Changes on Aurora basin, East Antarctica, in coupled and uncoupled ice-ocean simulations

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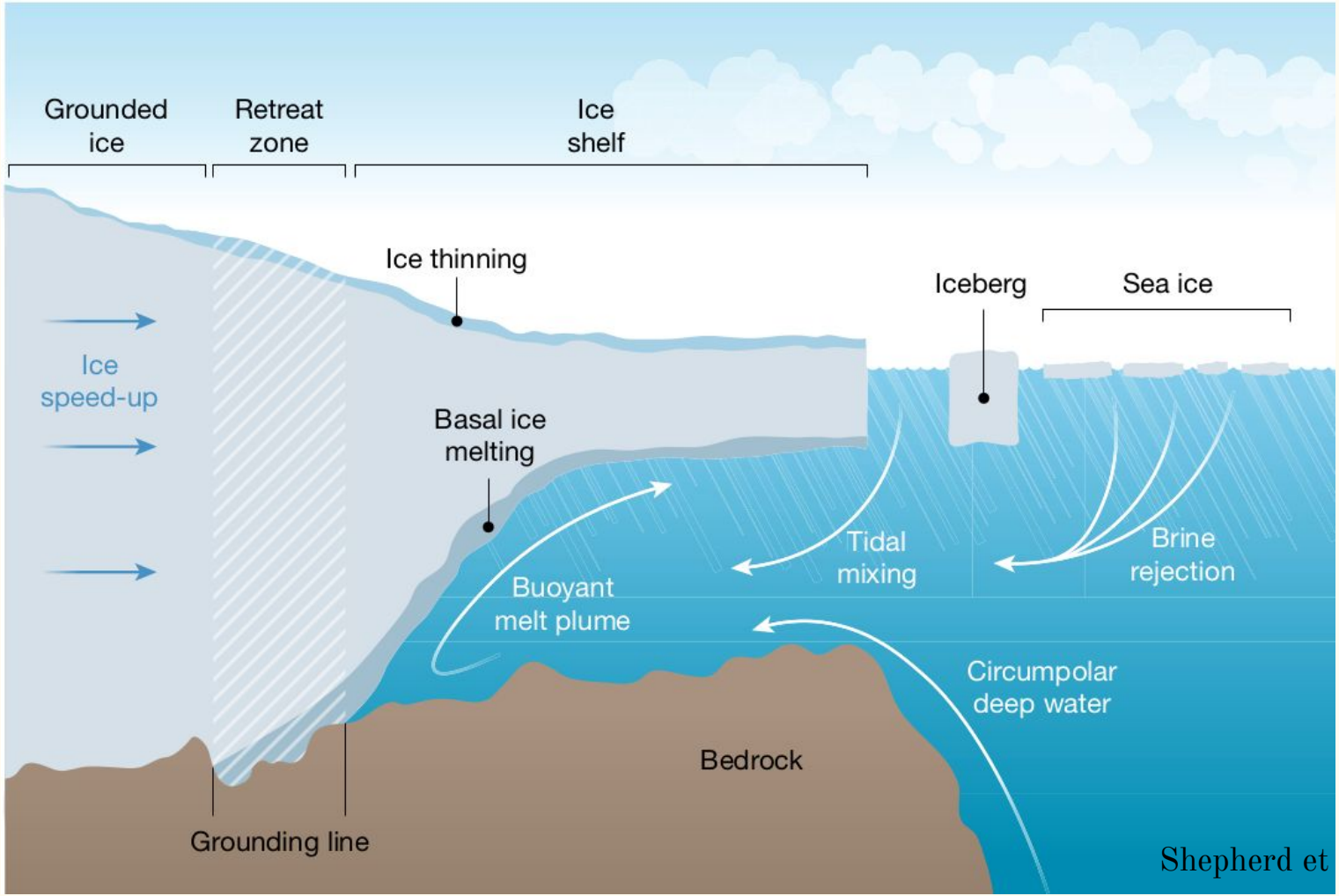
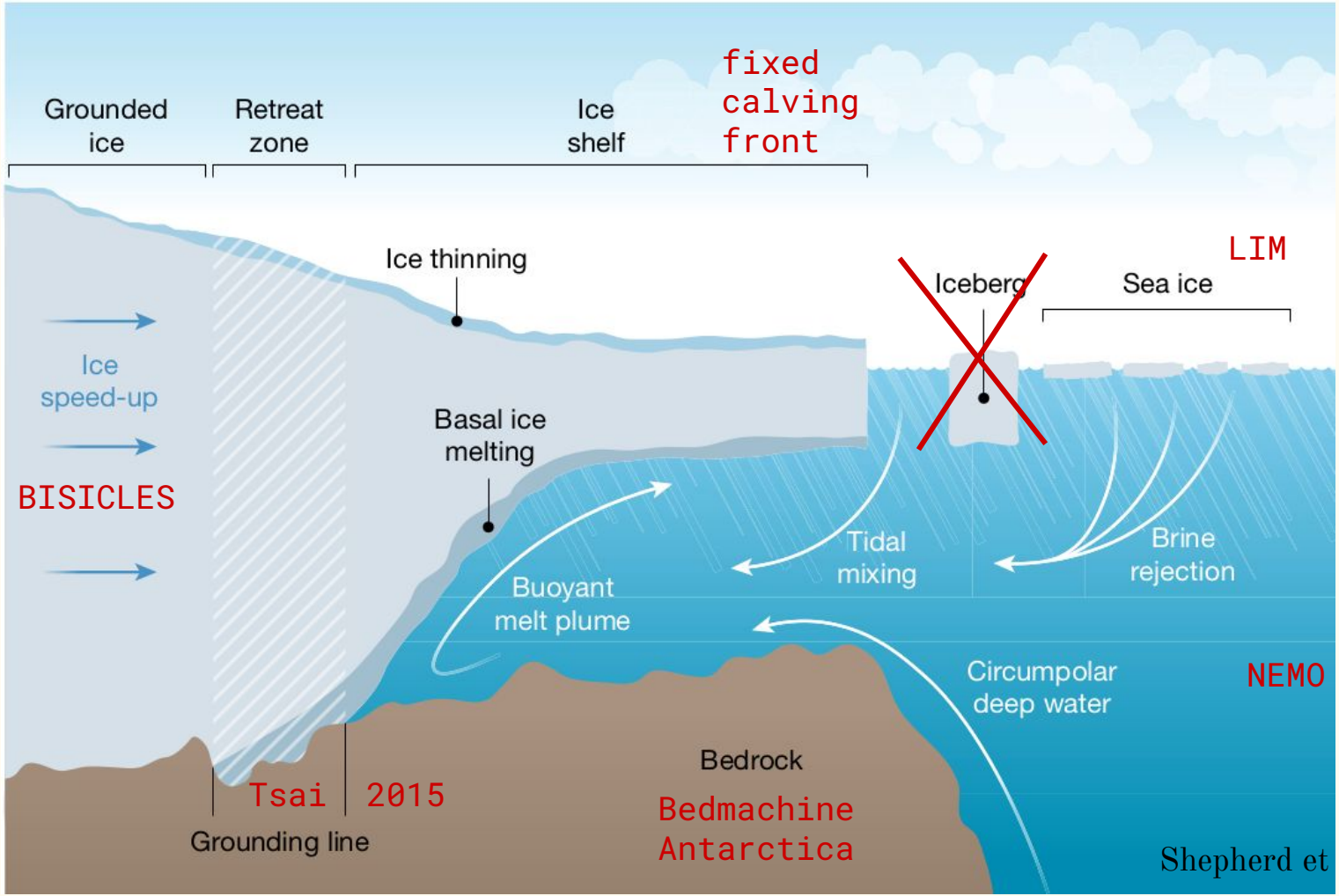


