# Impact of projected amplification of Antarctic meltwater on Antarctic Bottom Water formation

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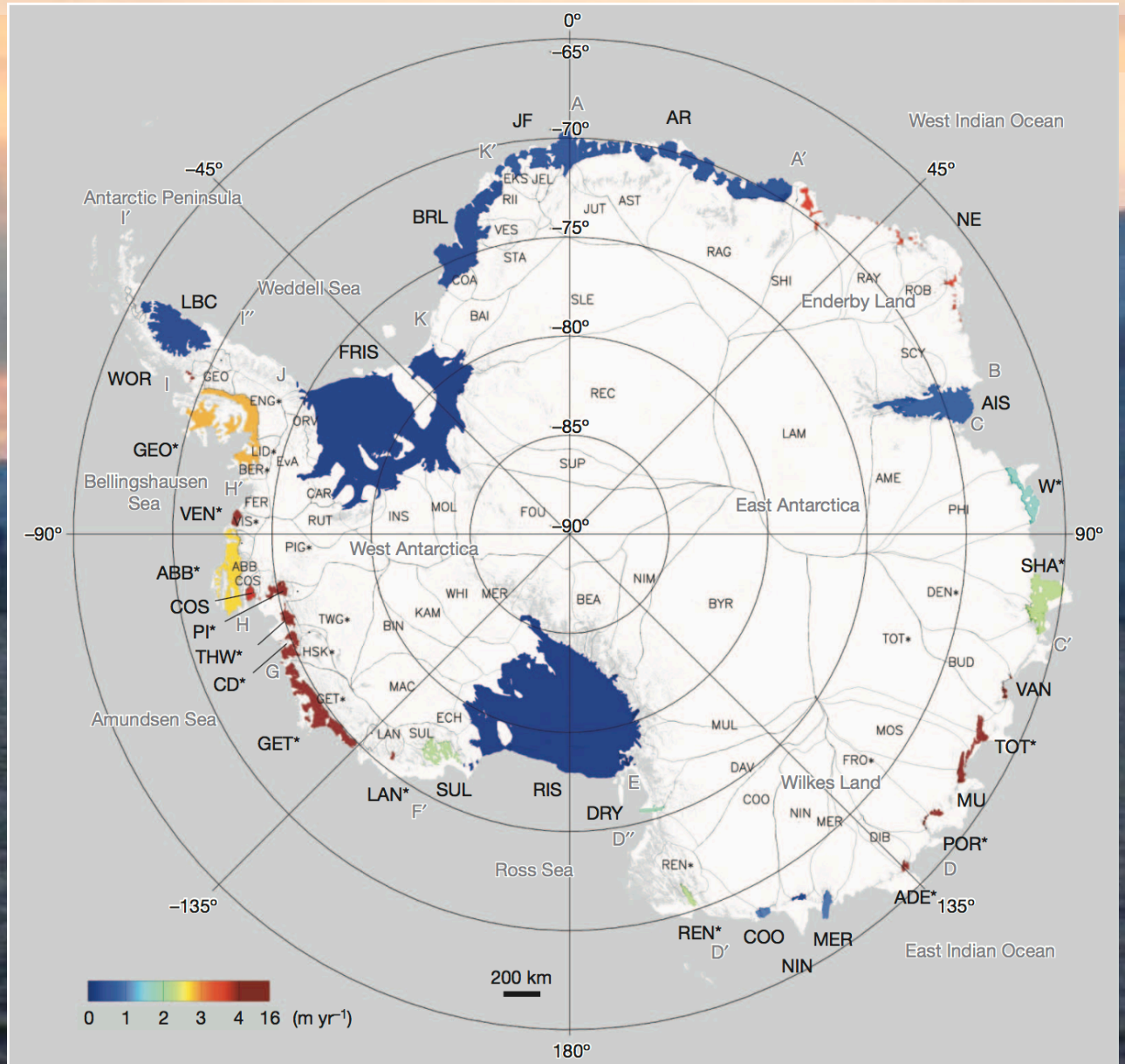
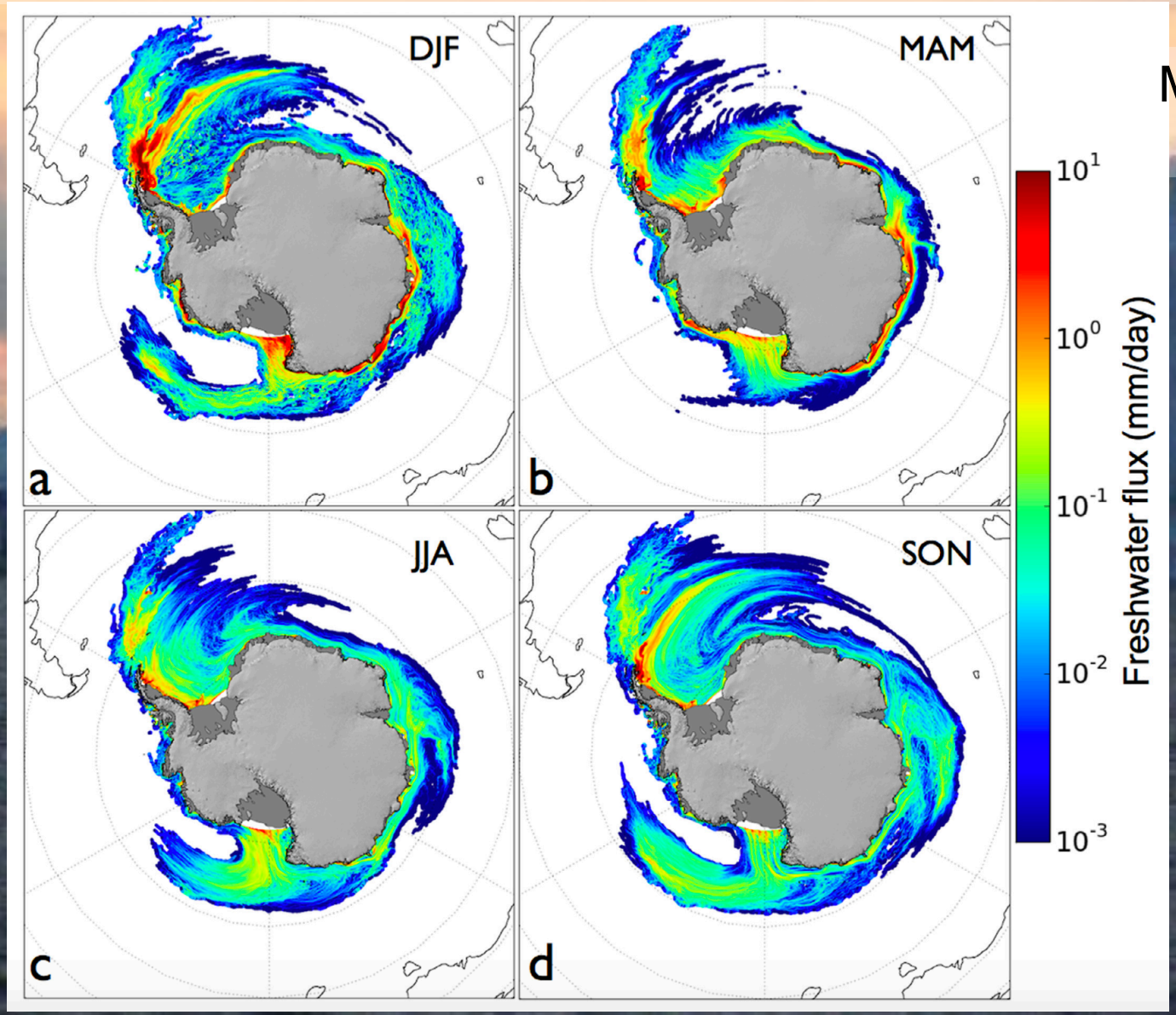
# Freshwater input distribution around Antarctica



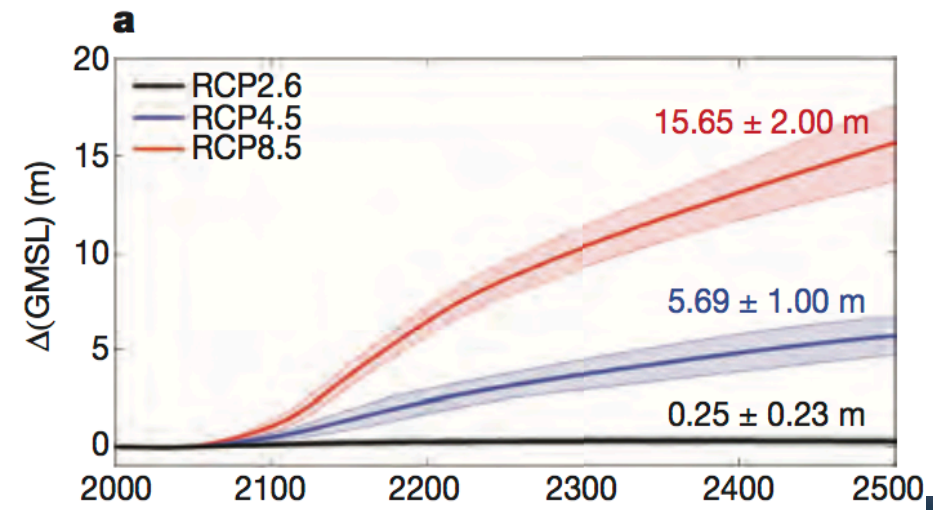

Depoorter et al. (2013)

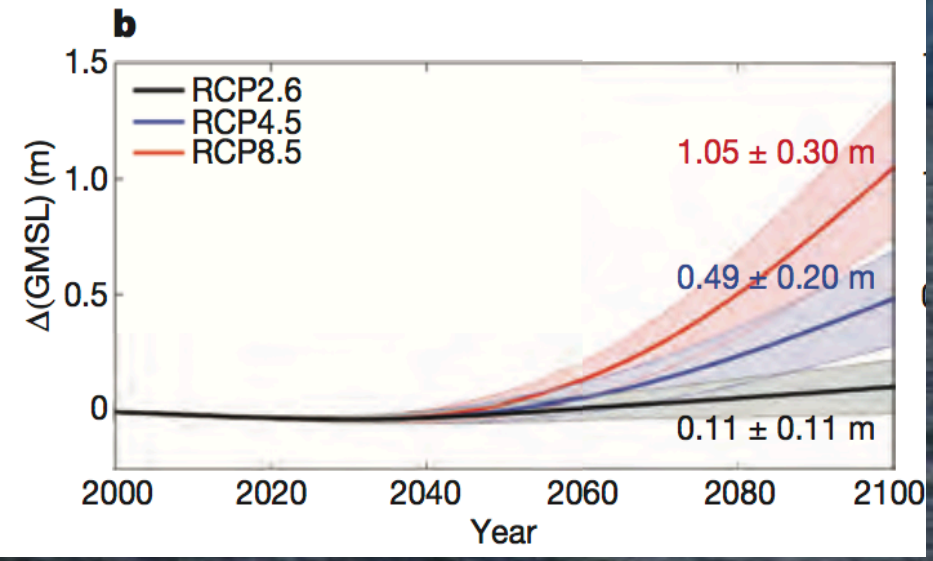
# Freshwater input distribution around Antarctica

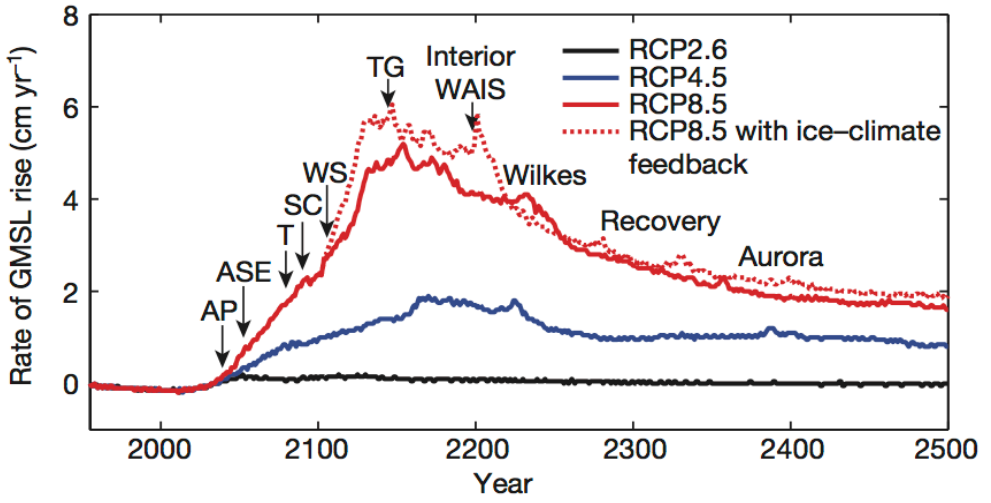



Merino et al. (2016)

