

Are we Redi?

Andy Hogg

Eddy-Permitting
models

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025

Experiments

Results

Options for
proceeding

Are we Redi for 0.25° Ocean-Clima Models?

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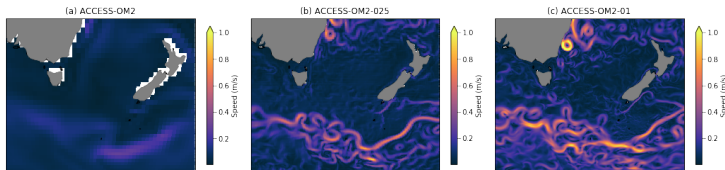
Research School of Earth Sciences
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Eddy-Permitting models

- ▶ Current coupled climate models tend to use a 1° ocean-sea ice model component.
- ▶ The 0.25° family of models is better at representing mesoscale features, which may alter low-frequency climate variability.
- ▶ But “eddy-permitting” models also have their problems (the subject of this talk).
- ▶ 0.1° models remain prohibitively expensive for climate studies (for Australia).



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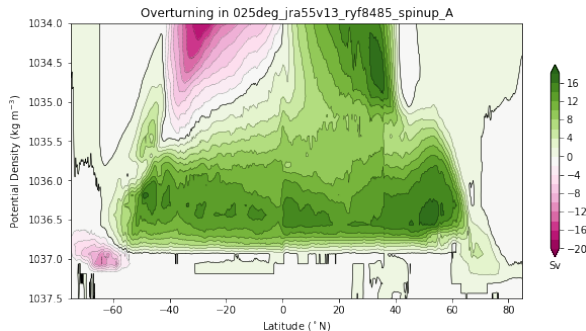
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- ▶ Our 0.25° models suffer from weak Bottom Water.
- ▶ → weak Drake Passage transport, enhanced ocean heat uptake.
- ▶ BGC models perform poorly (Chamberlain).
- ▶ Because eddies are neither resolved nor parameterised?



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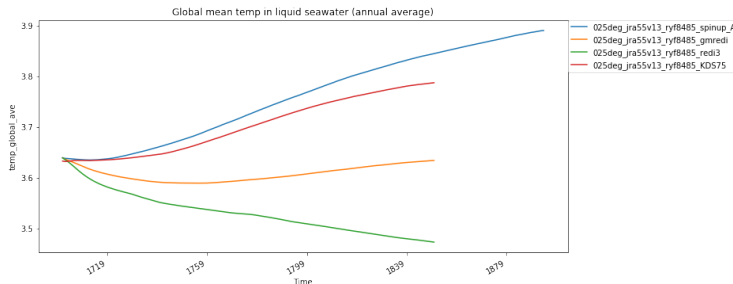
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- spinup** Our standard spinup case
 - gmredi** Added Gent-McWilliams eddy parameterisation and Redi diffusion
 - redi3** No GM, only Redi
 - KDS75** Enhanced vertical resolution
- Each case is run for 150 years or more



GM: gives better overturning ...

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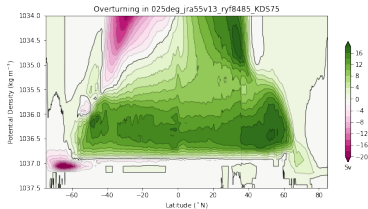
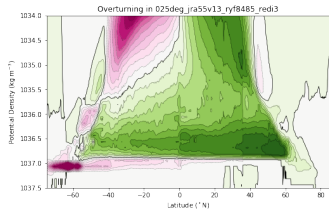
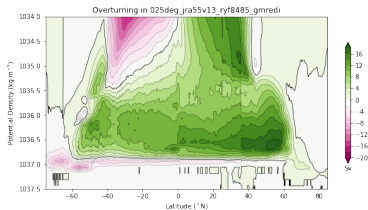
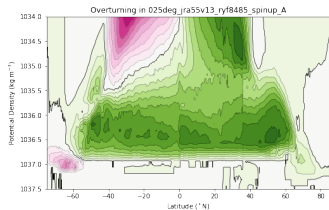
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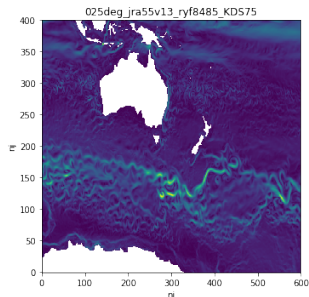
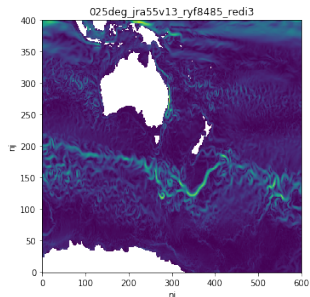
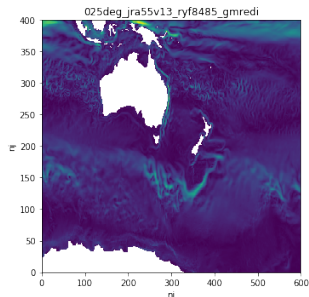
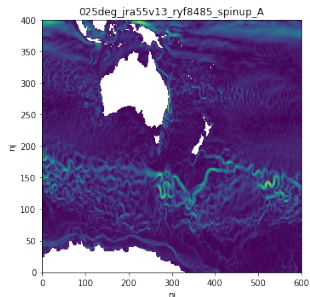
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GM: ...but terrible velocity fields

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Redi: better heat uptake & DP transport ...