Shepherd et al., 2018

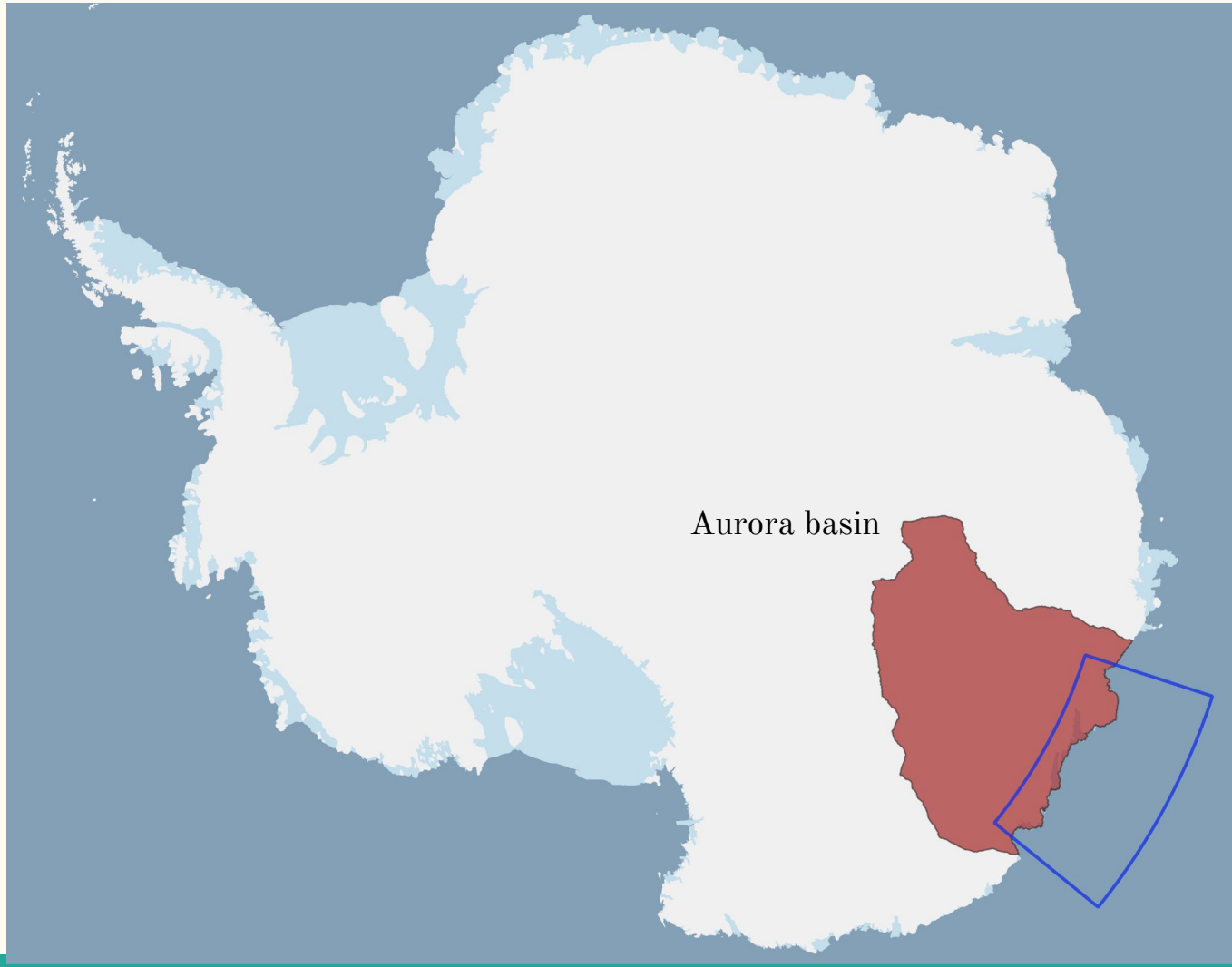


Shepherd et al., 2018

NEMO

&