# Antarctic ice sheet melt projection



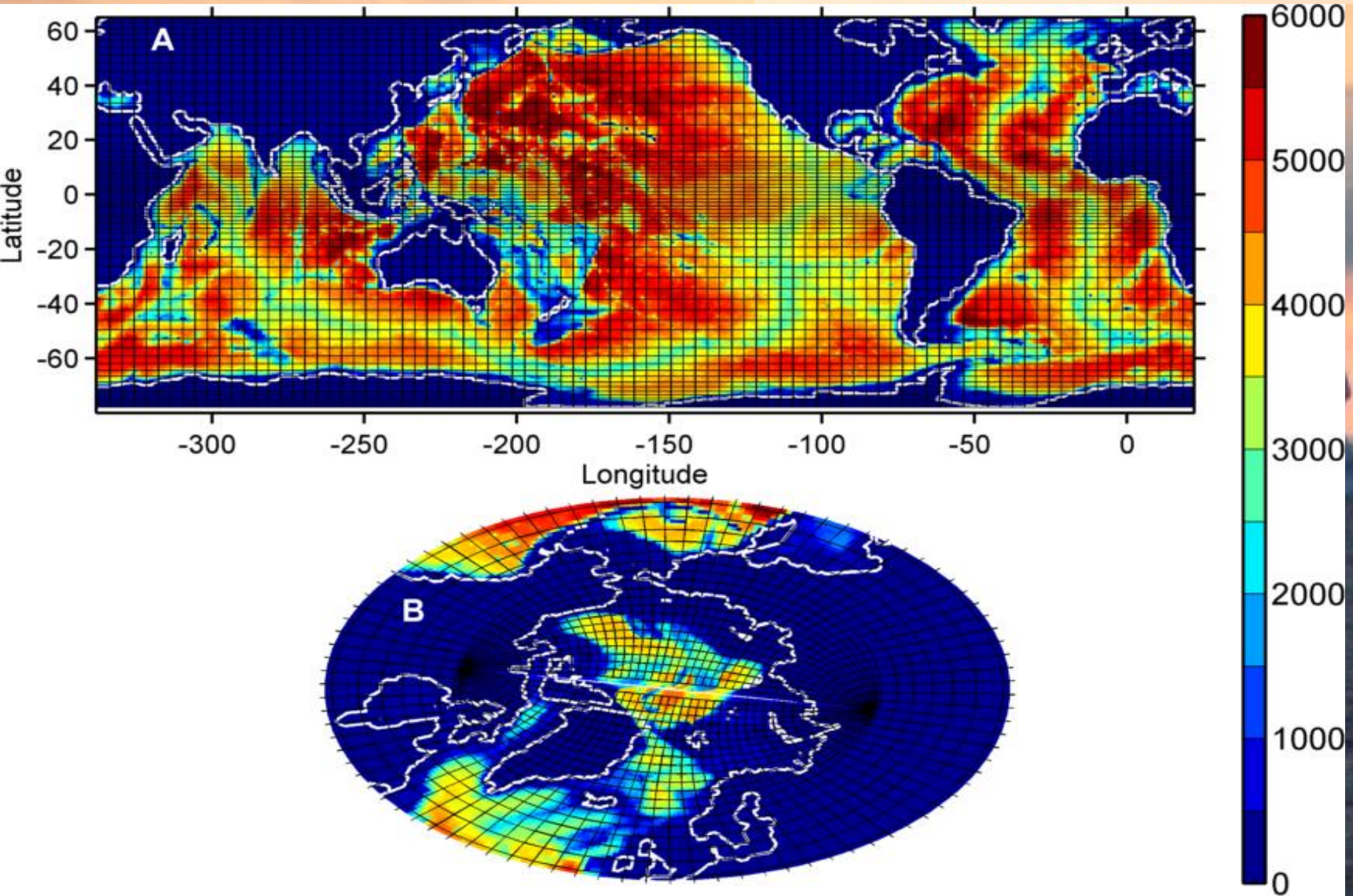



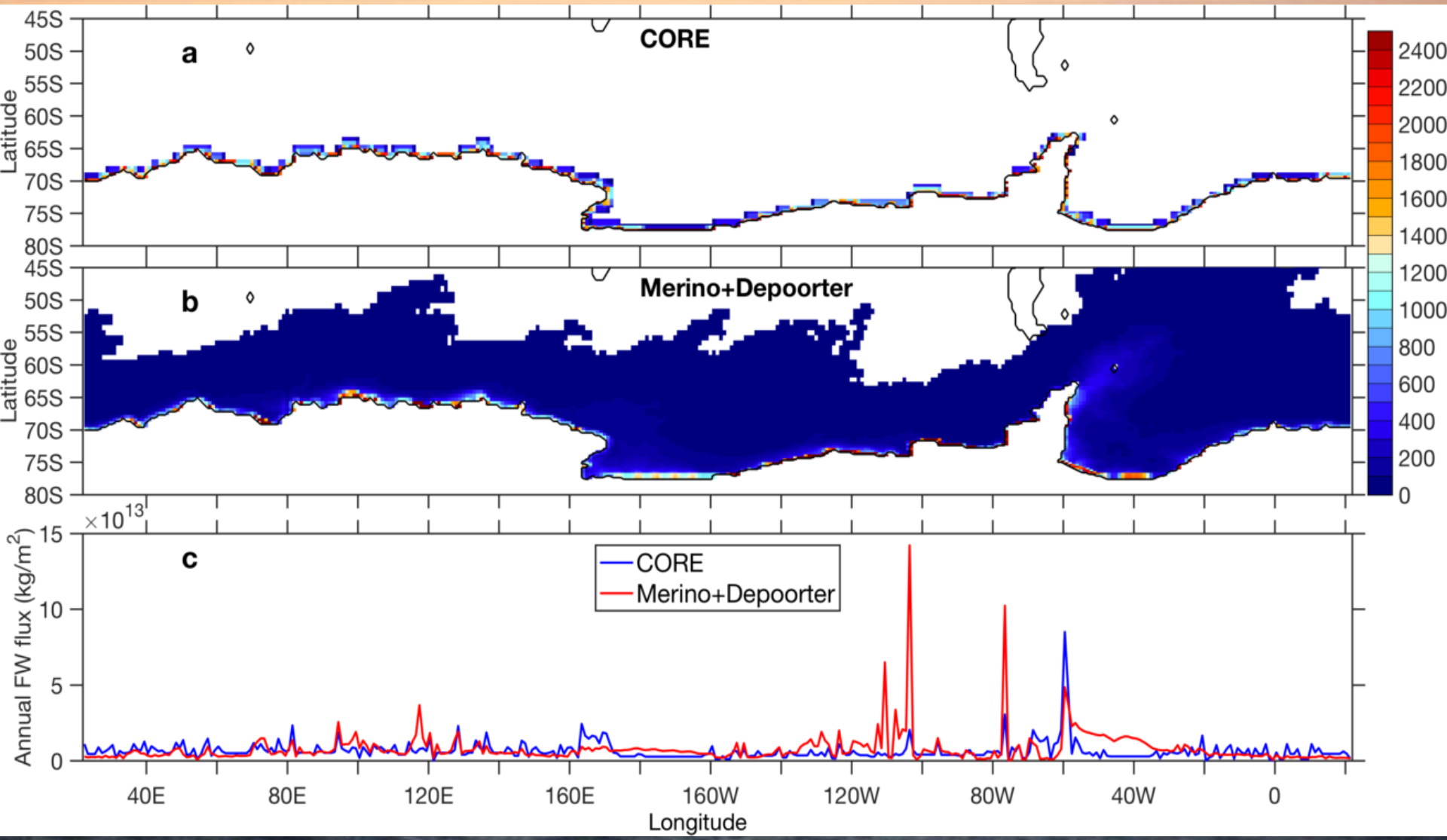

DeConto et al. (2016)

# ACCESS-OM

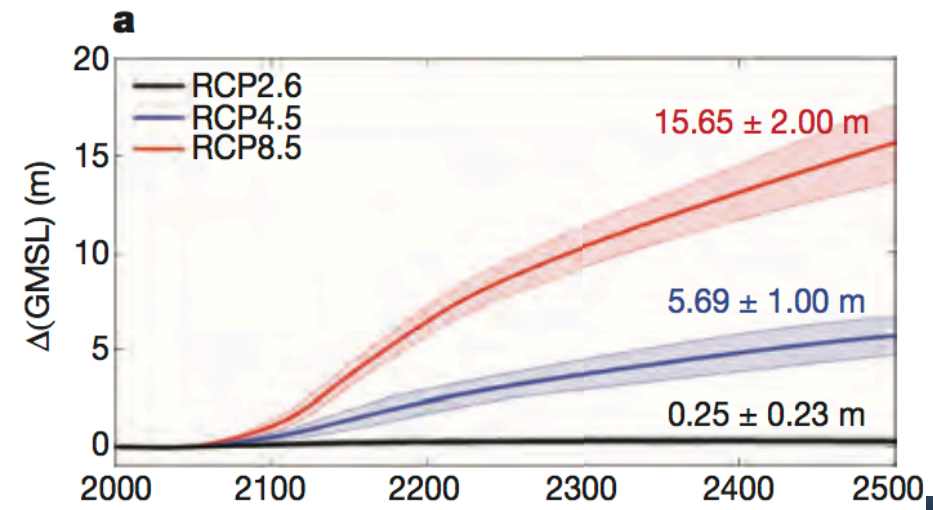
- 50 vertical levels
- ⅓° to 1° resolution
- CORE forcings

