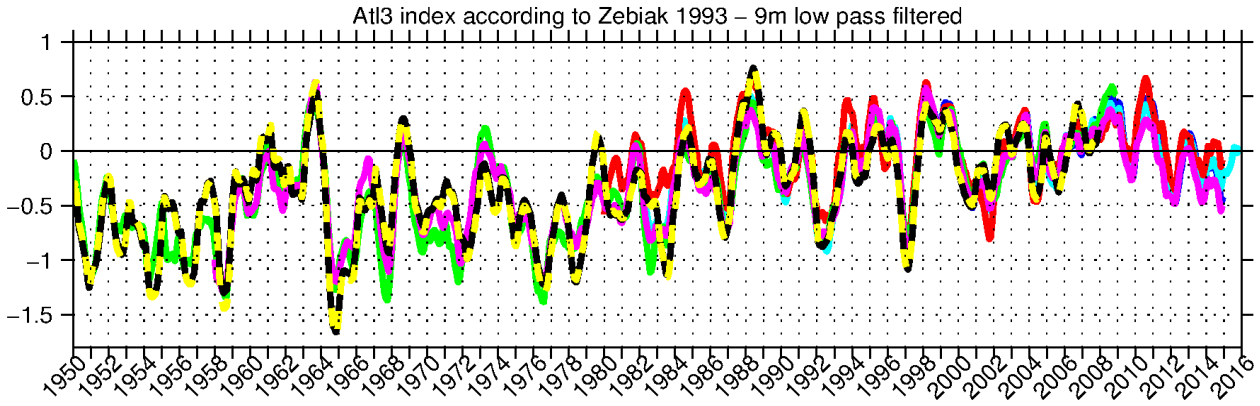
Duteil et al. (2014)

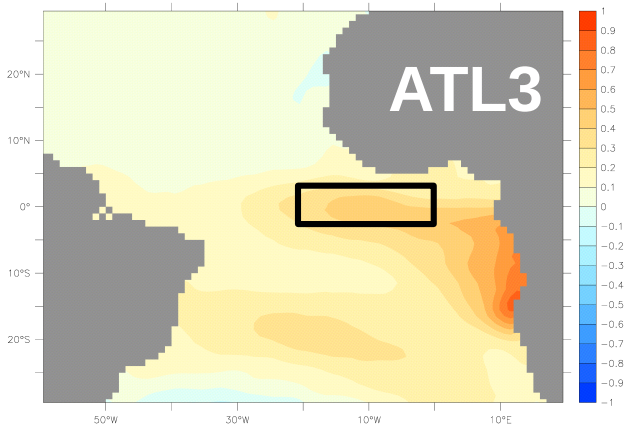
- Biogeochemical model coupled with high resolution (1/10°) nested OGCM TRATL01 from 1958 to 2007 (Duteil et al., 2014)

