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Laboratoire d'Océanographie et du Climat

The role of tides in ocean–ice-shelf interactions in the southwestern Weddell Sea

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for more: Hausmann et al. (2020), *JGR Oceans,* doi: 10.1029/2019JC015847

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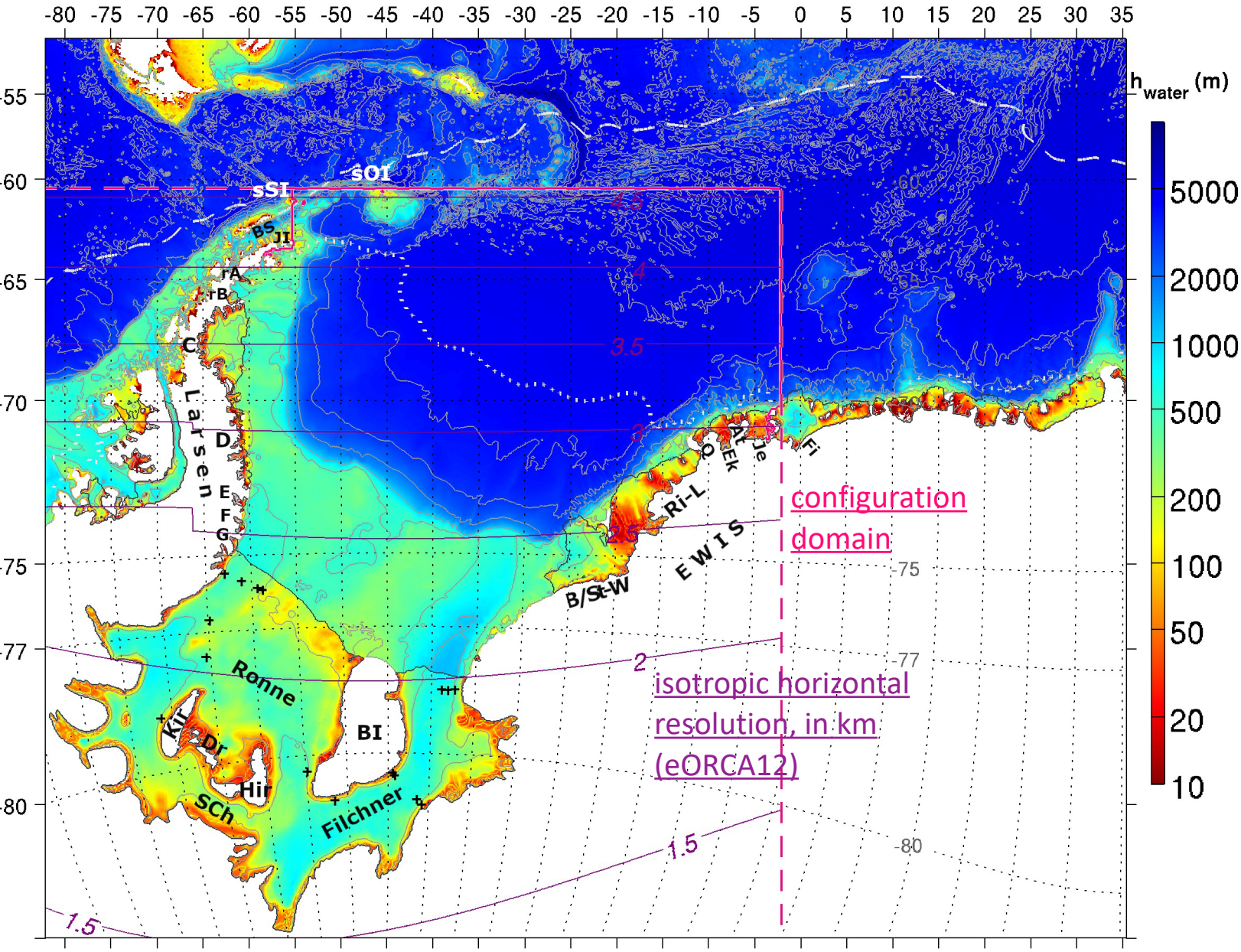
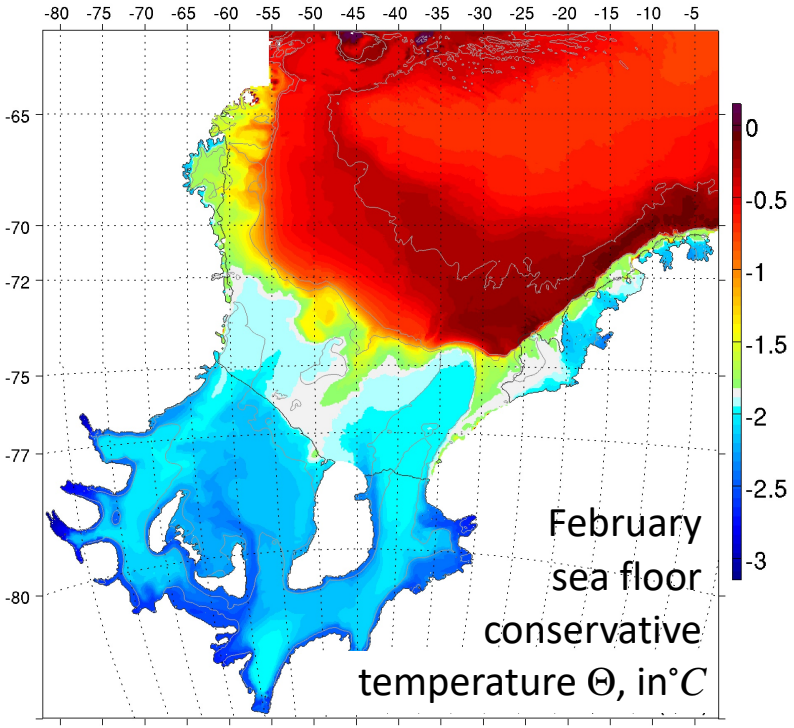
New regional ocean sea-ice model configuration, interacting with ice-shelf melting in resolved cavities