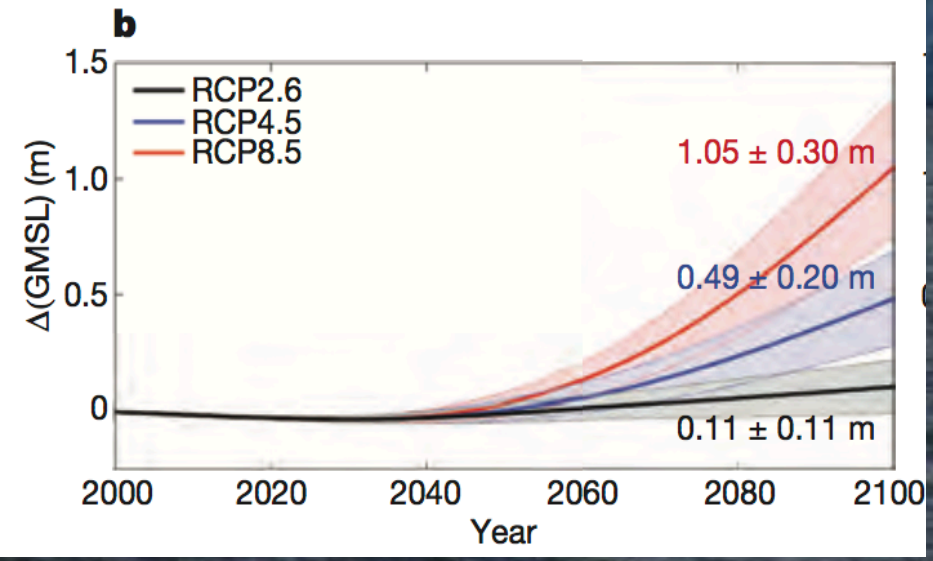


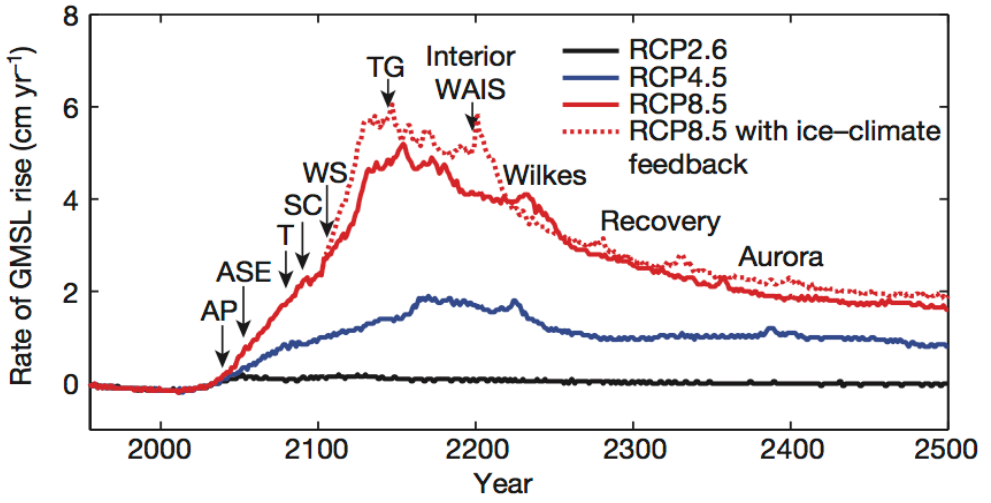
# Surface freshwater setup



# Antarctic ice sheet melt projection

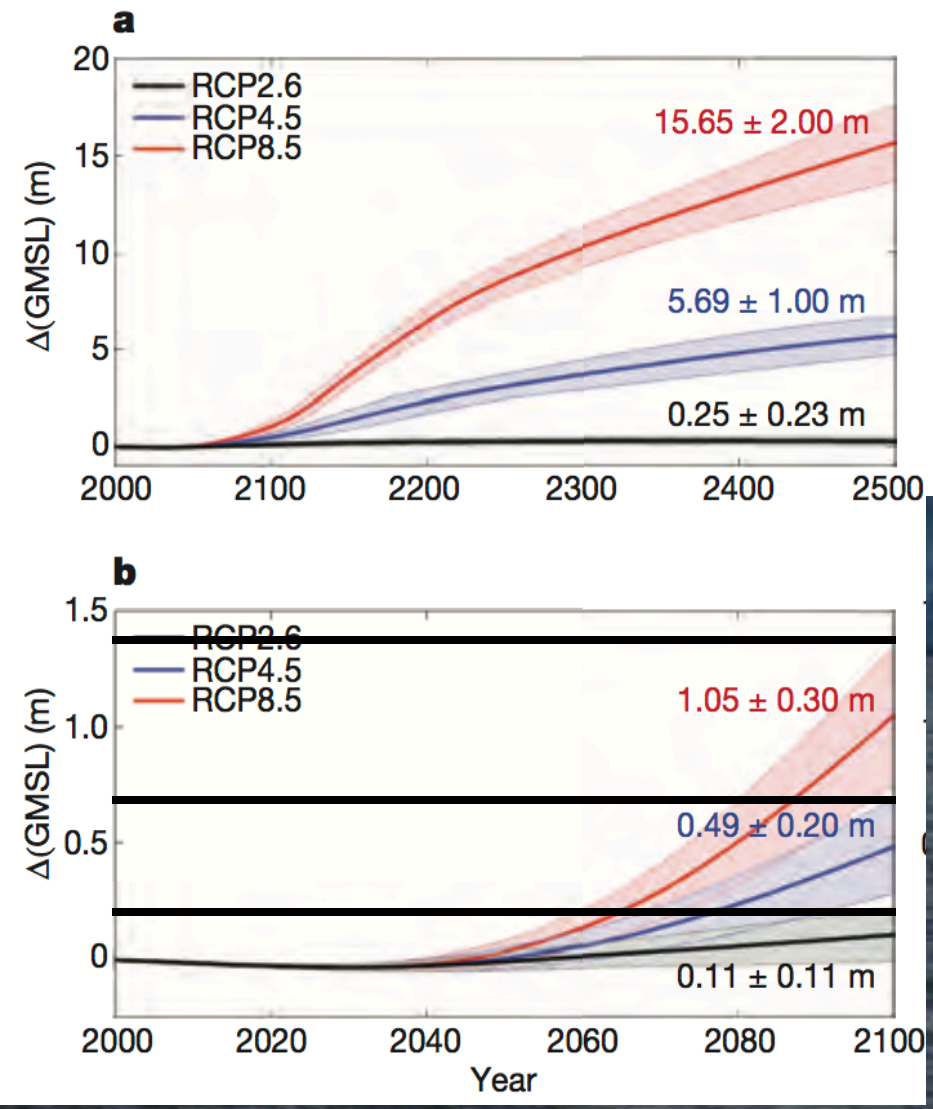


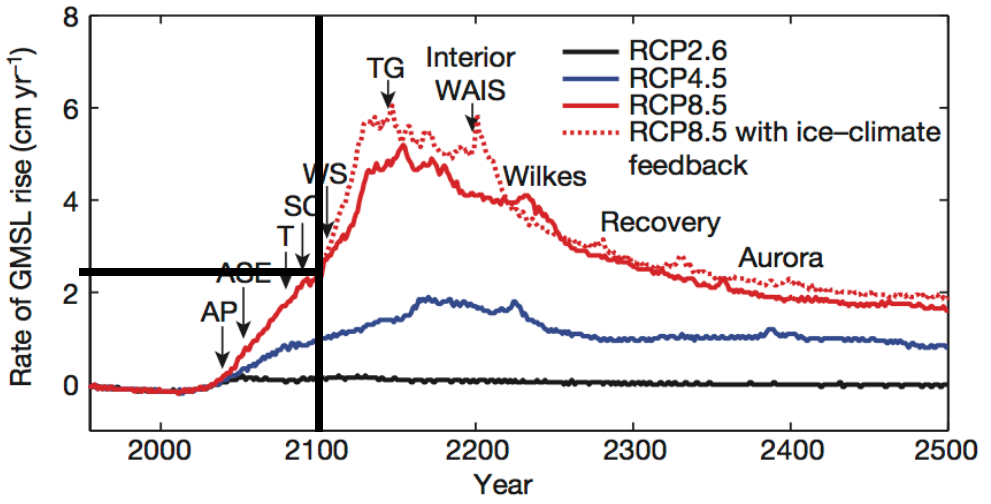




DeConto et al. (2016)