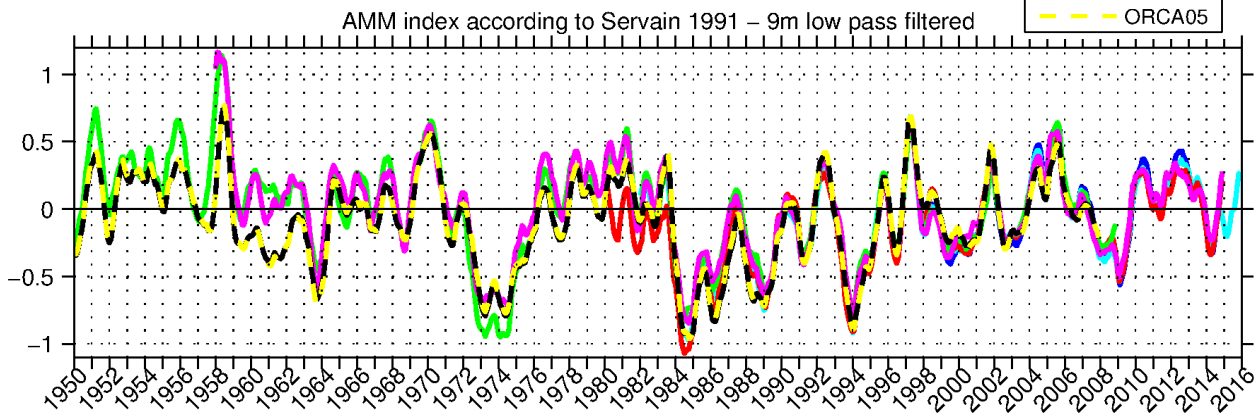
in combination with

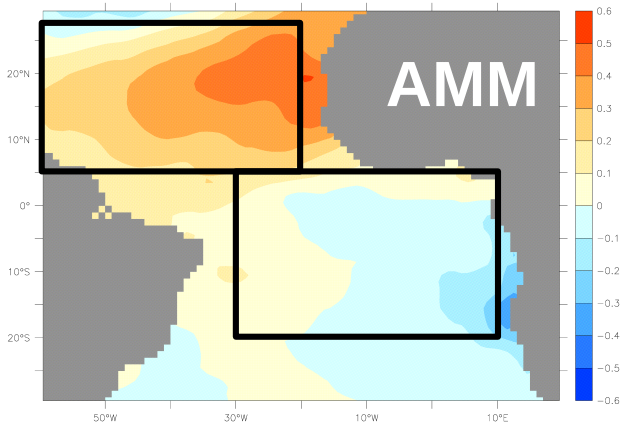
- Observational data (ship sections, moorings, satellite data)
- Reanalysis data (NOAA, GODAS, SODA, ORAS4)

