AMOC response to changing resolution in the Finite-volumE Sea ice–Ocean Model

D. Sidorenko[1], S. Danilov[1,2,3], V. Fofonova[1], W. Cabos[4], N. Koldunov[1,5], P. Scholz[1], D. Sein[1,6], Q. Wang[1]

[1]Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Bremerhaven, Germany.
[2]Department of Mathematics and Logistics, Jacobs University, Bremen, Germany.
[3]A. M. Obukhov Institute of Atmospheric Physics Russian Academy of Science, Moscow, Russia.
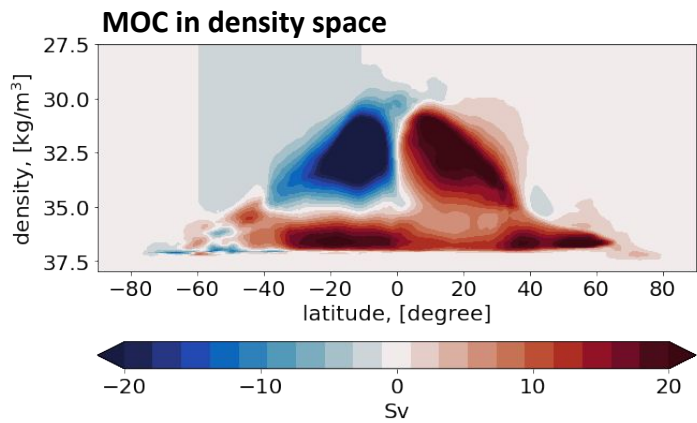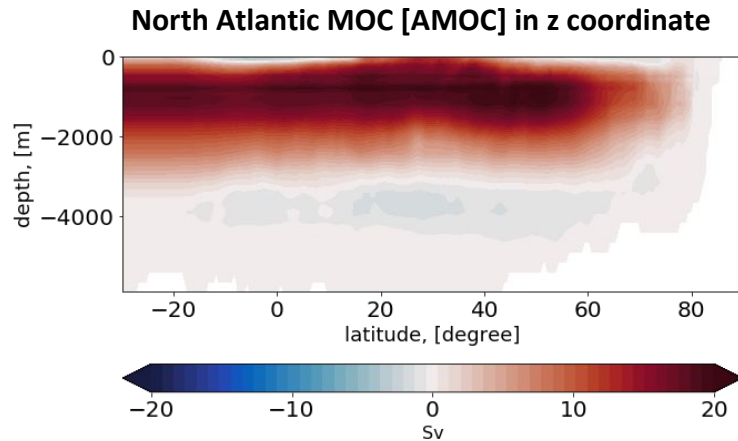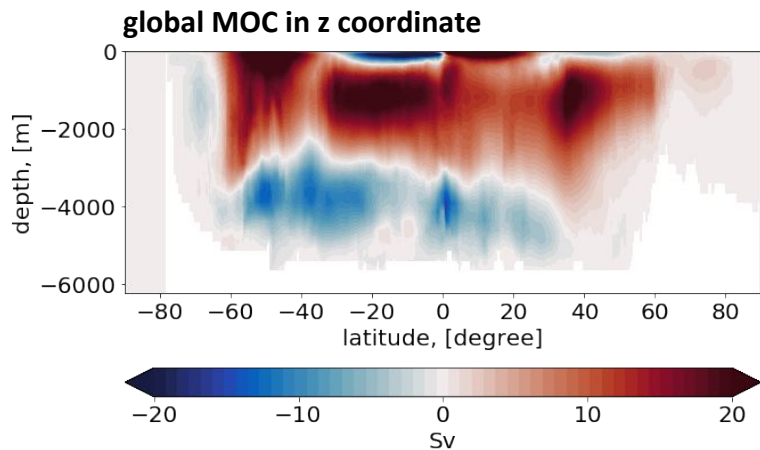[4]Department of Physics and Mathematics, University of Alcala, Alcala, Spain
[5]MARUM—Center for Marine Environmental Sciences, Bremen,Germany.
[6]Shirshov Institute of Oceanology, Russian Academy of Science, Moscow, Russia.