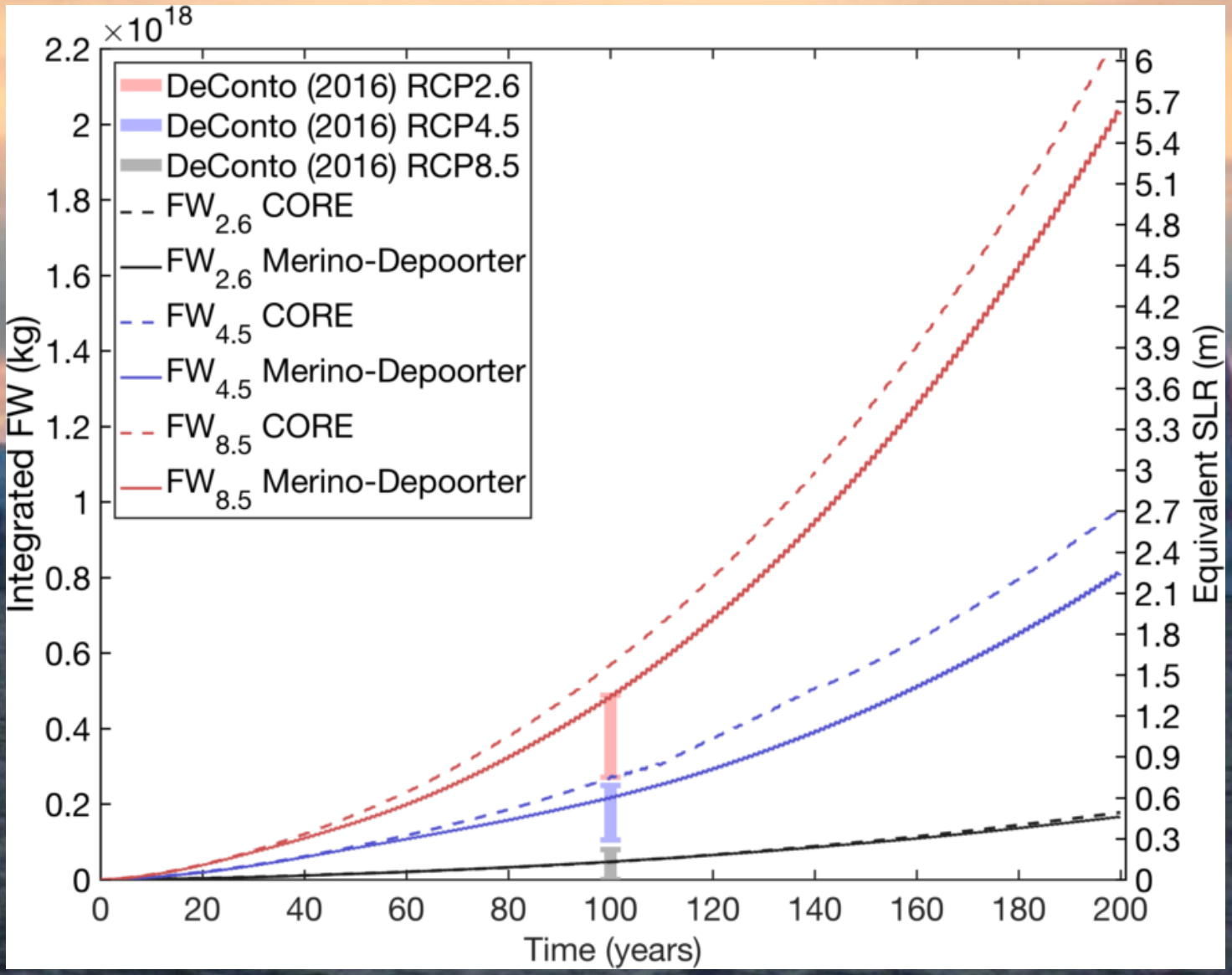
# Antarctic ice sheet melt projection



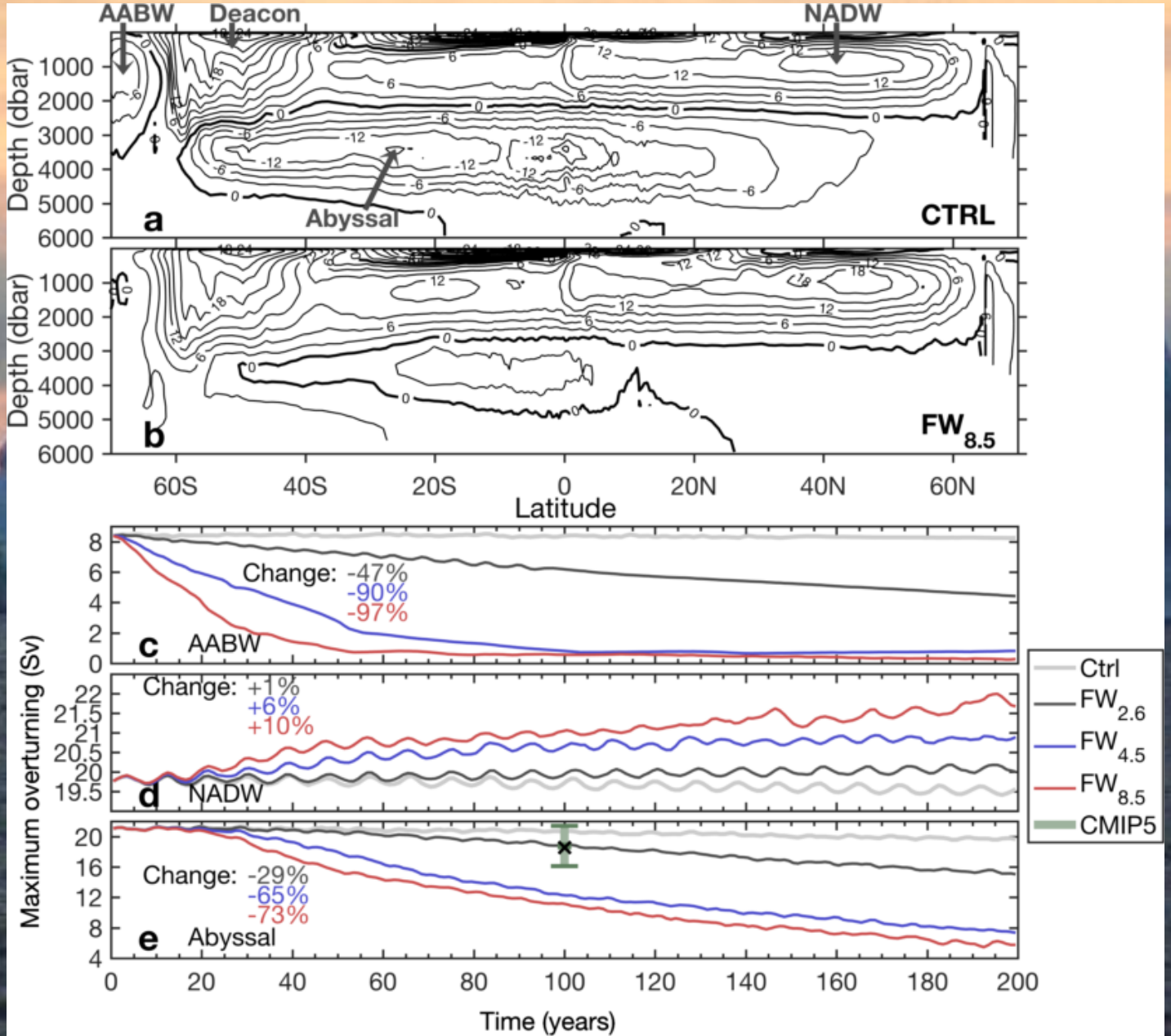




DeConto et al. (2016)