BISICLES



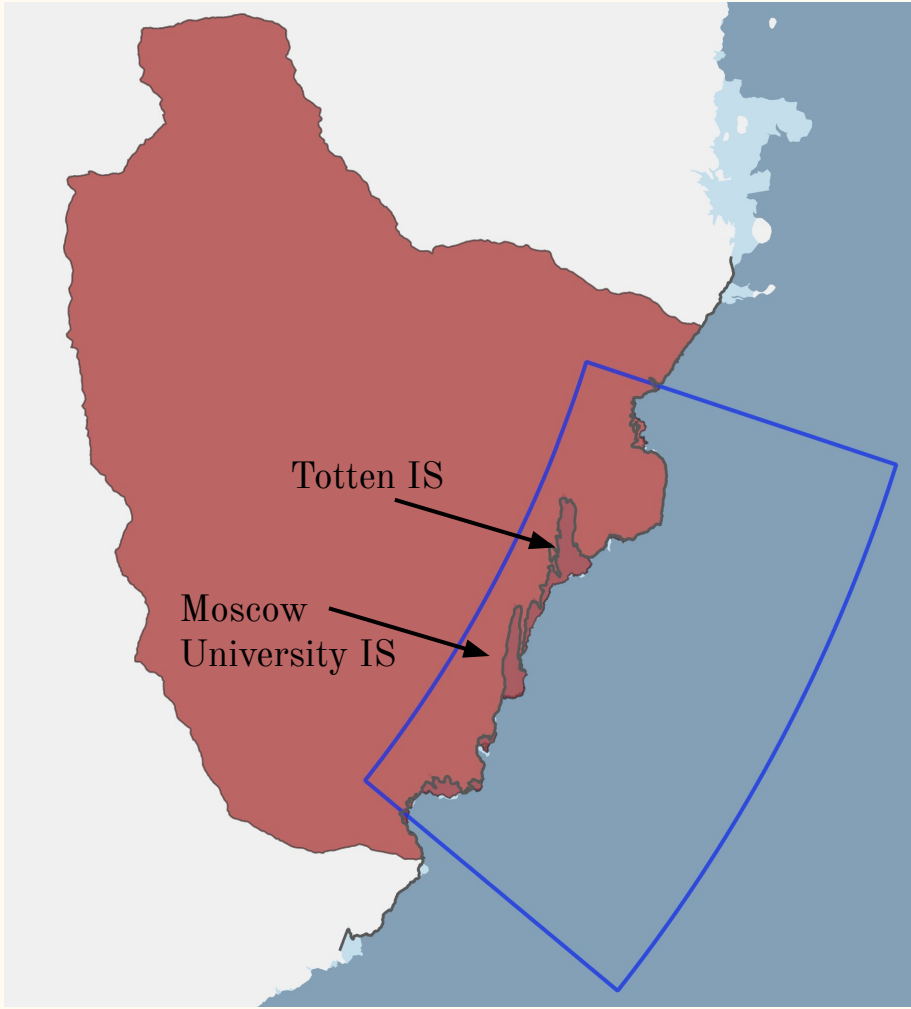
Overview

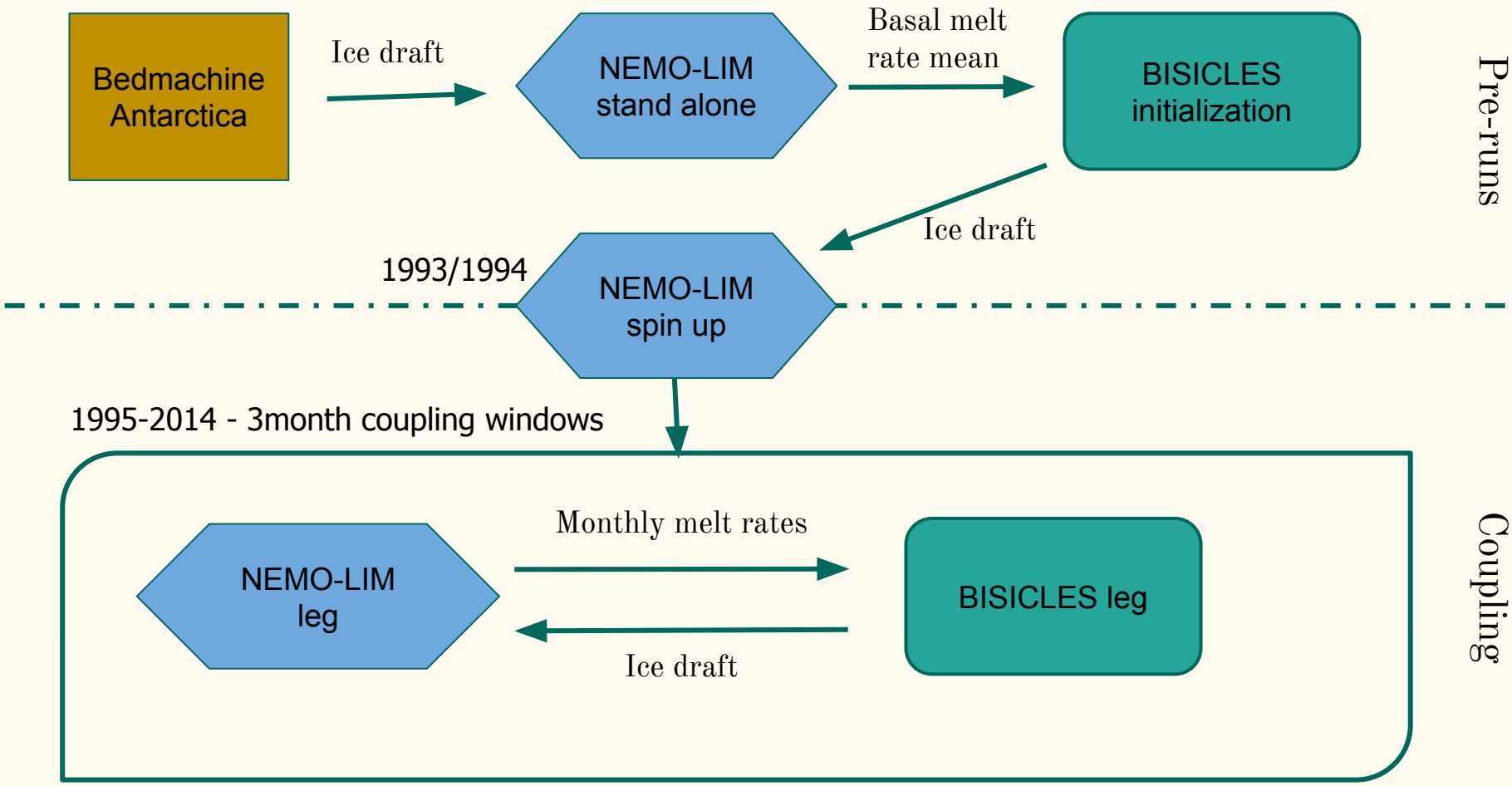
Resolution (temporal & spatial)
NEMO: 150sec 1/24° grid (~2km)
LIM: 900sec 1/24° grid (~2km)