Corresponding author: Dmitry Sidorenko (Dmitry.Sidorenko@awi.de)

Desired Diagnostics

global MOC in z coordinate

North Atlantic MOC [AMOC] in z coordinate

MOC in density space

Simple algorithms to compute meridional overturning and barotropic streamfunction on unstructured meshes

Dmitry Sidorenko[1], Sergey Danilov[1,2,3], Nikolay Koldunov[1,4], Patrick Scholz[1], and Qiang Wang[1]

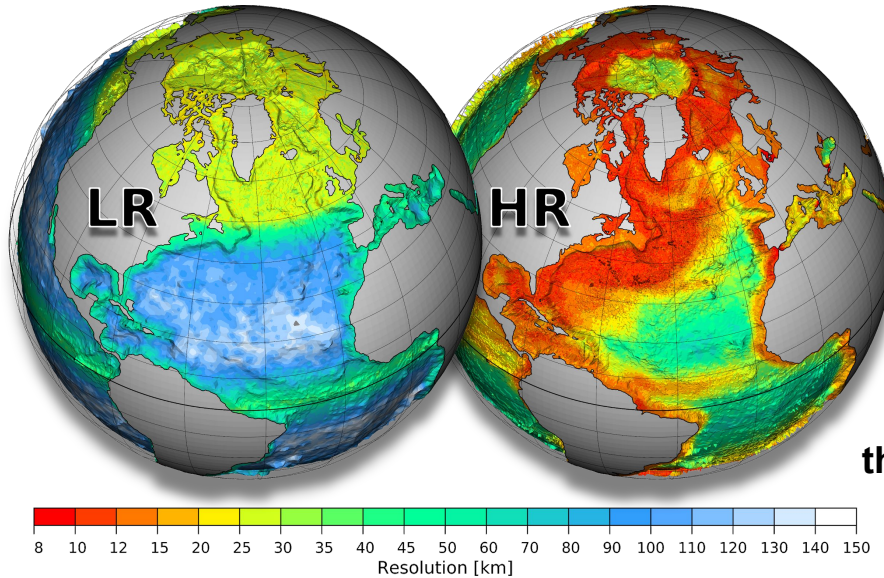[1]Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany
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Correspondence: D. Sidorenko (dmitry.sidorenko@awi.de)
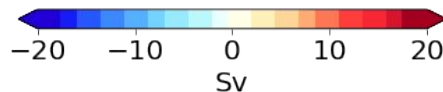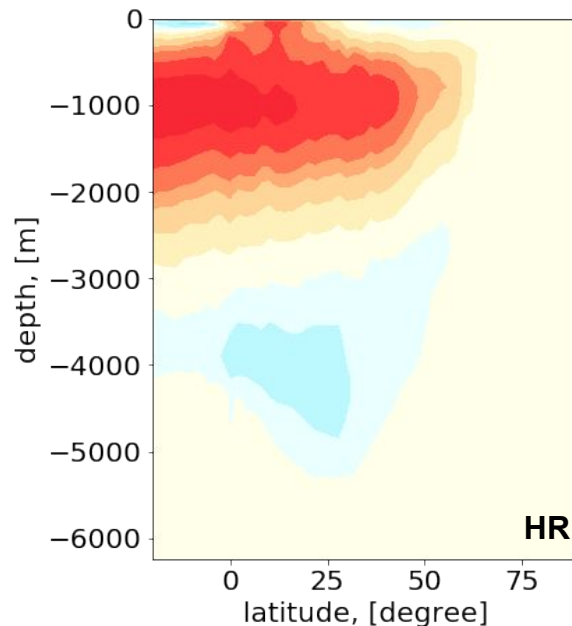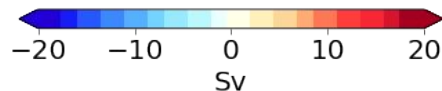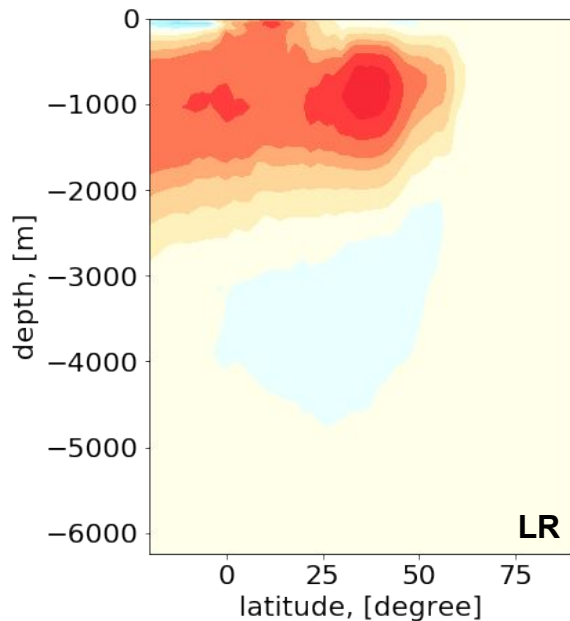
model runs