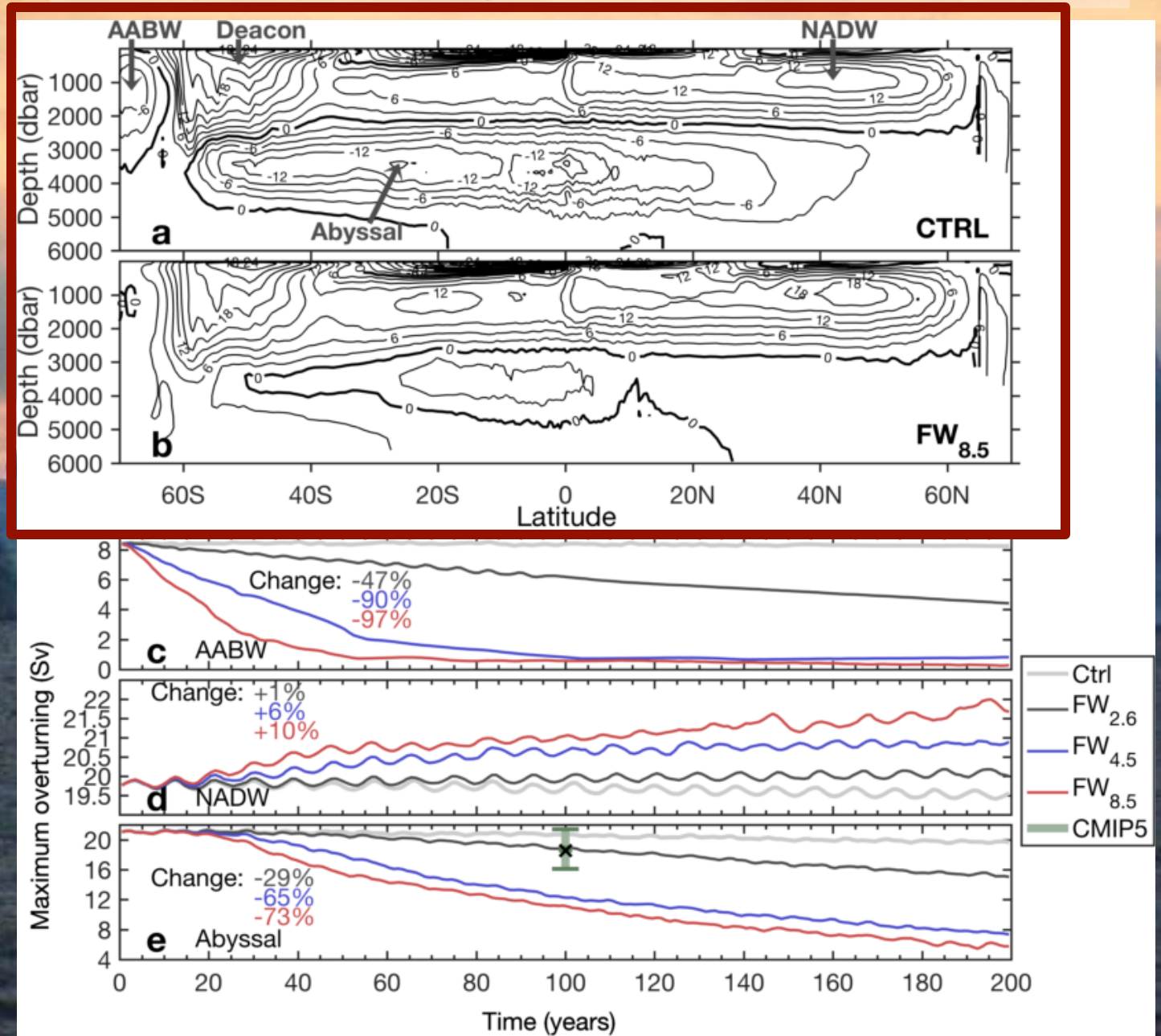
# Surface freshwater setup



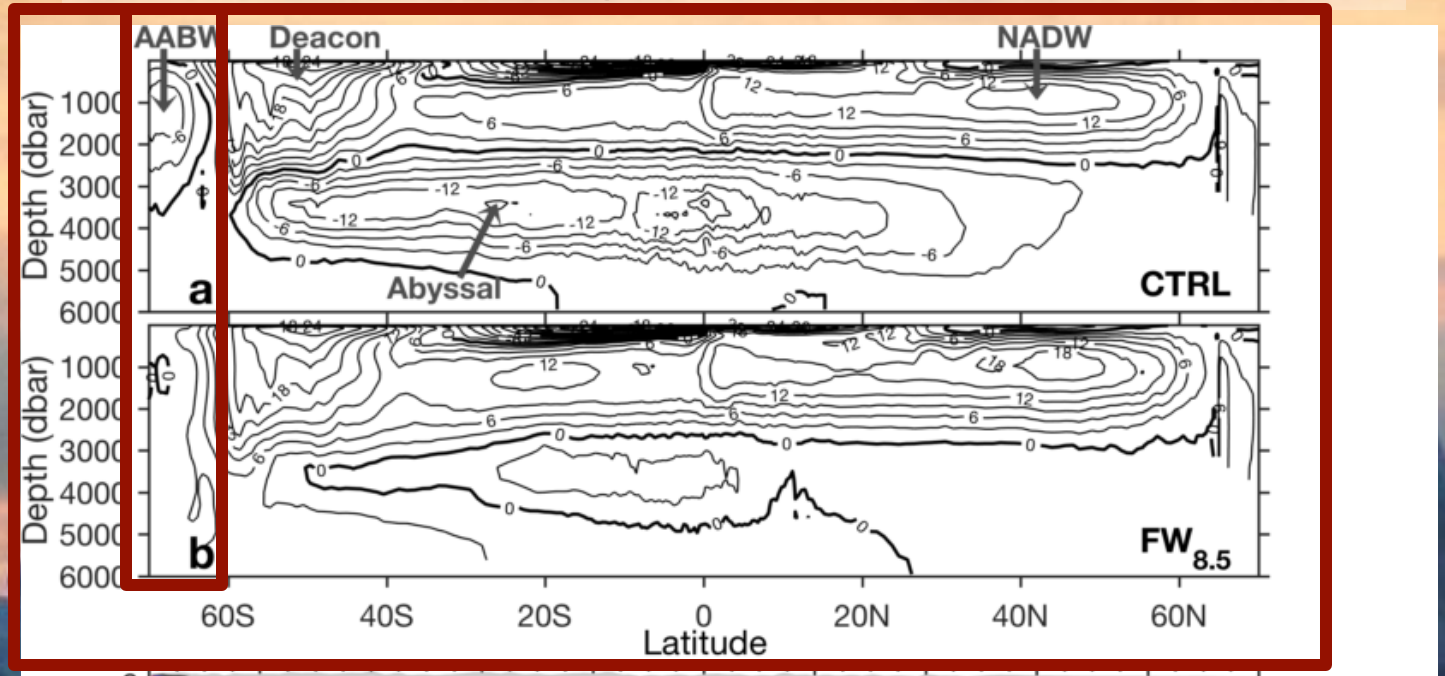
# Overturning Streamfunction

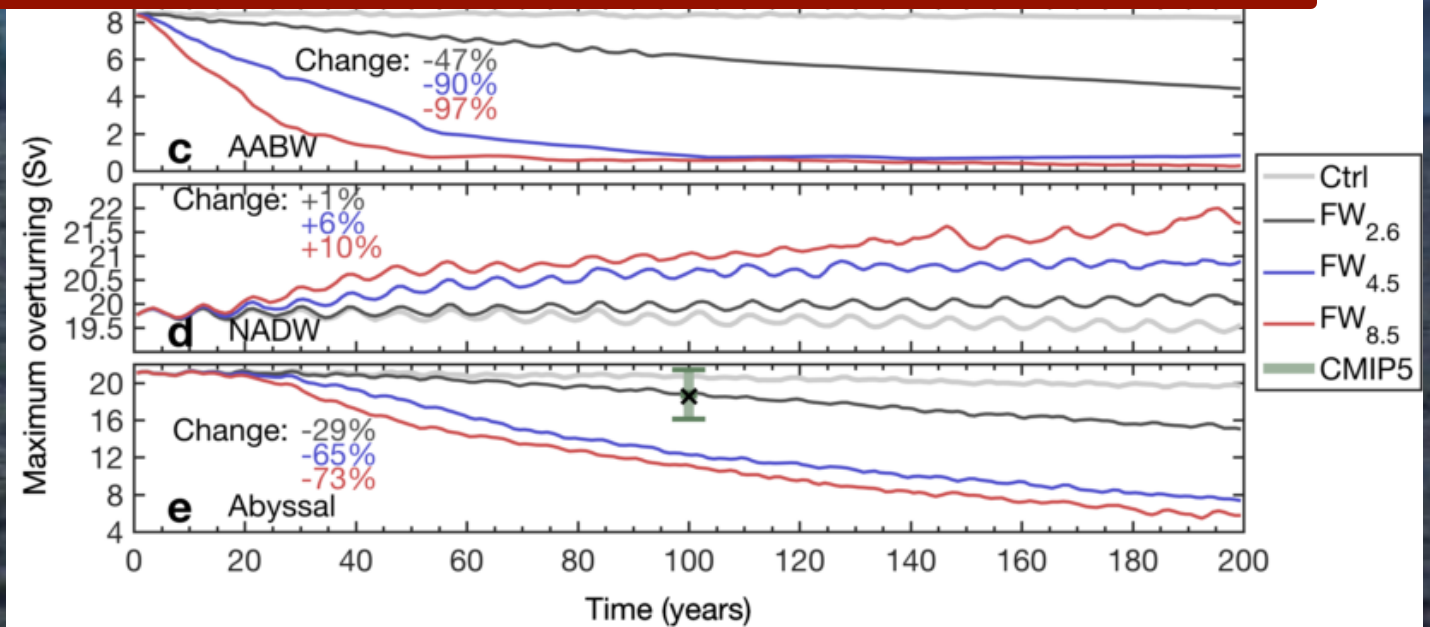


# Overturning Streamfunction



# Overturning Streamfunction



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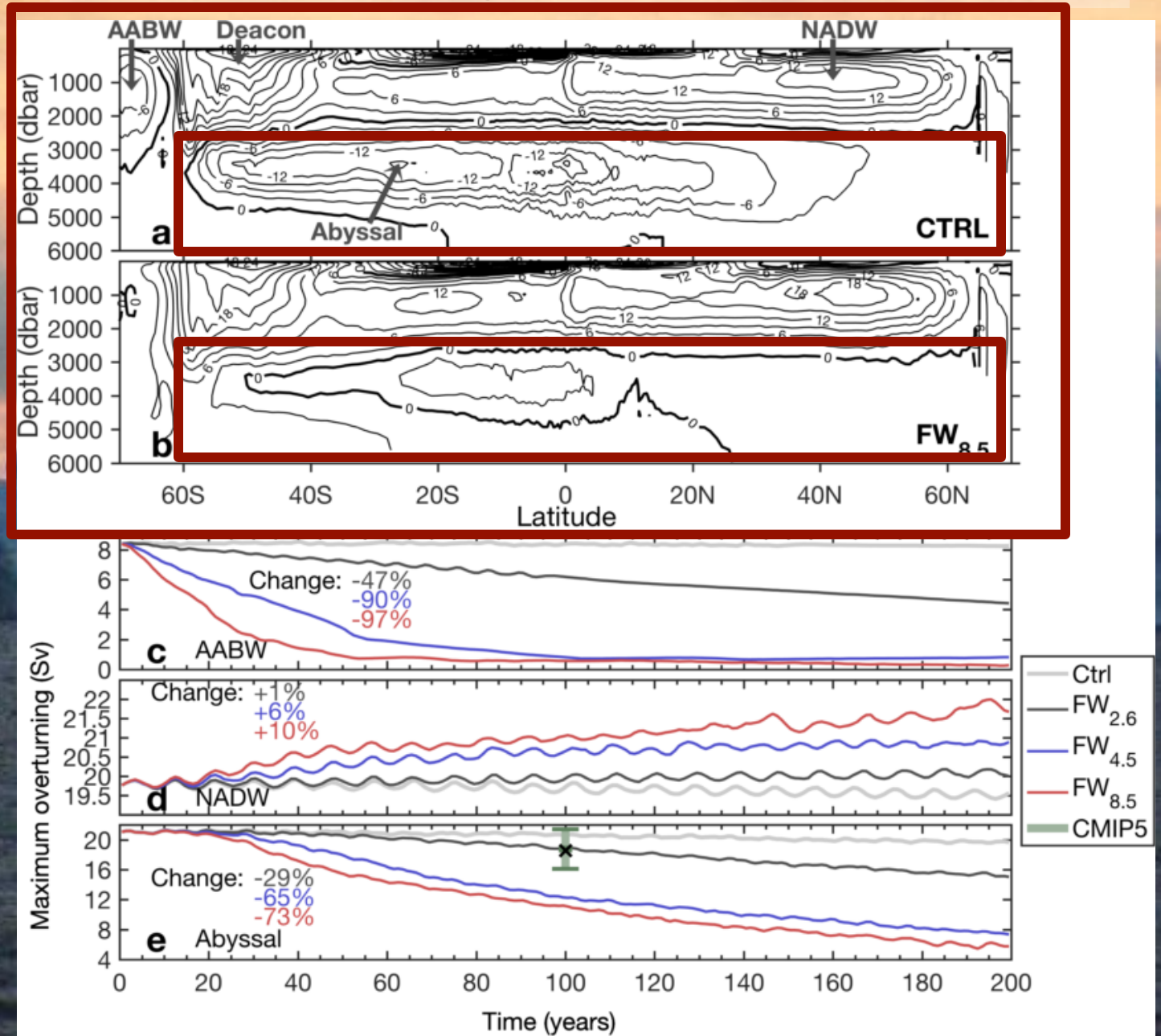

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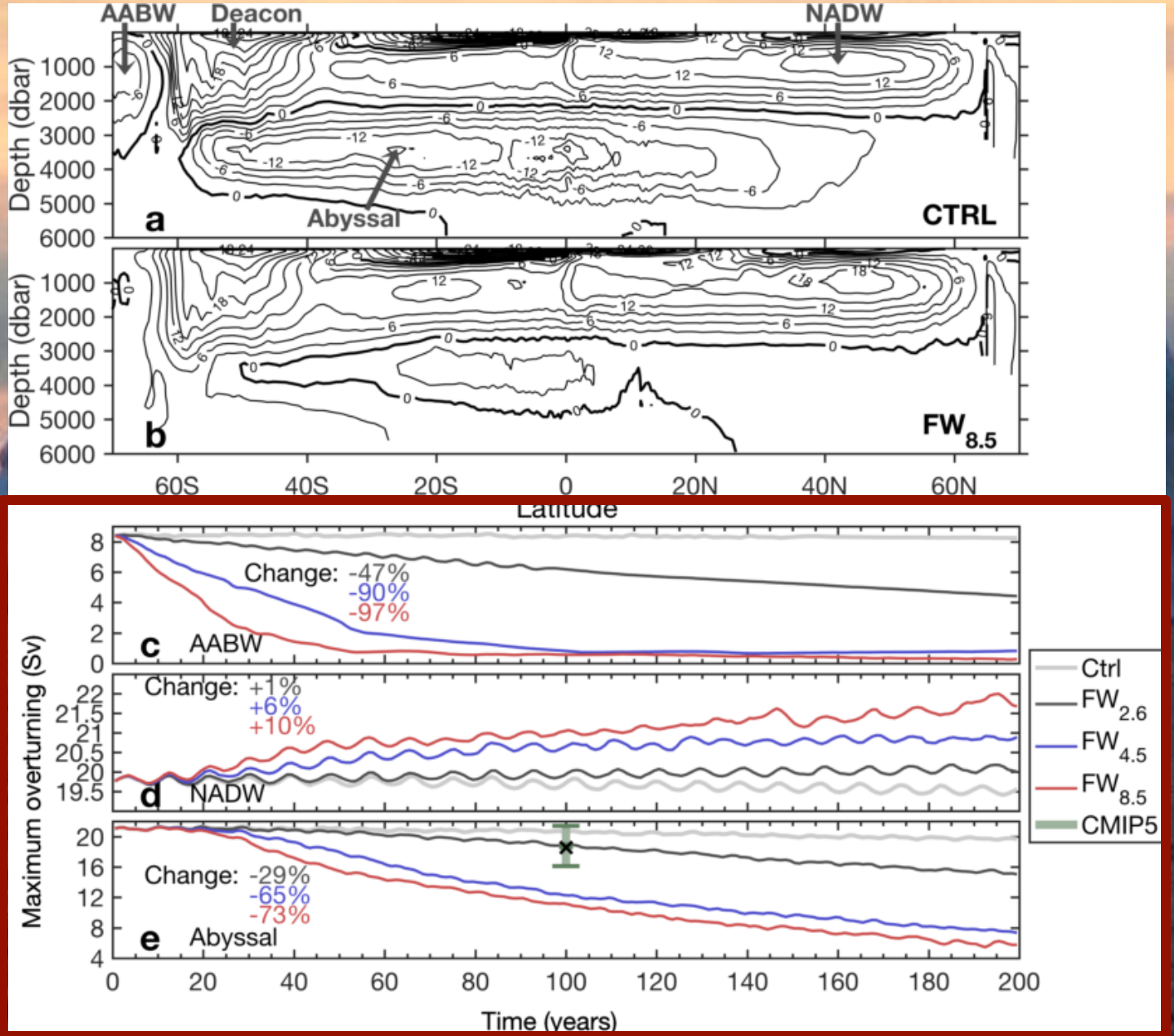

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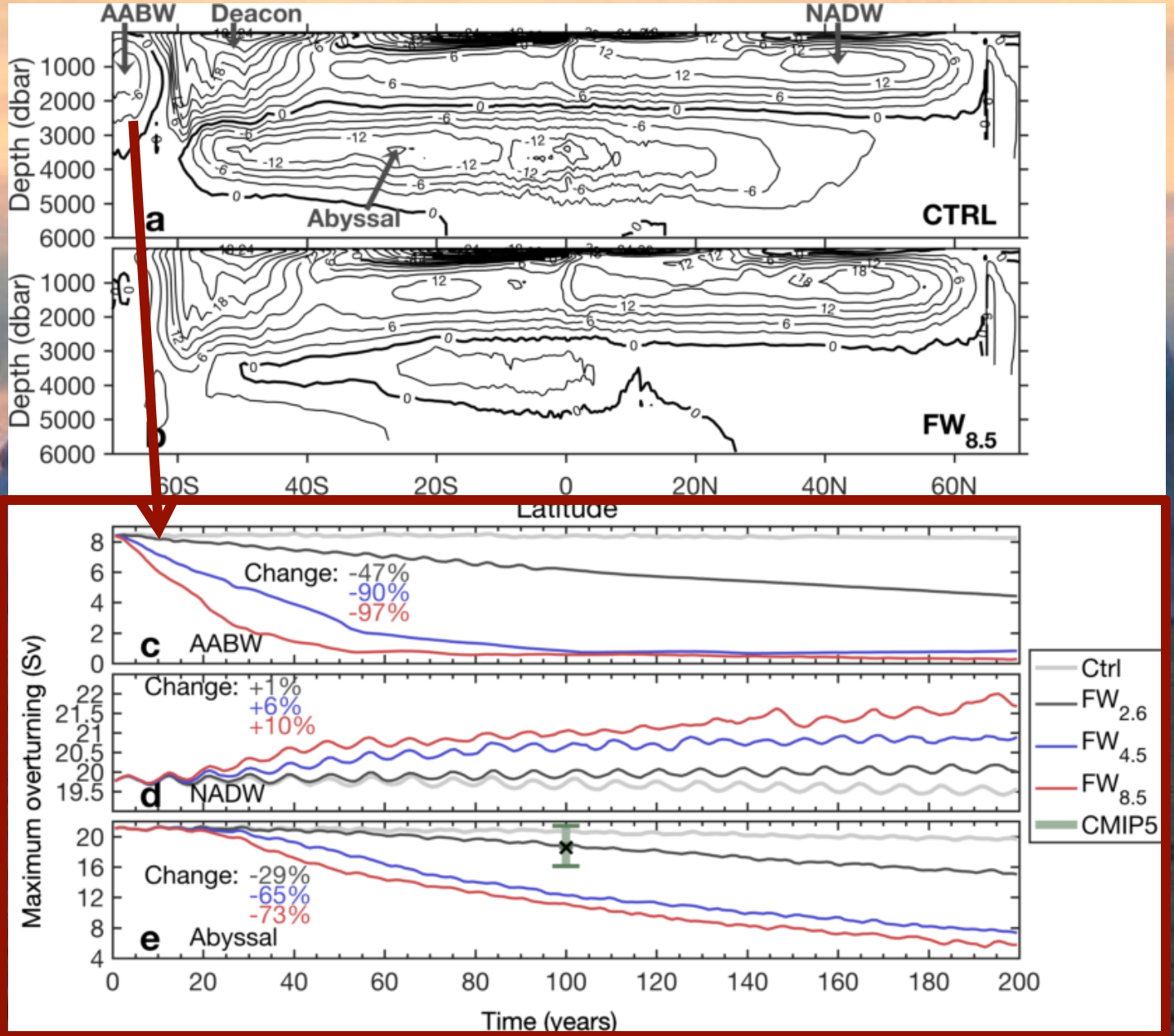