Results:
Indices of the Atlantic climate modes



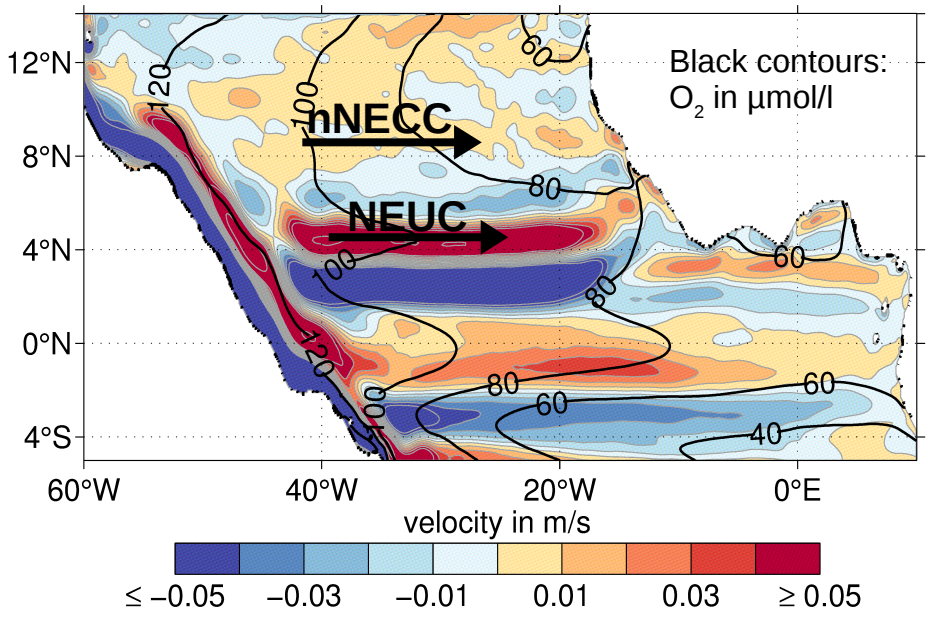




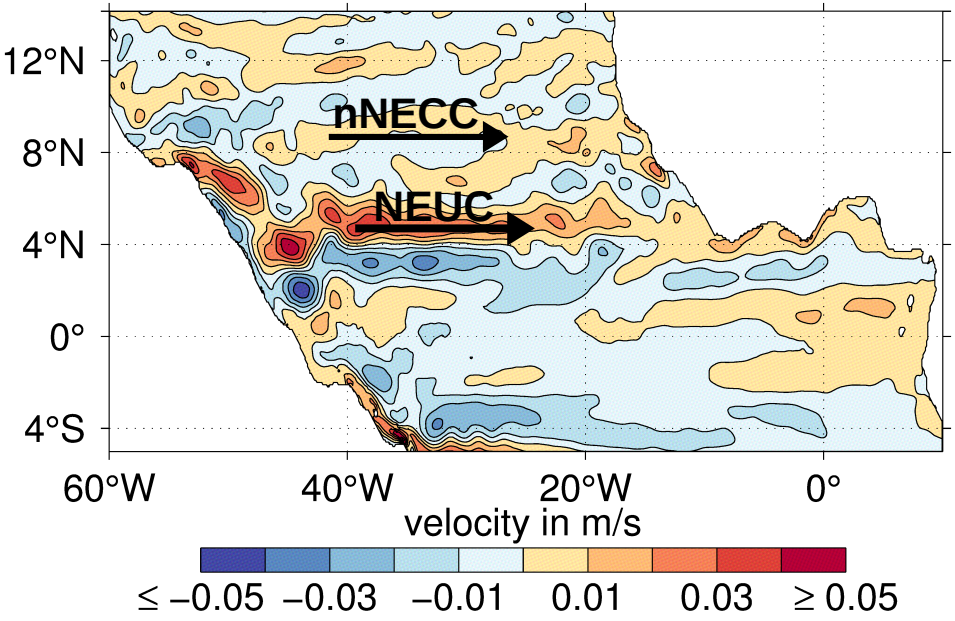


Oxygen and zonal velocity at 200-400m

Total mean 1998-2007



Positve minus negative AZM events



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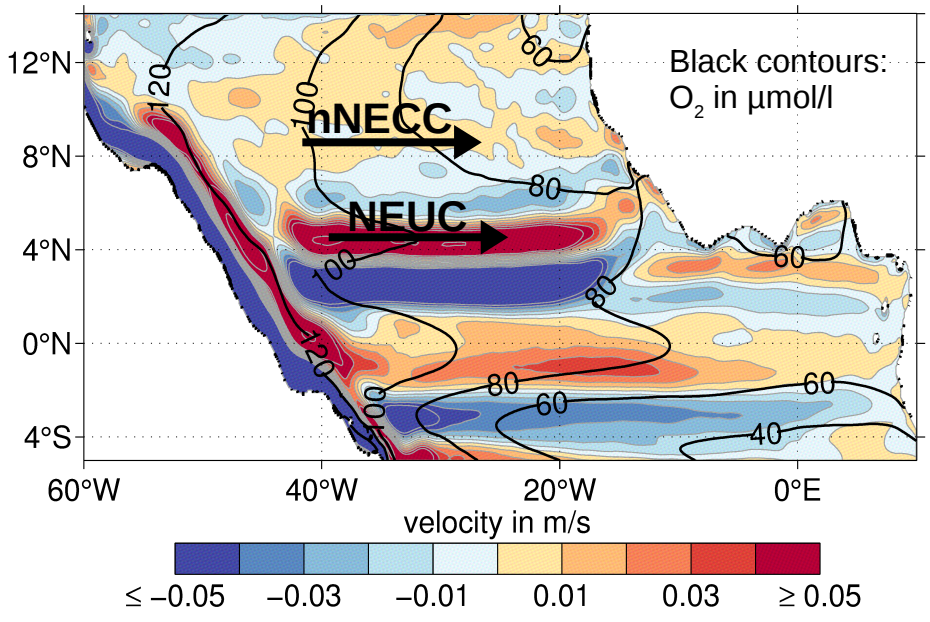