thanks to Patrick ;)

Resolution in the **LR** and **HR** ocean meshes. The number of surface vertices is 126,858 in **LR** and 1,306,775 in **HR**.
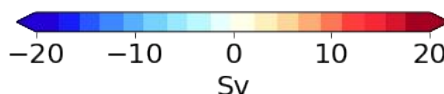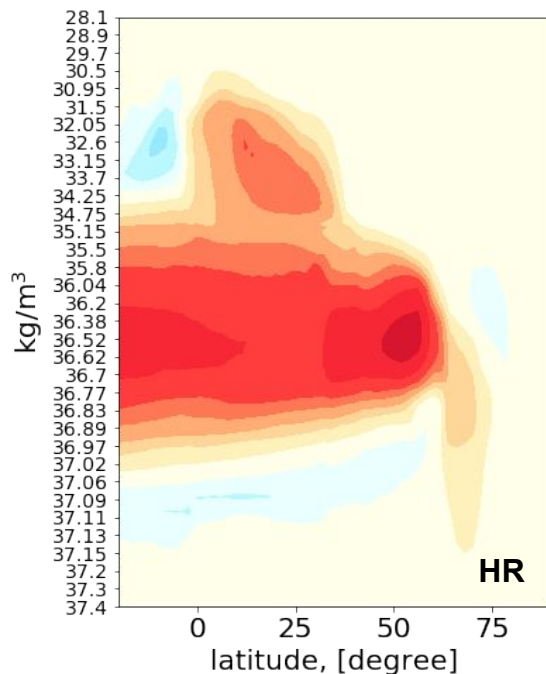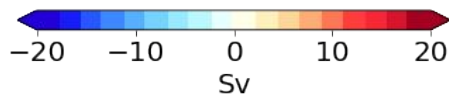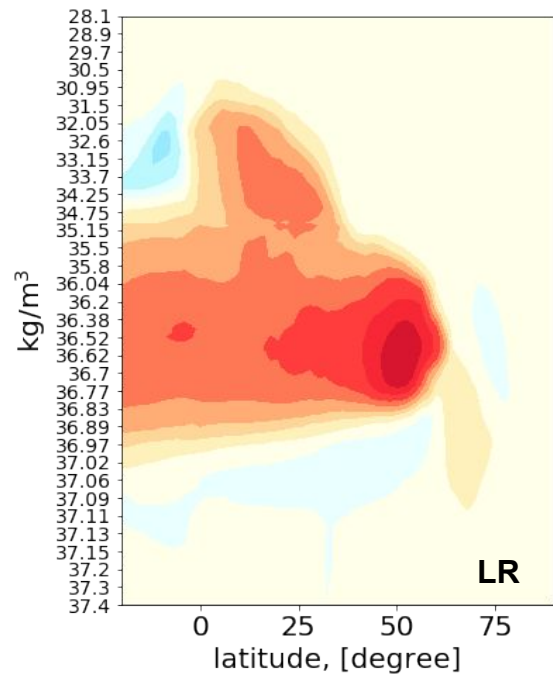- CORE-II interannual atmospheric forcing
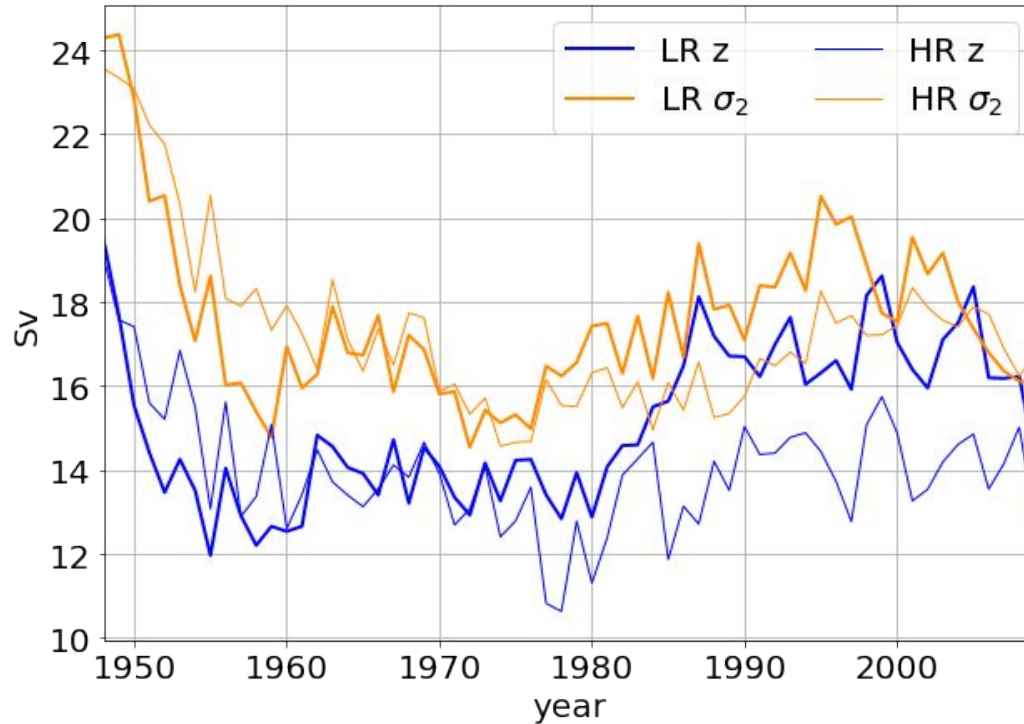- time-averaged over 1960-2008