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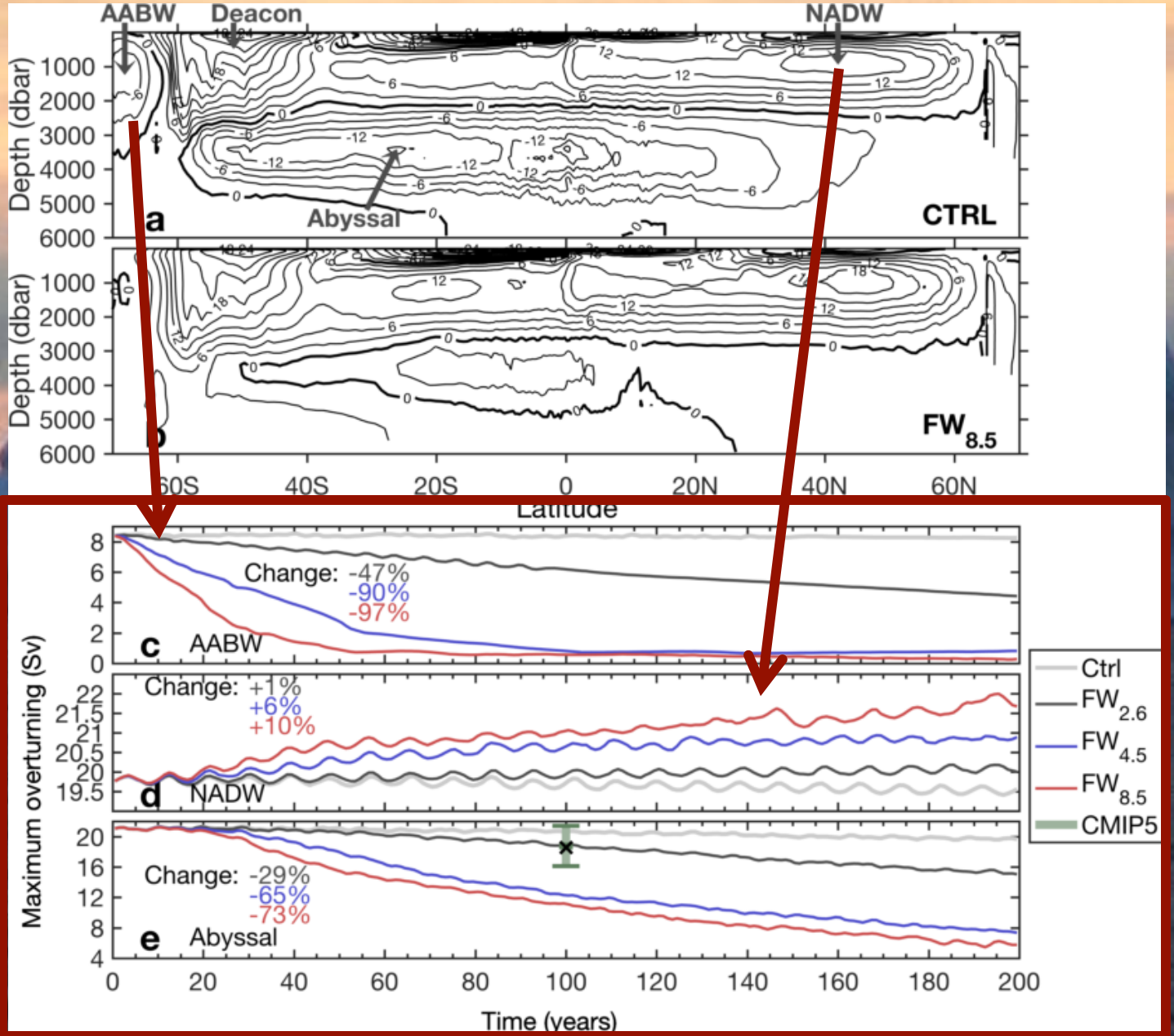

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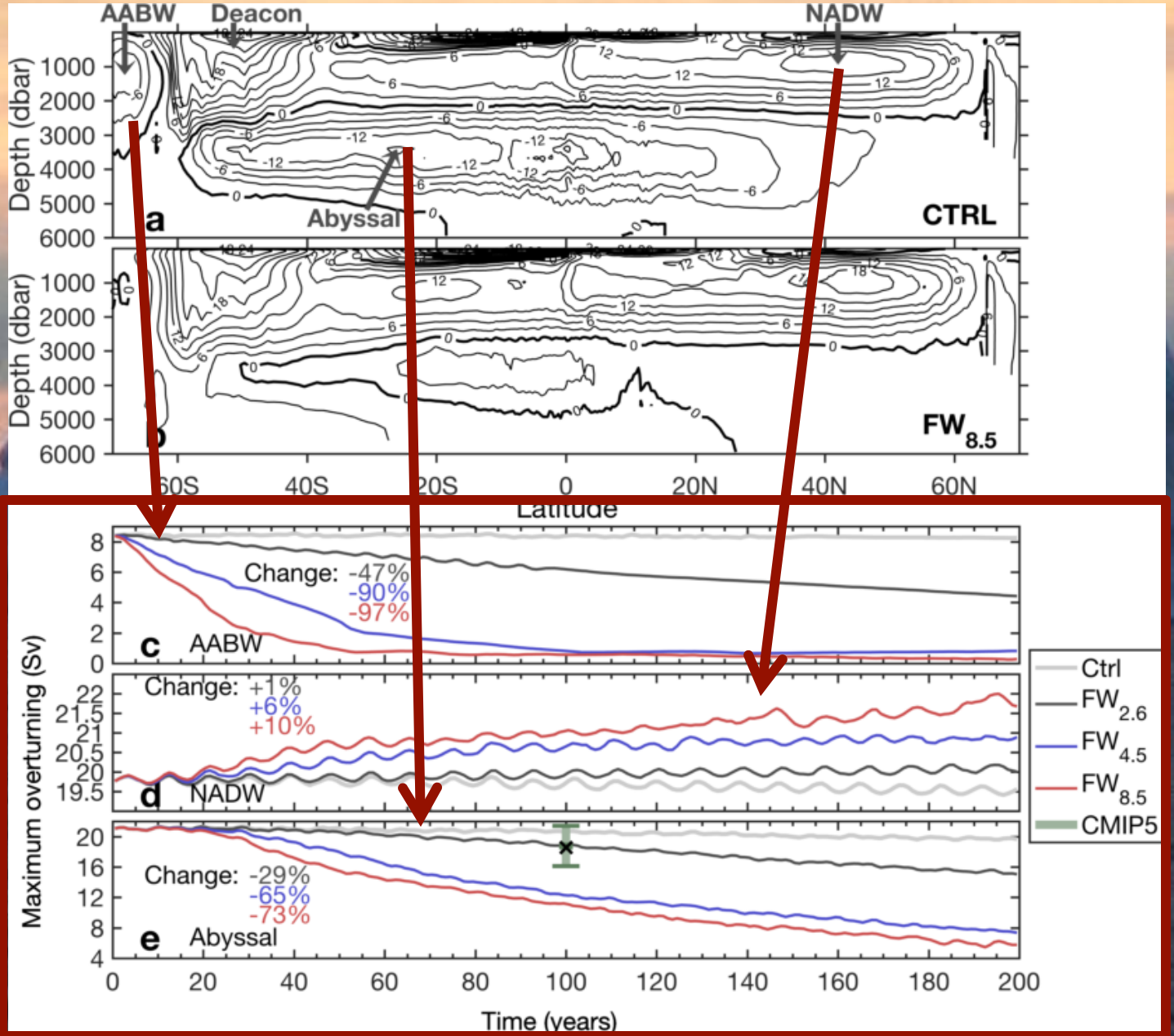
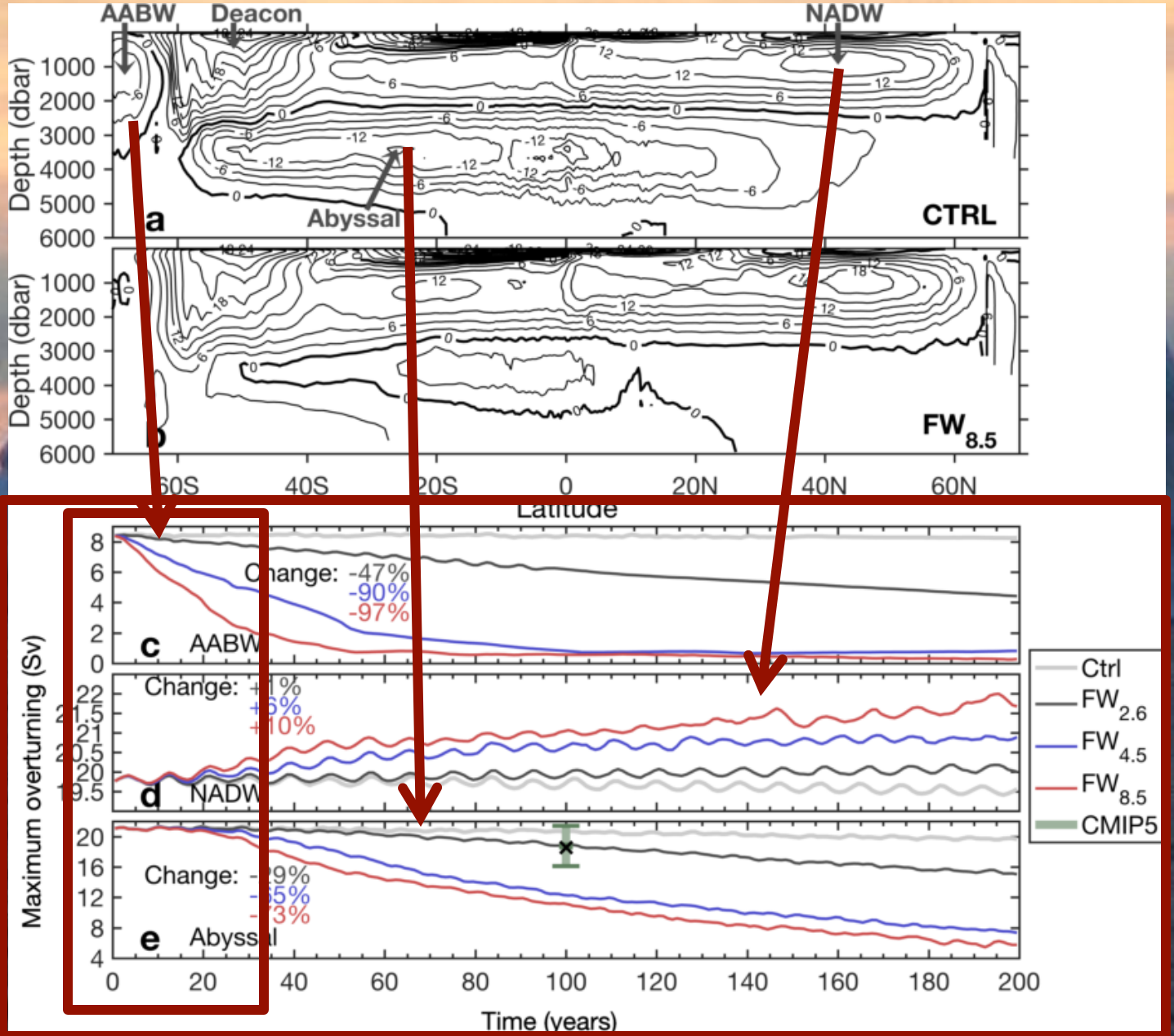
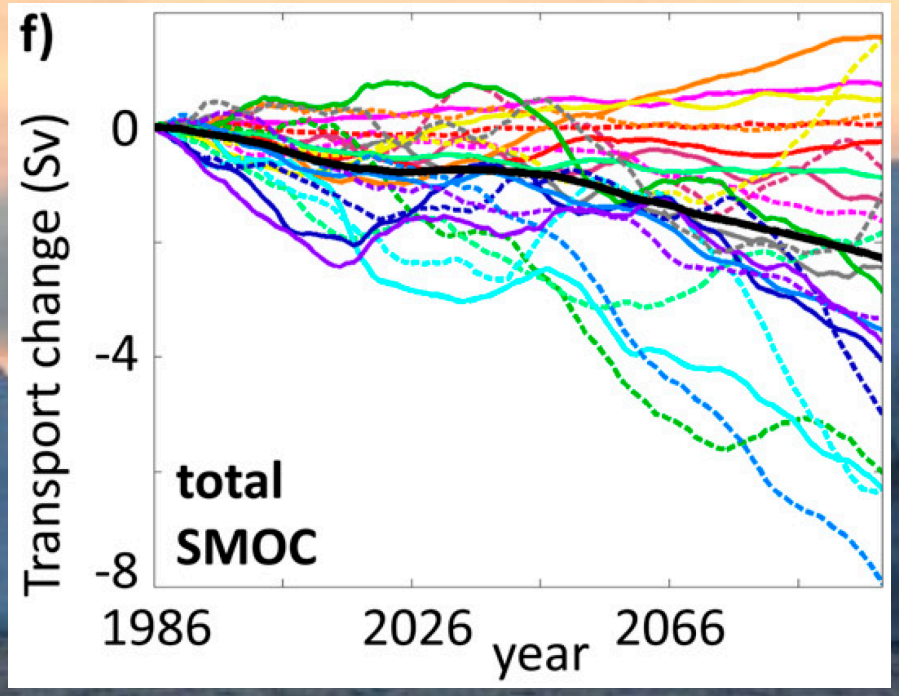