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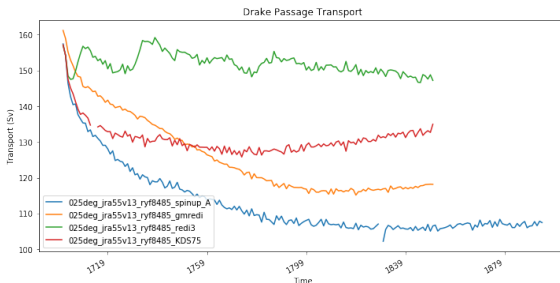
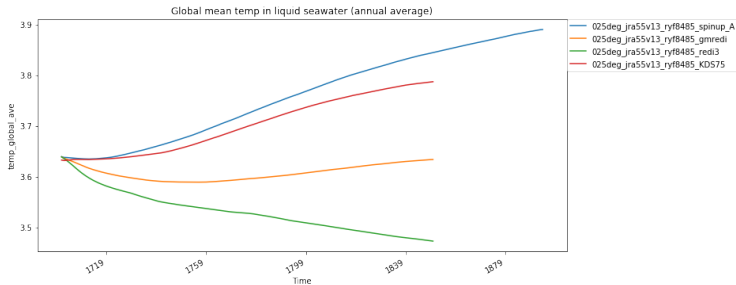
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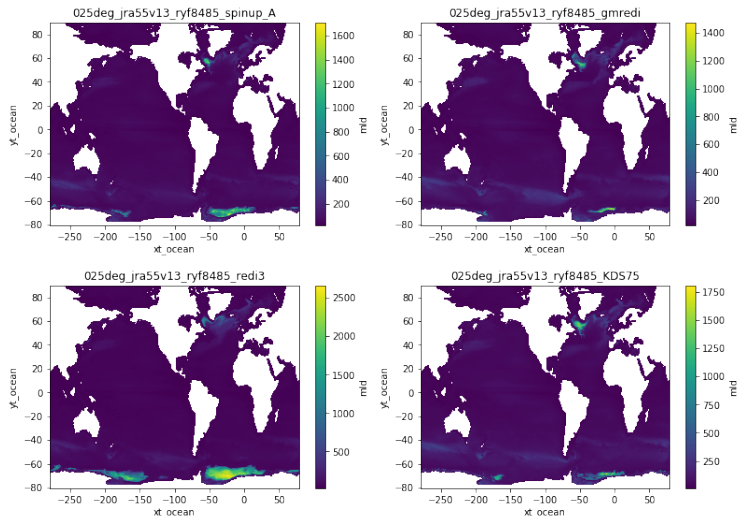
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Redi: ...but Weddell polynyas are huge

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KDS75: Better than spinup, but AABW weak

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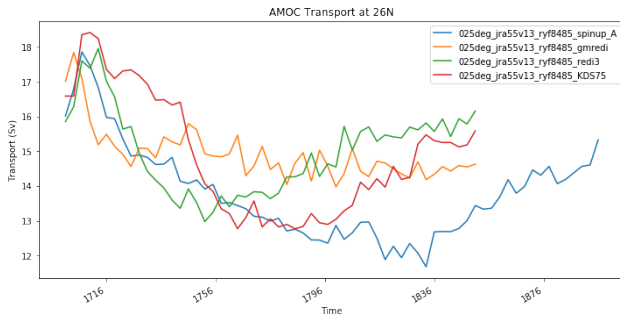
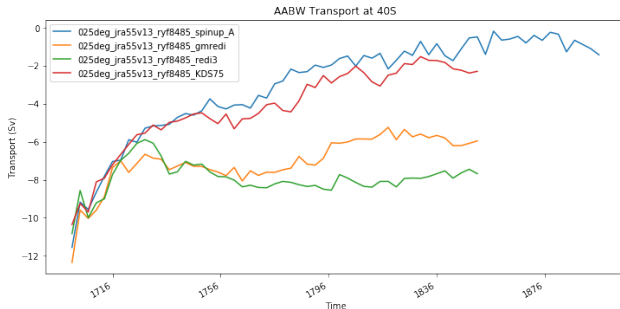
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Options for proceeding

- ▶ Deeper analysis and slightly longer runs may tell us more.
- ▶ Check out latitudinal dependence GM schemes in MOM.
- ▶ Hallberg's (2013) solution for switching GM on only when Rossby radius is unresolved?
- ▶ Forget about 0.25° and run everything at 0.1° ? (The NCAR option)
- ▶ Any other ideas?

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