AMOC (z coordinate)

1. **the AMOC recirculation at 1000m is more expressed in LR (south of 40°N)**
2. **middepth cell in HR mesh is larger than in LR**
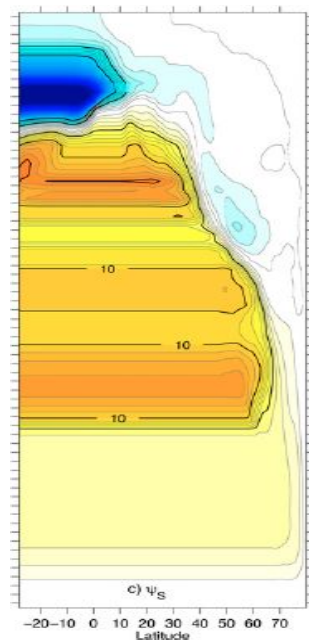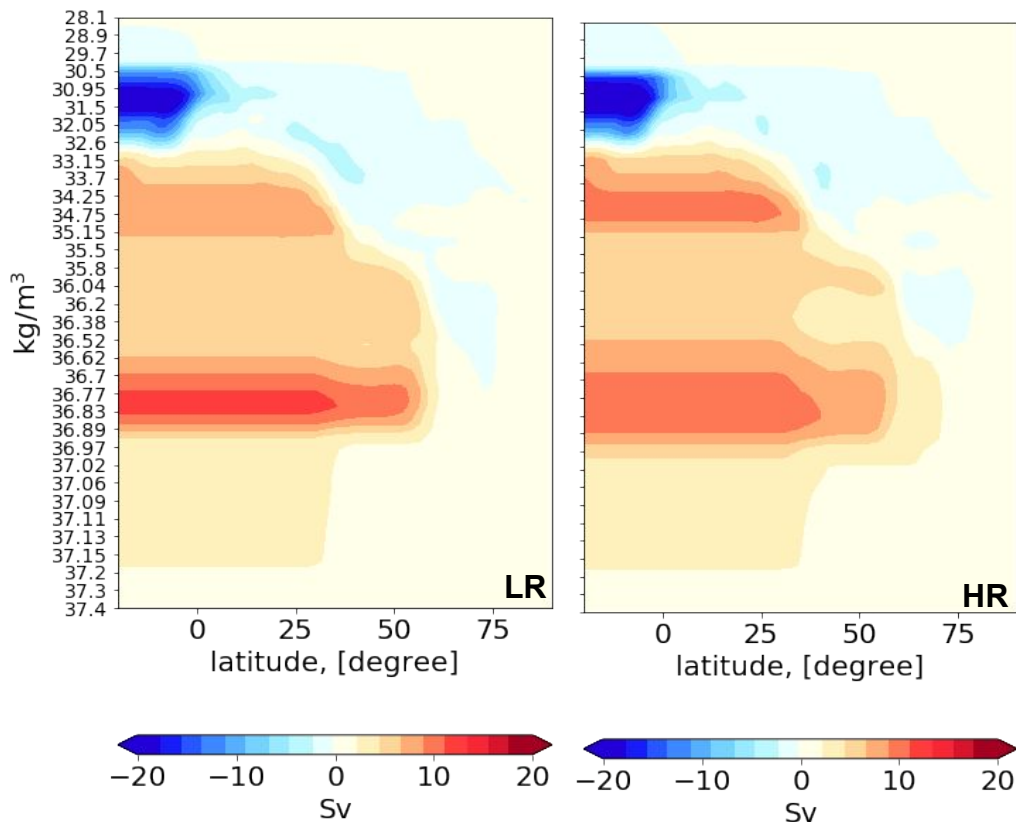
AMOC (σ_2 coordinate)

1. same messages as above but for σ_2=36.62
2. AMOC maximum is shifted to 50°N (where it should be) as compared to z representation

AMOC maximum (from 45°N to 50°N)