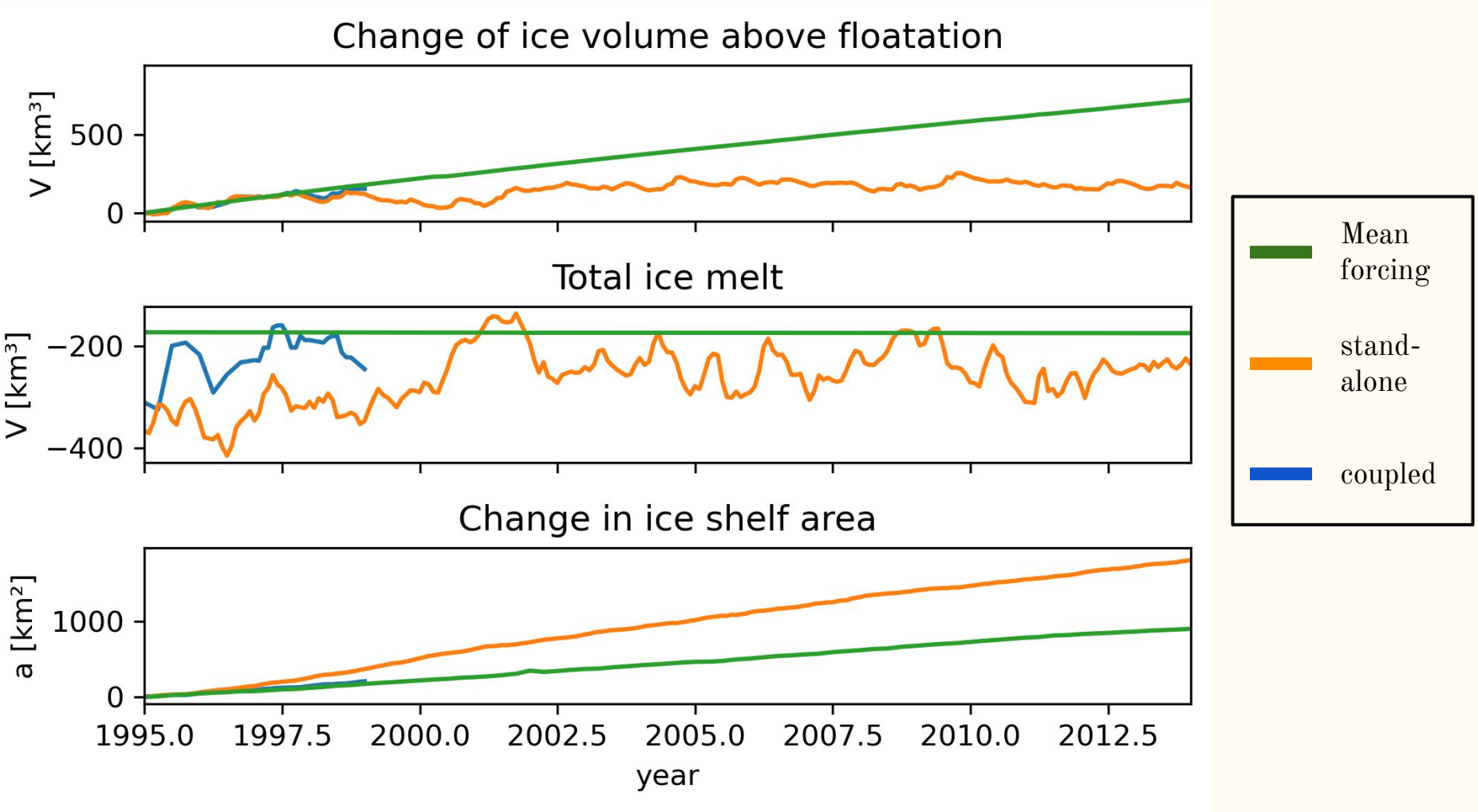
BISICLES: ~ 10d (adaptive time steps (CFL)
500m - 4km