# Overturning Streamfunction



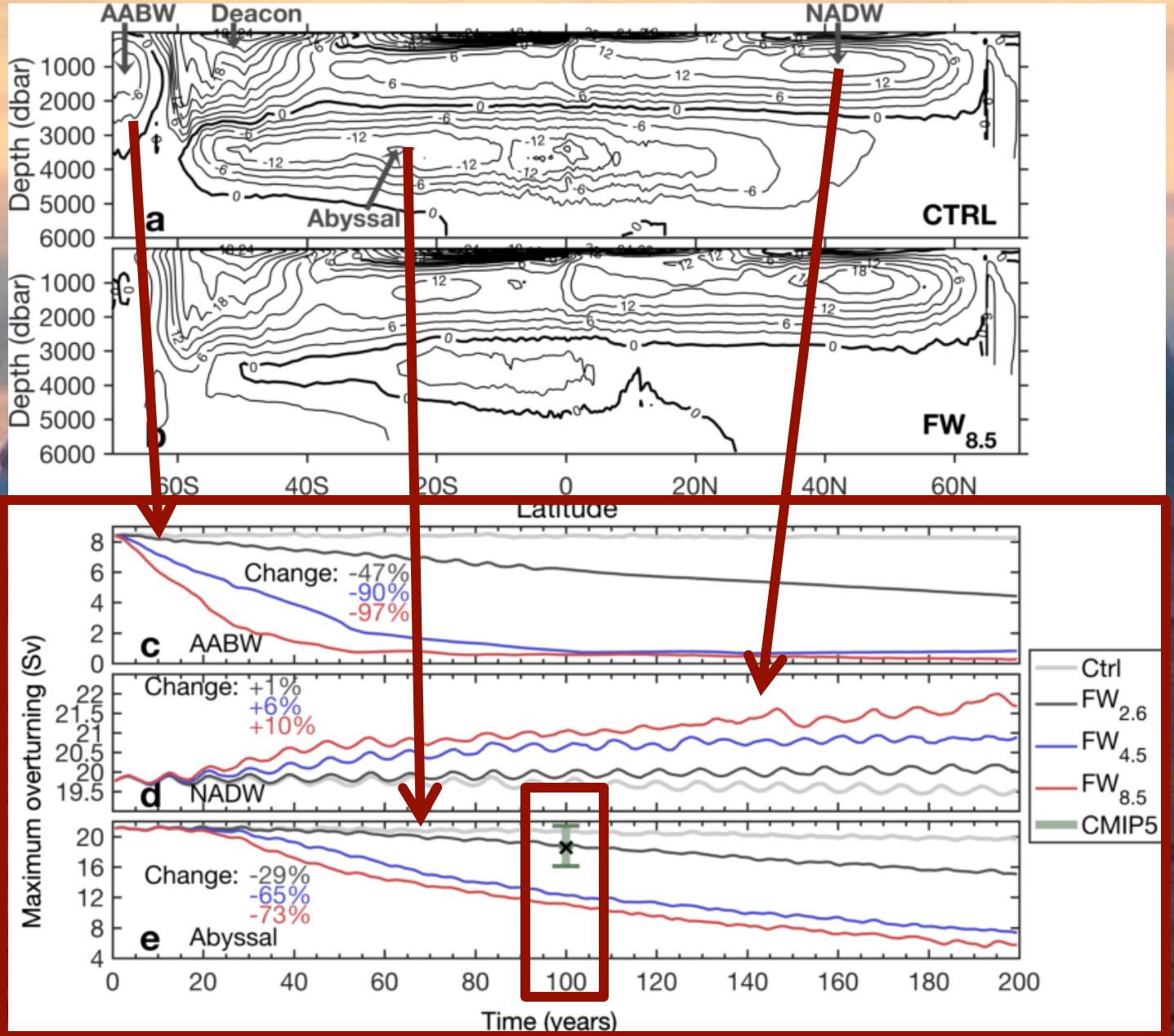
# RCP8.5 abyssal overturning in CMIP5 models



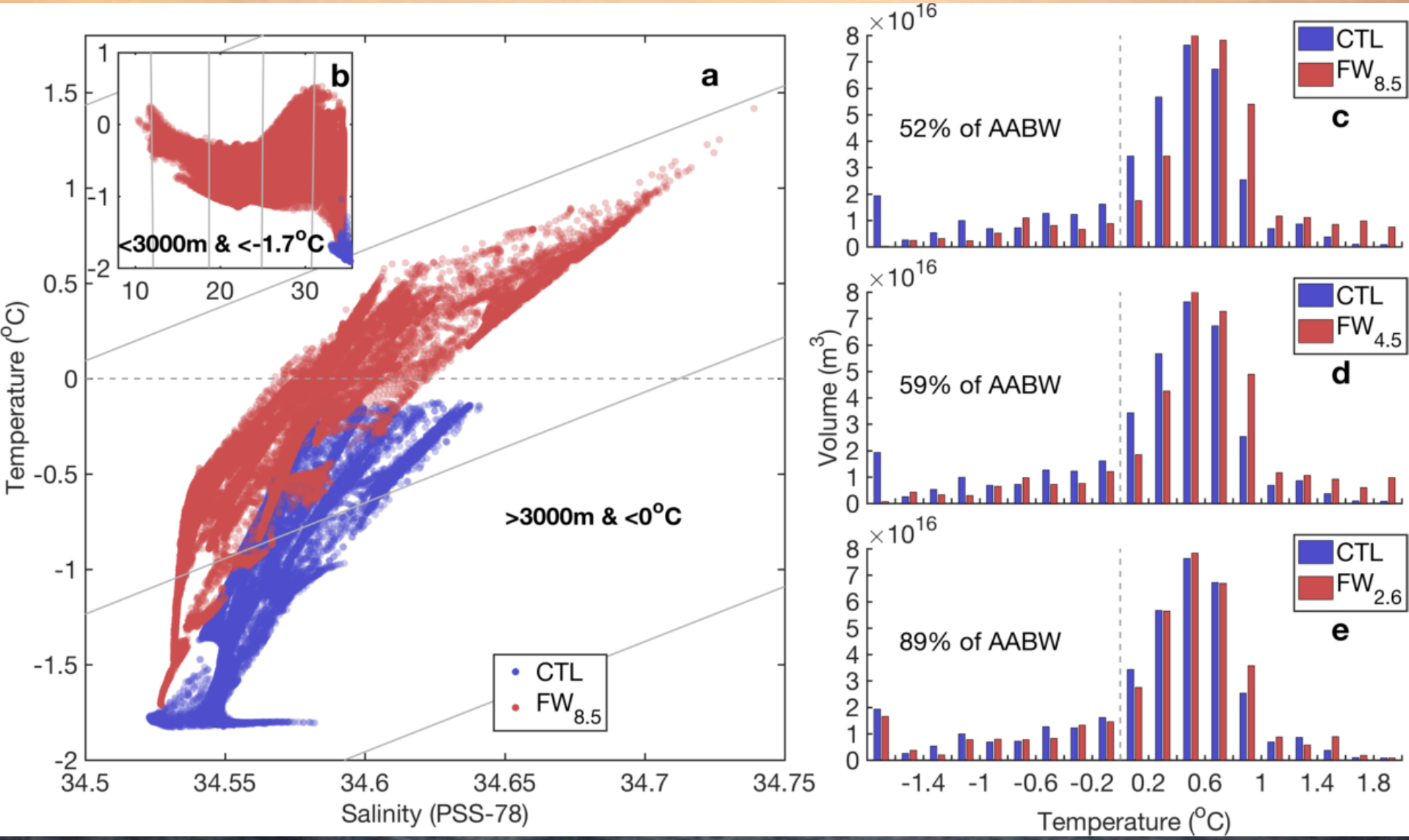

Heuzé et al. (2015)

ACCESS1-0
bcc-csm1-1
CanESM2
CCSM4
CESM1-CAM5
CMCC-CM
CMCC-CMS
CNRM-CM5
CSIRO-Mk3-6-0
FGOALS-g2
GFDL-CM3
GFDL-ESM2G
GFDL-ESM2M
GISS-E2-H
GISS-E2-R
HadGEM2-CC
HadGEM2-ES
IPSL-CM5A-LR
IPSL-CM5A-MR
MIROC5
MIROC-ESM-CHEM
MPI-ESM-LR
MPI-ESM-MR
NorESM1-M