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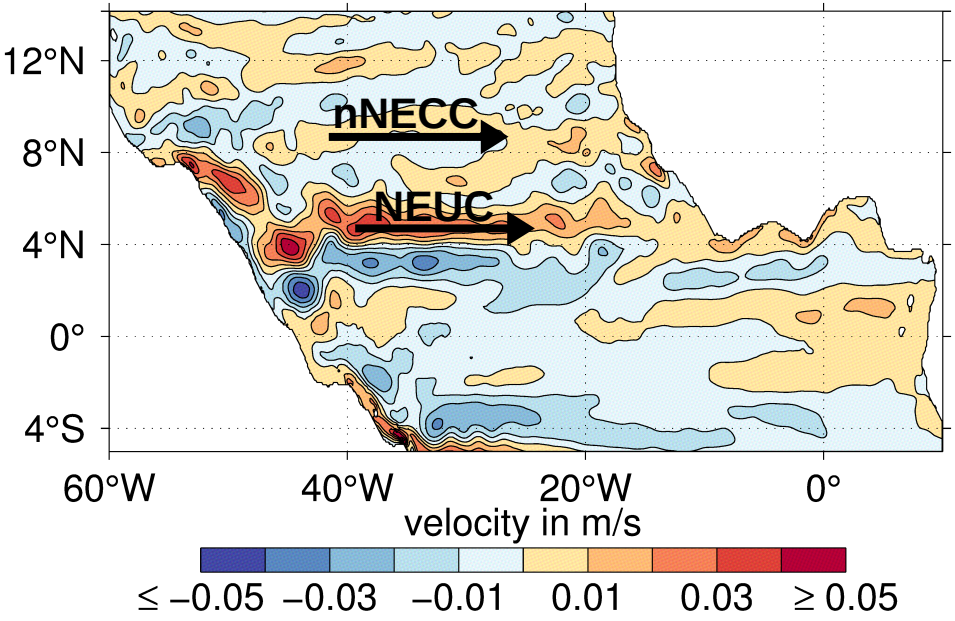
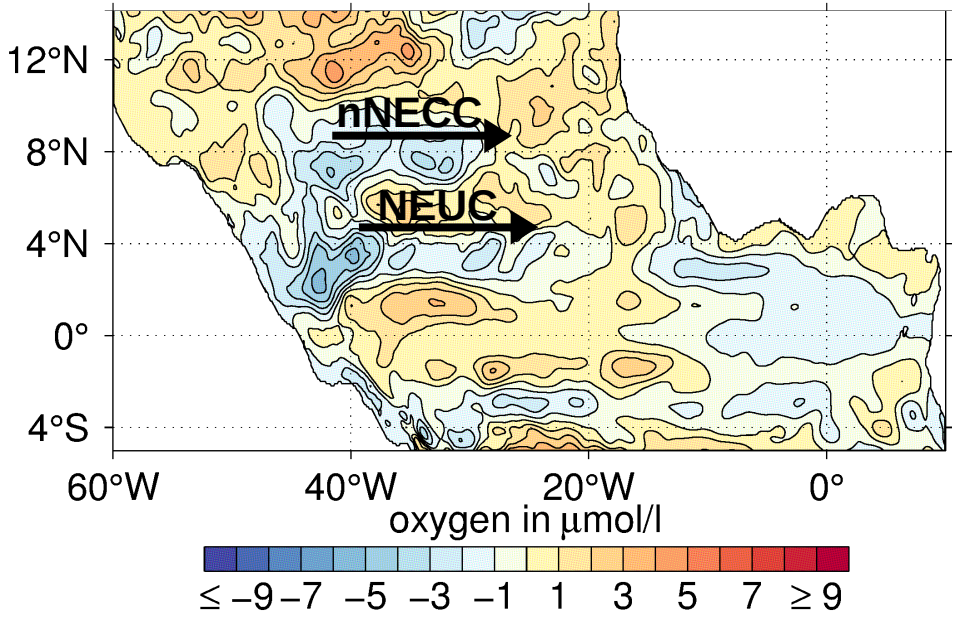
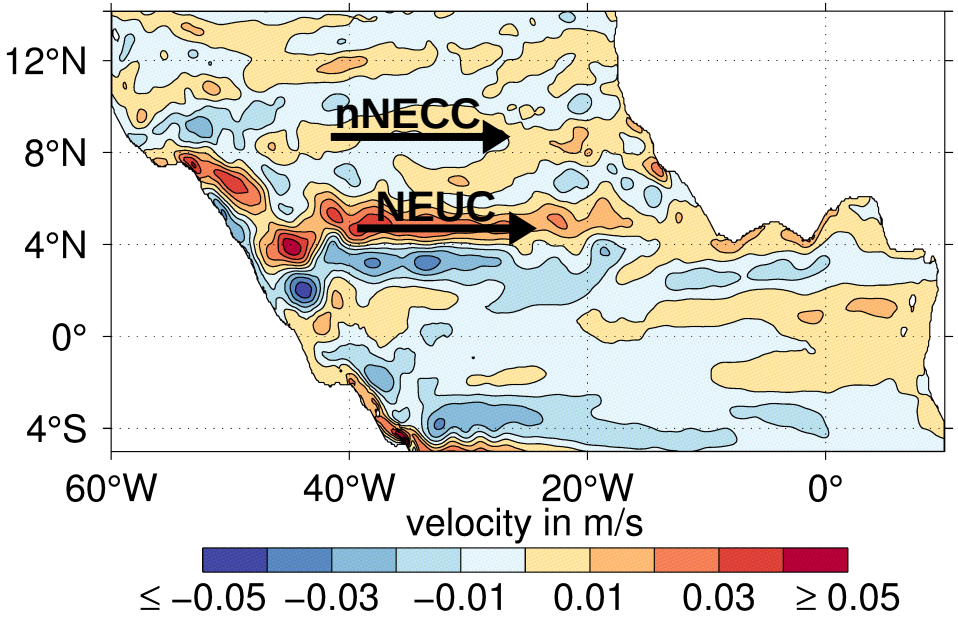


→ Stronger eastward flow at 4°N during positive AZM events compared to negative AZM events