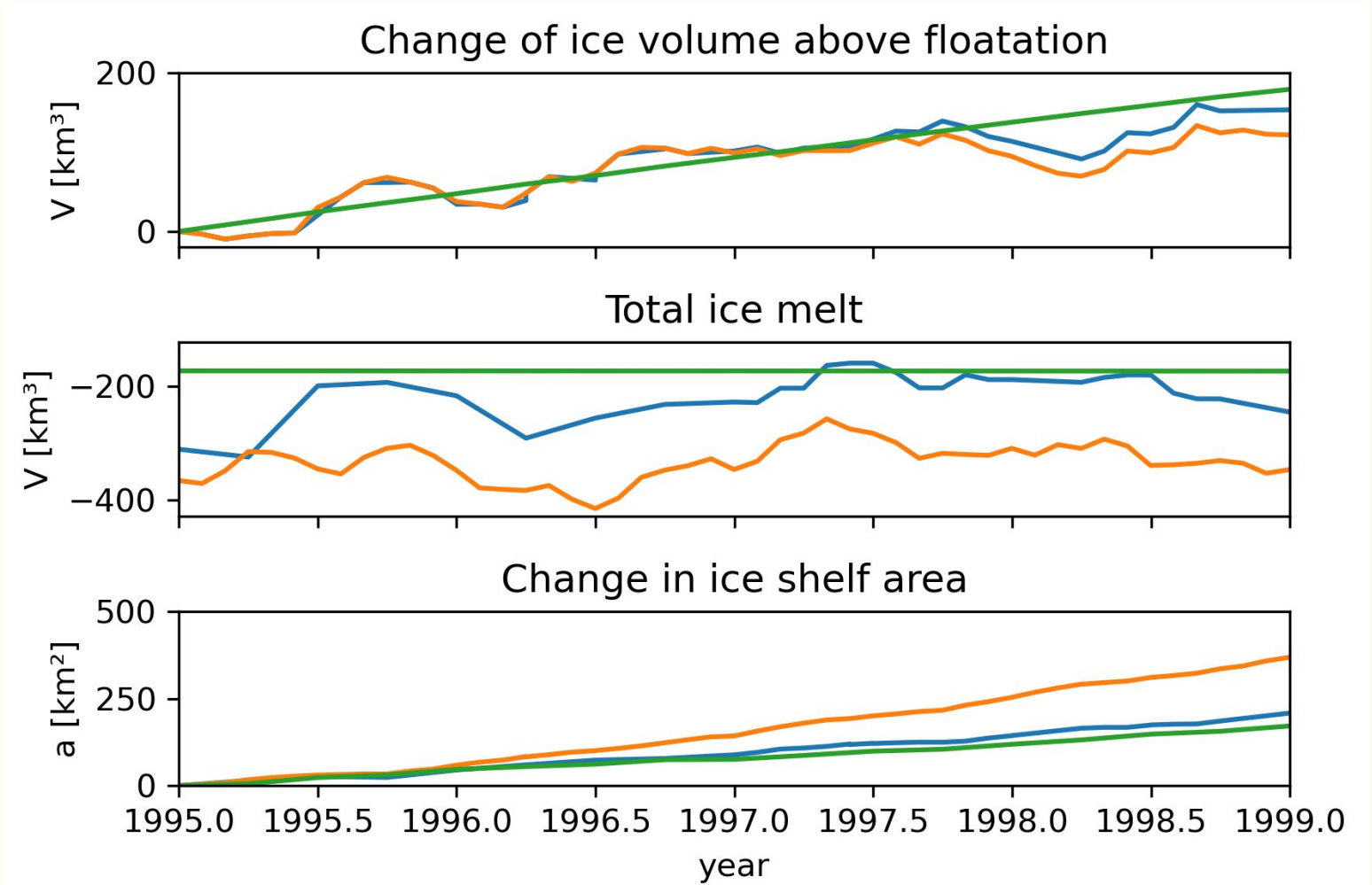
Boundary Conditions:
NEMO: NEMO PARASO (Antarctica run)
& ERA5

BISICLES: MAR mean SMB(1988-1998)
+ monthly COSMO-CLM anomalies
fixed calving front