1. no 100% correlation between z and σ_2 representations
2. maximum of AMOC in HR is lower than in LR
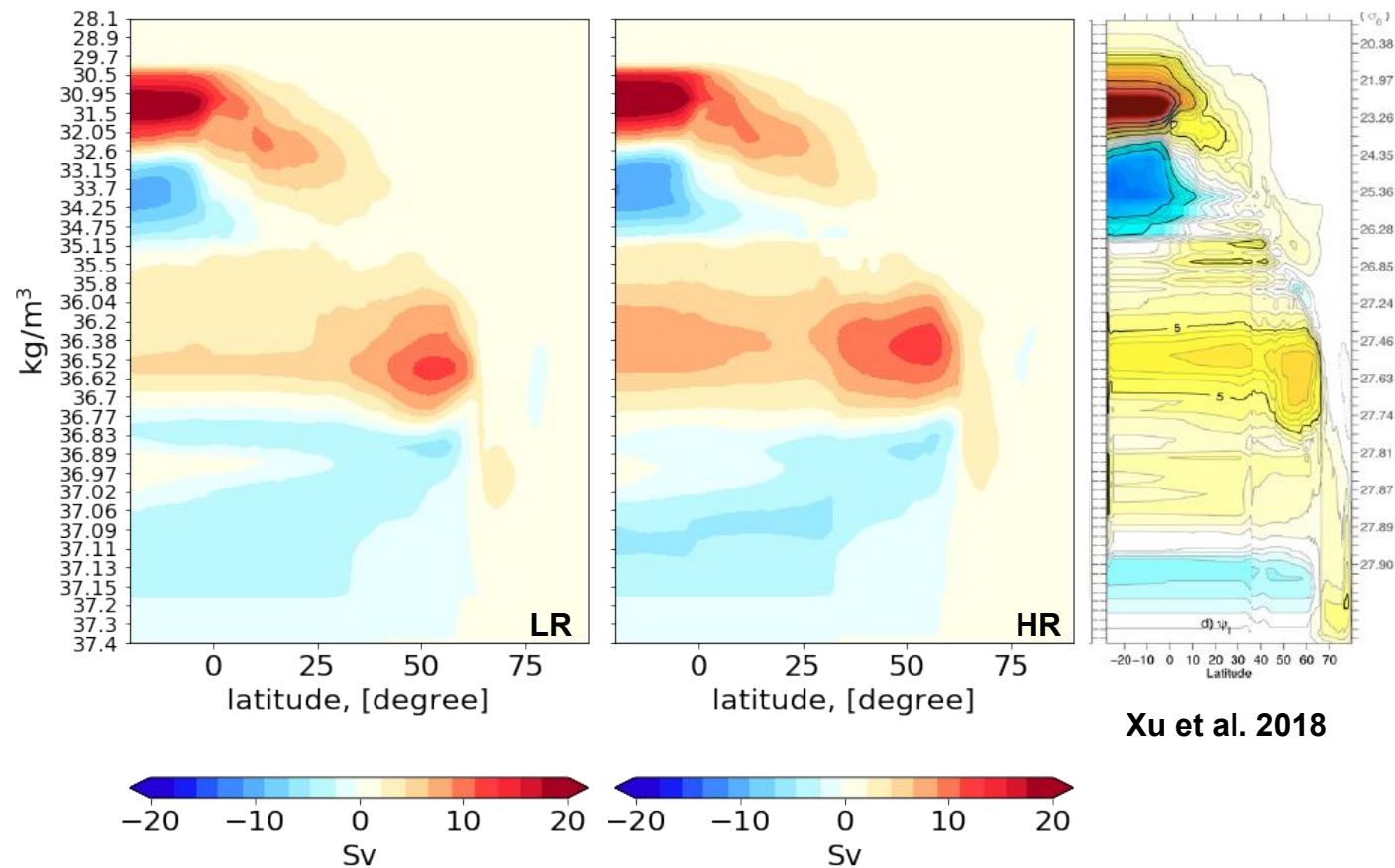
surface buoyancy forced transformations

LR

HR

Xu et al. 2018

characterizes ventilation and positions of outcrops!

result om HR mesh is closer to that in Xu et at. 2018!