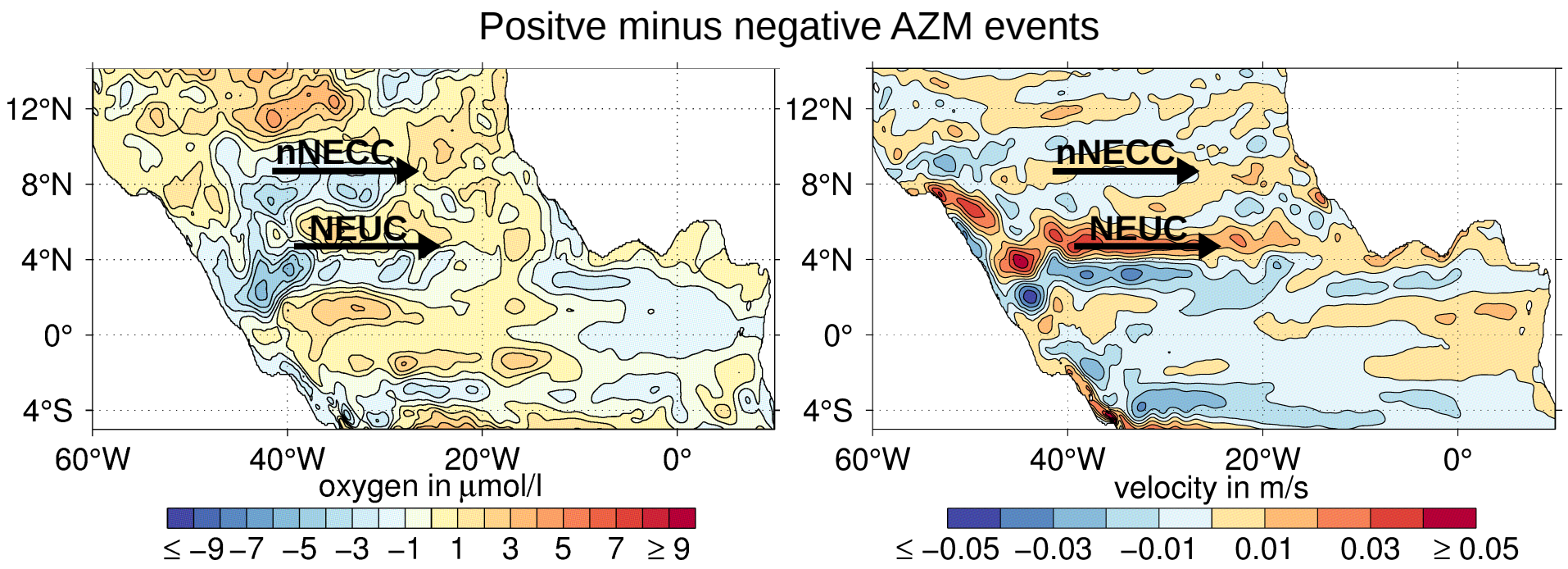
Oxygen and zonal velocity at 200-400m

Positve minus negative AZM events





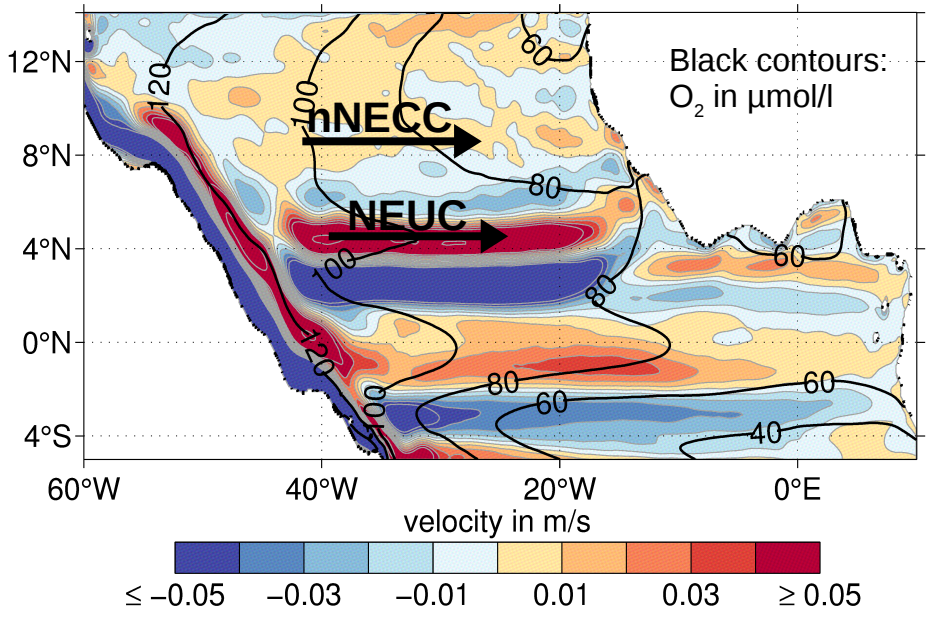