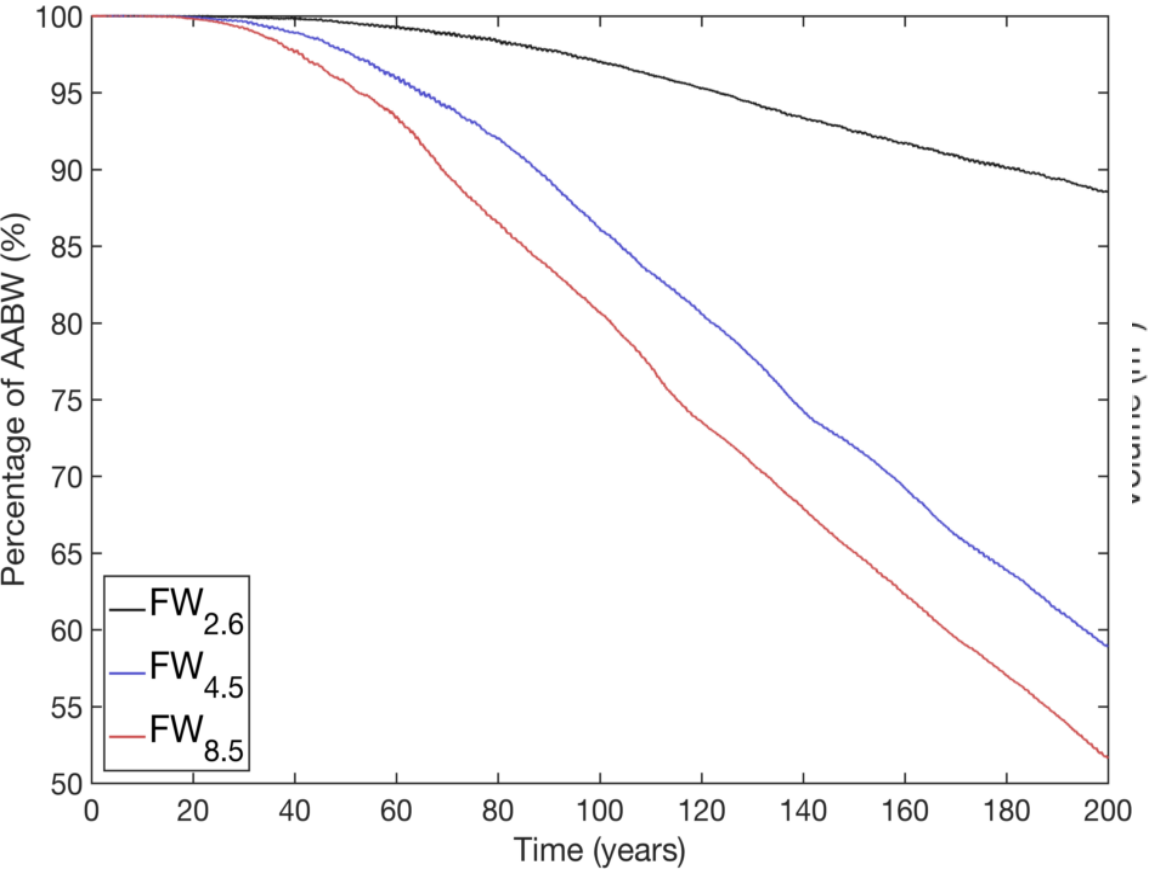
# Overturning Streamfunction

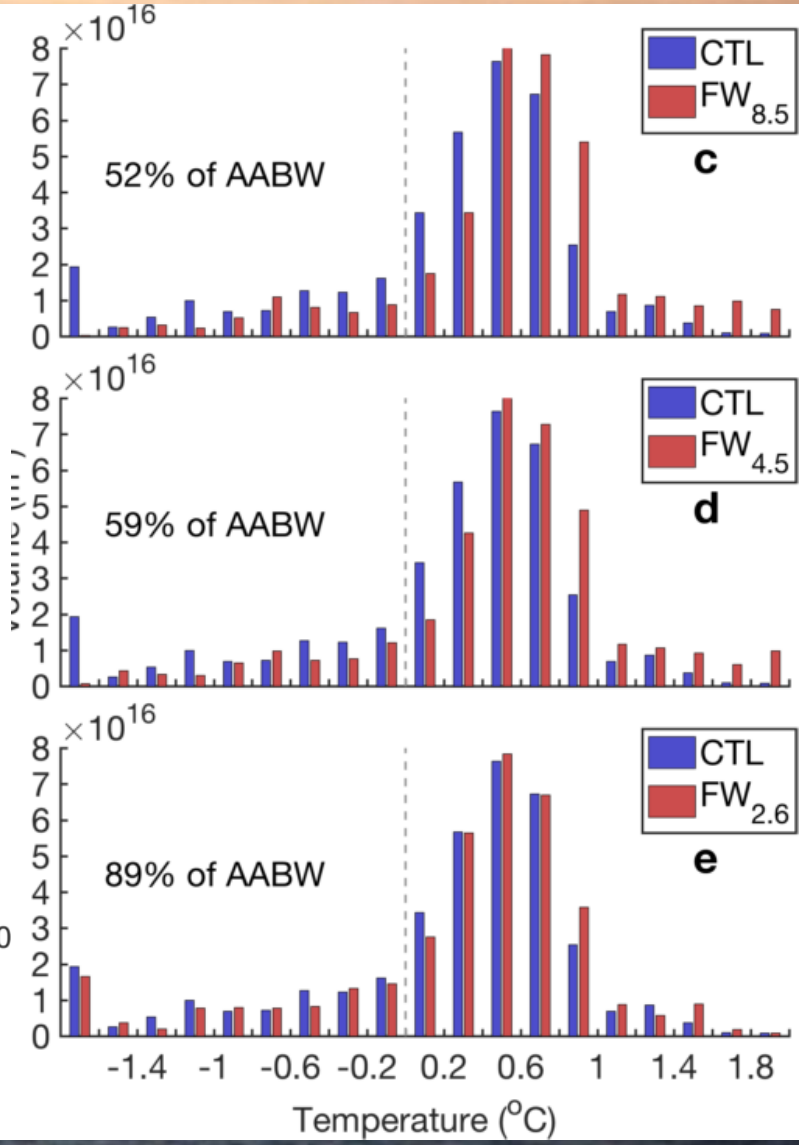


# AABW Volume

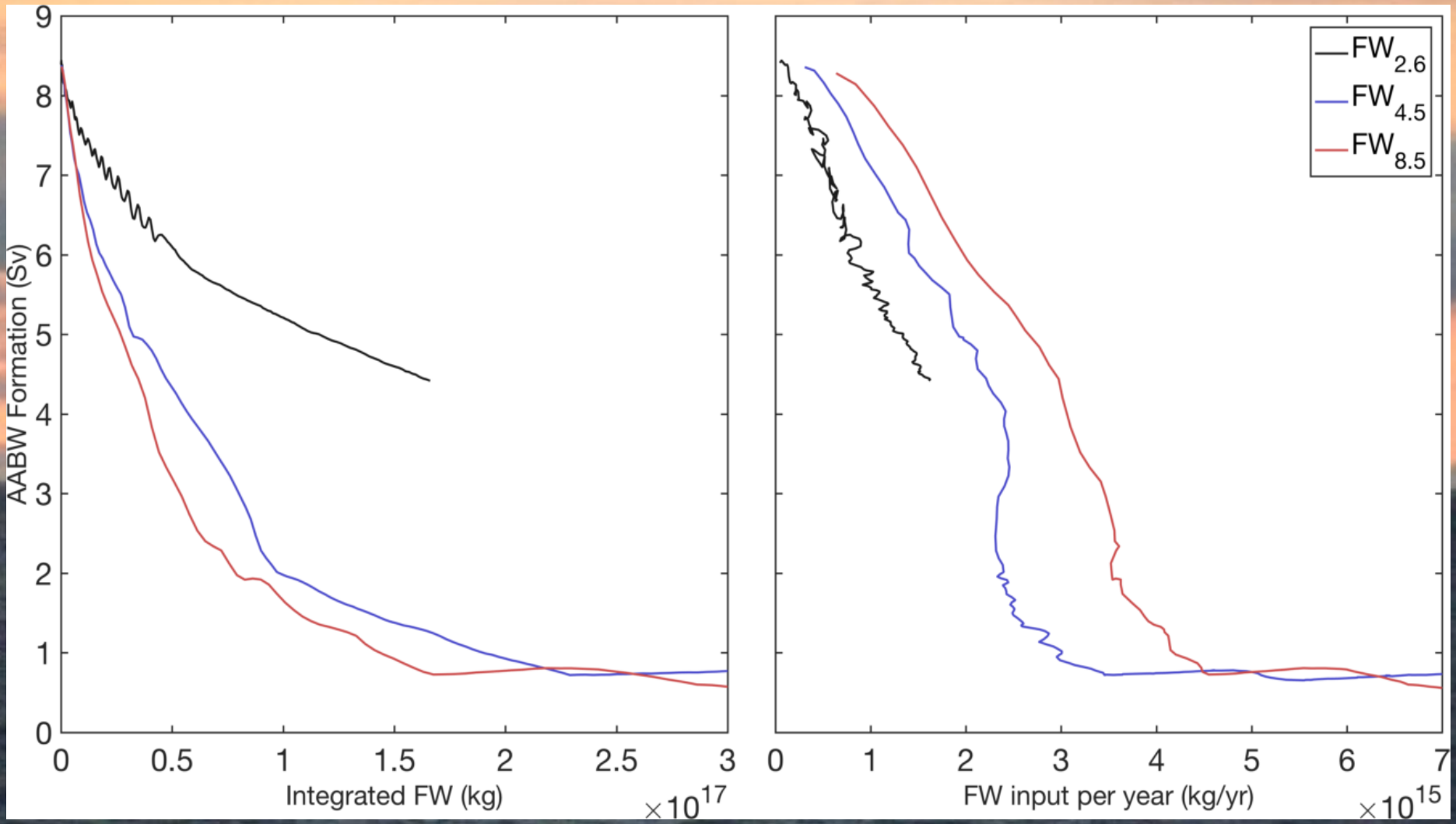

a
b
<3000m & <-1.7°C
>3000m & <0°C
CTL
FW8.5
Temperature (°C)
Salinity (PSS-78)
34.5
34.55
34.6
34.65
34.7
34.75
c
d
e
52% of AABW
59% of AABW
89% of AABW
CTL
FW8.5
FW4.5
FW2.6
×10^16
Volume (m^3)
-1.4
-1
-0.6
-0.2
0.2
0.6
1
1.4
1.8
Temperature (°C)

# AABW Volume

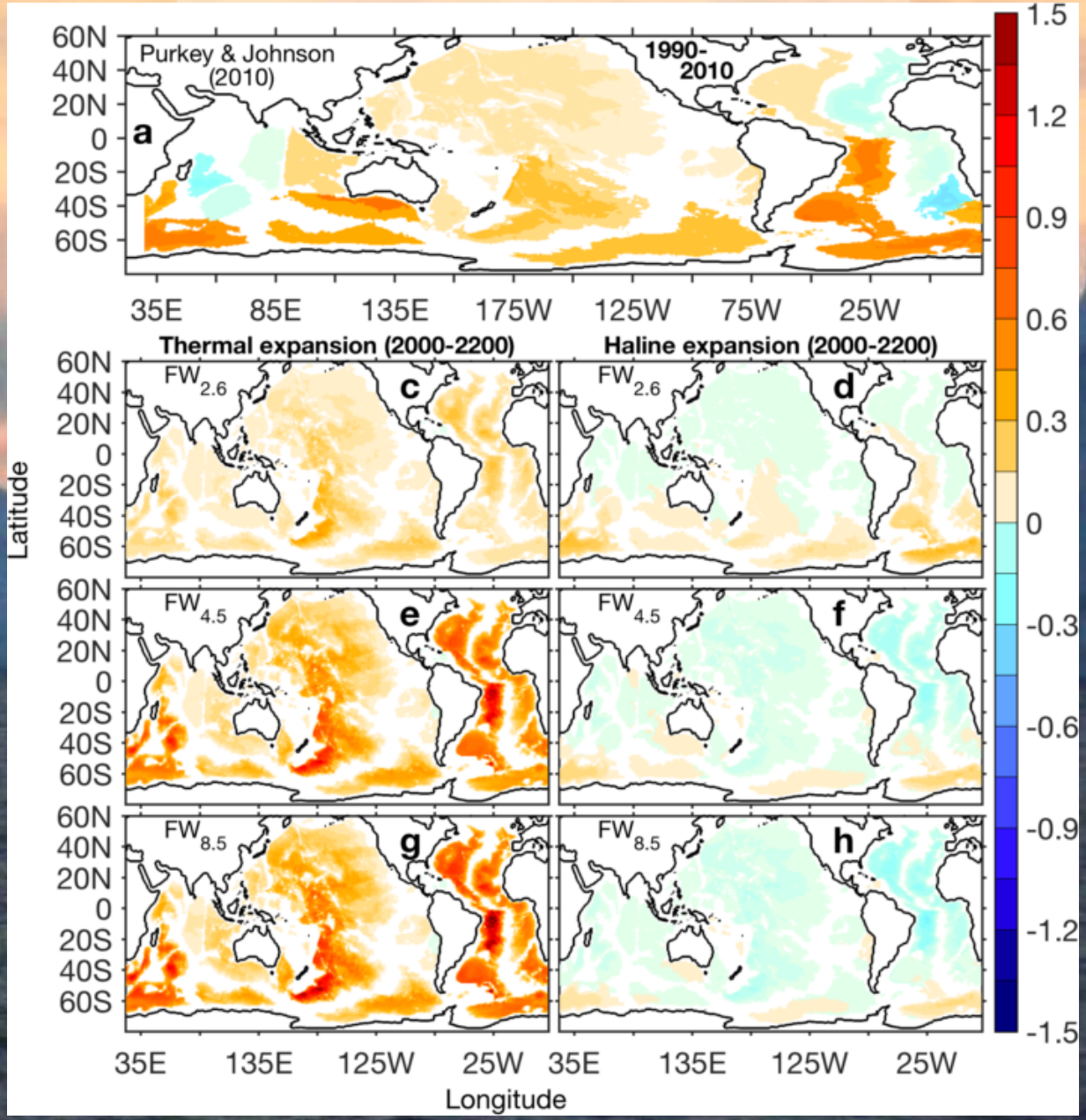

Percentage of AABW (%)
Time (years)
FW2.6
FW4.5
FW8.5


×10^16
CTL
FW8.5
52% of AABW
c
CTL
FW4.5
59% of AABW
d
CTL
FW2.6
89% of AABW
e
Temperature (°C)

# AABW formation response to FW flux



# Abyssal SLR


Purkey & Johnson (2010)
1990-2010
a
Thermal expansion (2000-2200)
Haline expansion (2000-2200)
FW2.6
FW4.5
FW8.5
c
d
e
f
g
h
60N
40N
20N
0
20S
40S
60S
35E
85E
135E
175W
125W
75W
25W
Latitude
Longitude
1.5
1.2
0.9
0.6
0.3
0
-0.3
-0.6
-0.9
-1.2
-1.5

# Summary

- CMIP5 underestimated the freshwater input from Antarctica.
- Collapse within 100 years of AABW formation with $FW_{4.5}$ and $FW_{8.5}$.
- Rate of collapse of AABW formation linked to FW flux.
- Pattern of abyssal steric SLR due to surface freshening ressembles recent observations.