interior mixing induced transformations

continuously stronger middepth cell in HR is the result of the interior dynamics (not surface buoyancy forcing)
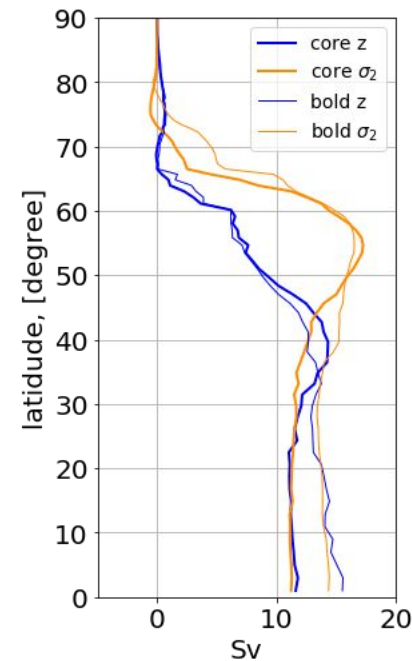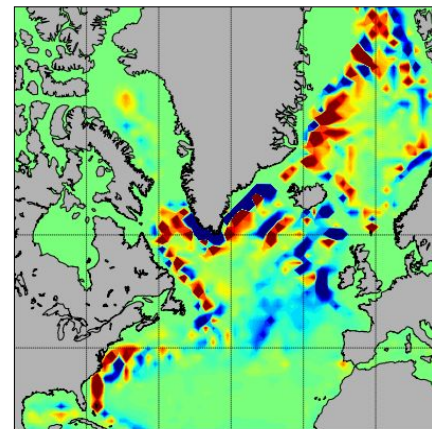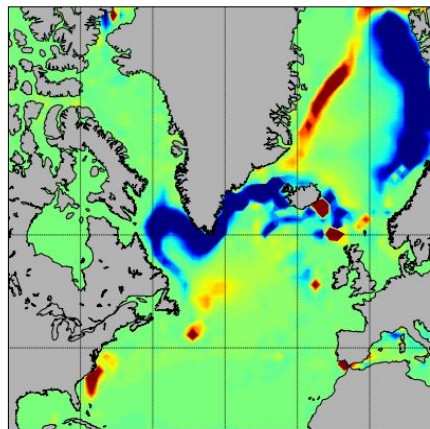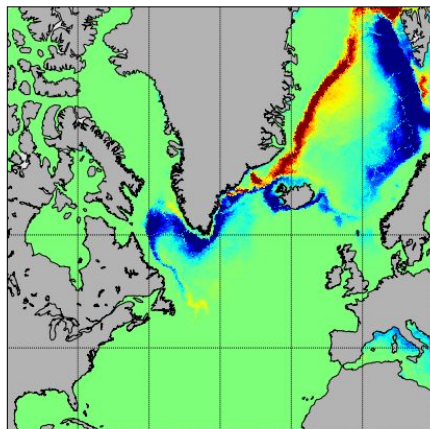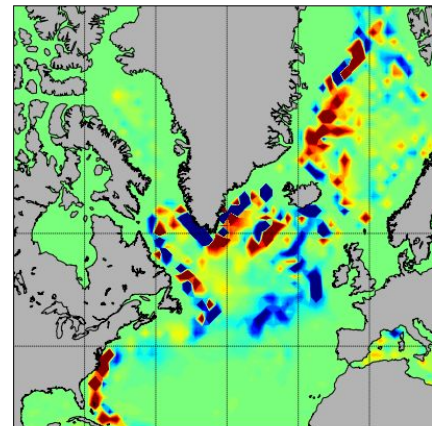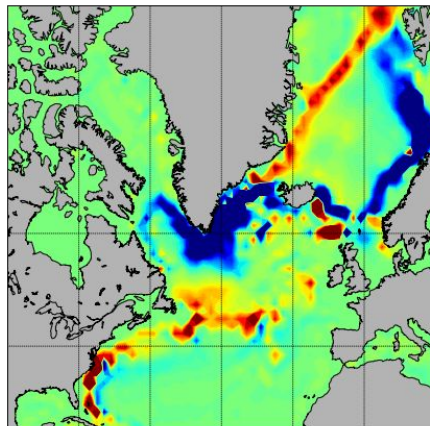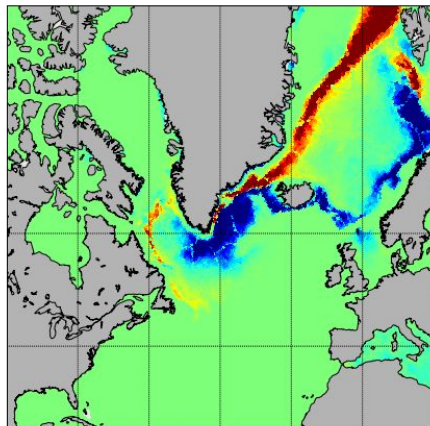
Xu et al. 2018

where and how is the AMOC formed?

buoyancy force (σ_2=36.62)   diapycnal velocity (σ_2=36.62)   vertical velocity (z=1000m)

−0.000005   0.000000   0.000005

2° x 2° binning is used for velocities!

1. **AMOC in σ_2 is formed in: (1) South of Greenland and (2) in the Norwegian Sea. It is primarily boyancy forced!**

2. **AMOC in z is formed in: (1) South of Greenland, (2) Newfoundland, (3) along the route of the North Atlantic Current and in (2) the North East Atlantic. The recirculation (upwelling) is found at Cape Hatteras. This explains the soutern shift of it's maximum as compared to σ_2 representation!**

3. **Surface transformations show nothing south of Grand Banks means the diapycnal velocities we see in the GS separation/extension area are purely internal, i.e. related to model diffusivities; they are much smaller in HR, which can be attributed to finer mesh (and reduced dissipation).**