Oxygen and zonal velocity at 200-400m



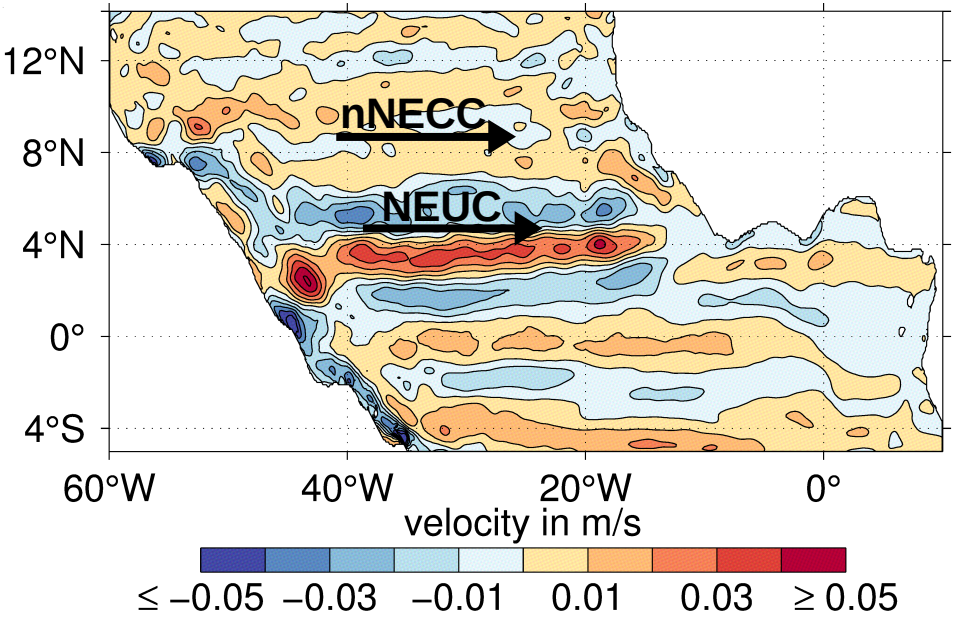
→ Positive velocity anomalies associated with positive oxygen anomalies and vice versa