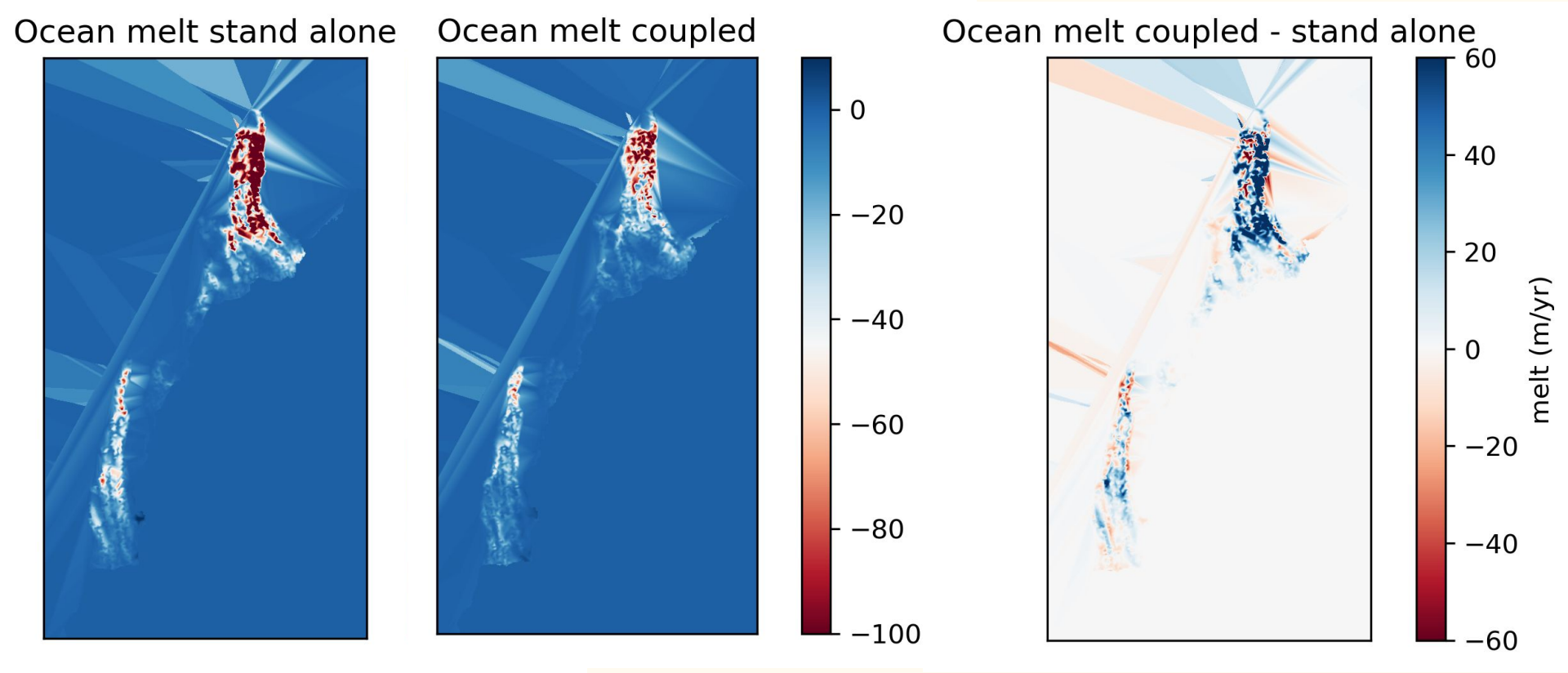



Bedmachine Antarctica
Ice draft
NEMO-LIM stand alone
Basal melt rate mean
BISICLES initialization
Pre-runs
Ice draft
1993/1994
NEMO-LIM spin up
1995-2014 - 3month coupling windows
Monthly melt rates
NEMO-LIM leg
BISICLES leg
Ice draft
Coupling


Change of ice volume above floatation
V [km³]
500
0
Total ice melt
V [km³]
−200
−400
Change in ice shelf area
a [km²]
1000
0
1995.0
1997.5
2000.0
2002.5
2005.0
2007.5
2010.0
2012.5
year
Mean forcing
stand-alone
coupled


Change of ice volume above floatation
V [km³]
200
0
Total ice melt
V [km³]
−200
−400
Change in ice shelf area
a [km²]
500
250
0
1995.0
1995.5
1996.0
1996.5
1997.0
1997.5
1998.0
1998.5
1999.0
year
Mean forcing
stand-alone
coupled

Ocean melt rates in Jan 1998



Conclusions

- NEMO can deal with icea draft changes on this resolution
- Fluctuation in melt rates seem still to be dominated by boundary condition forcing
- Ocean stand alone simulation over-estimates melt rates (ice draft changes in coupled run lead to decrease in melt rates)

...to be continued (16 more years of simulation)