Oxygen and zonal velocity at 200-400m

Total mean 1998-2007

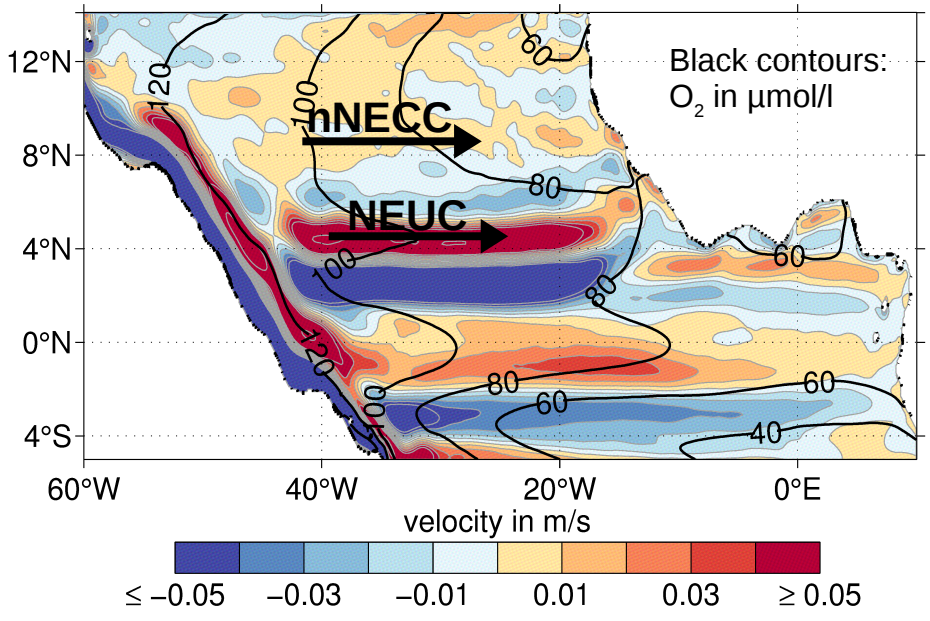


Positve minus negative AMM events

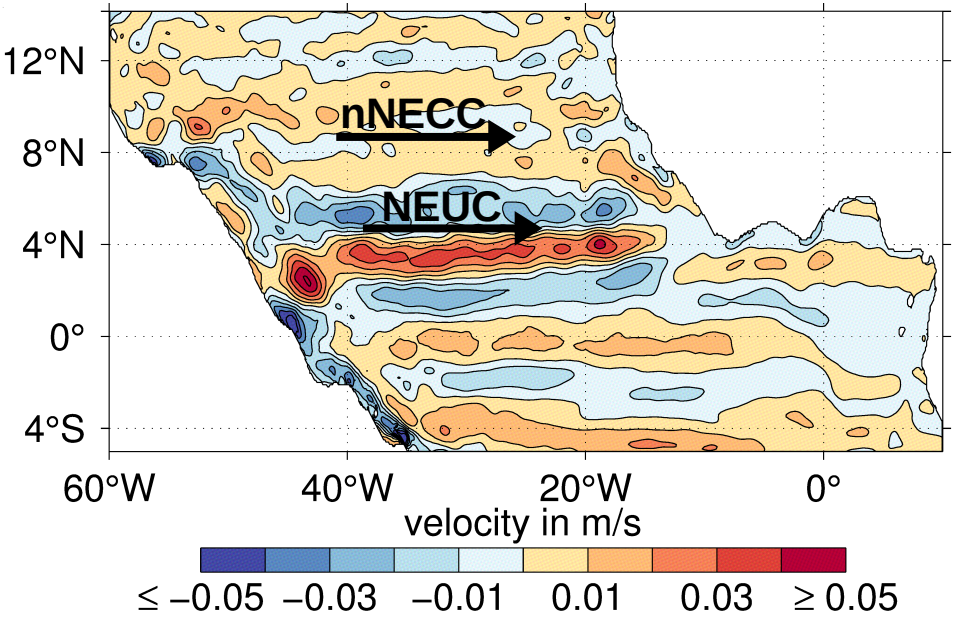


Oxygen and zonal velocity at 200-400m

Total mean 1998-2007

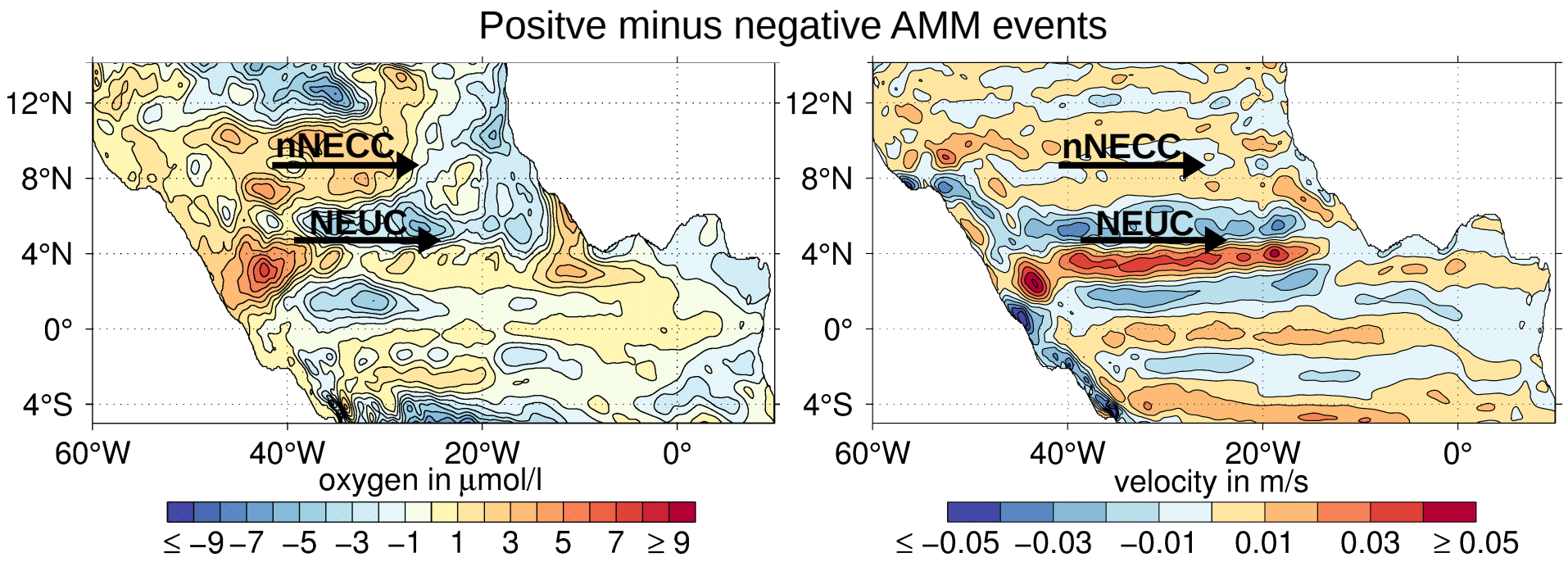


Positve minus negative AMM events

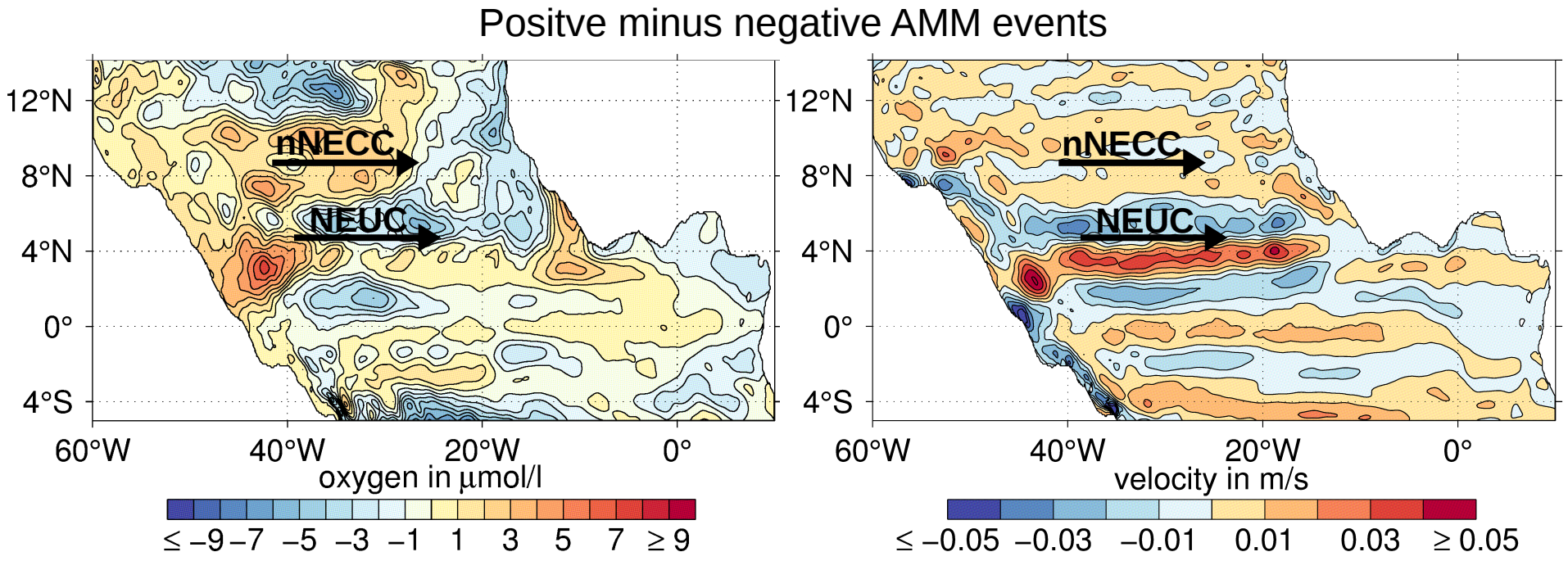


→ Northward shift of estward flow at 4°N during negative AMM events compared to positive AMM events

Oxygen and zonal velocity at 200-400m



Oxygen and zonal velocity at 200-400m



→ Negative velocity anomalies associated with negative oxygen anomalies and vice versa

→ Link between oxygen and zonal current variability partly modulated by the Atlantic zonal and meridional mode

Outlook

- Compare to observational and reanalysis data
- Estimate core position and intensity of zonal current bands according to Johnson et al. (2002) and Hsin and Qiu (2012)
- Extend model simulation until 2016

Results:
Indices of the Atlantic climate modes