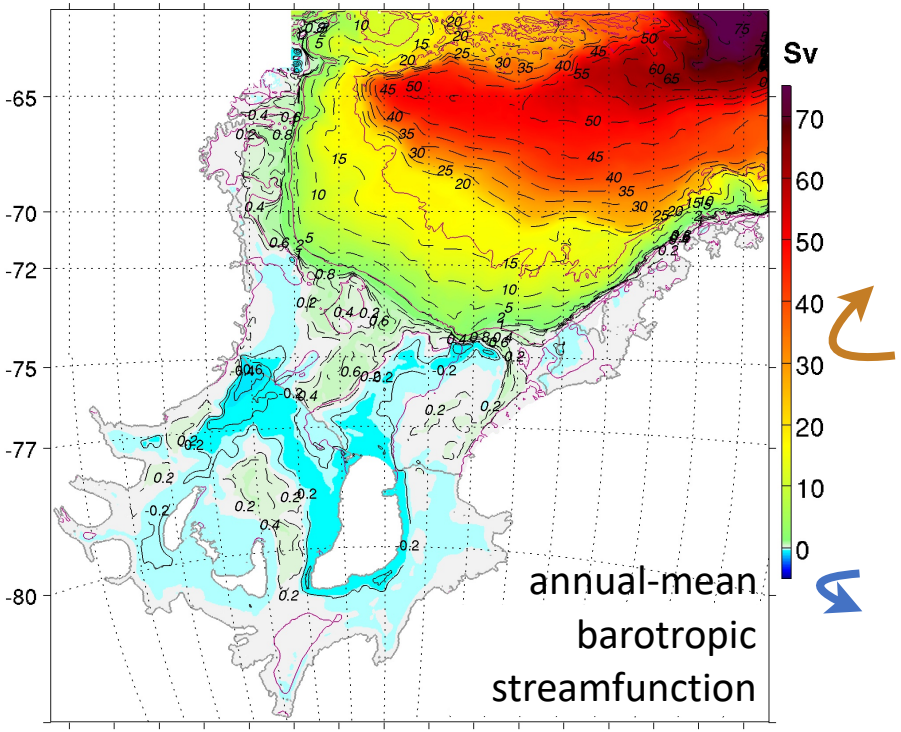


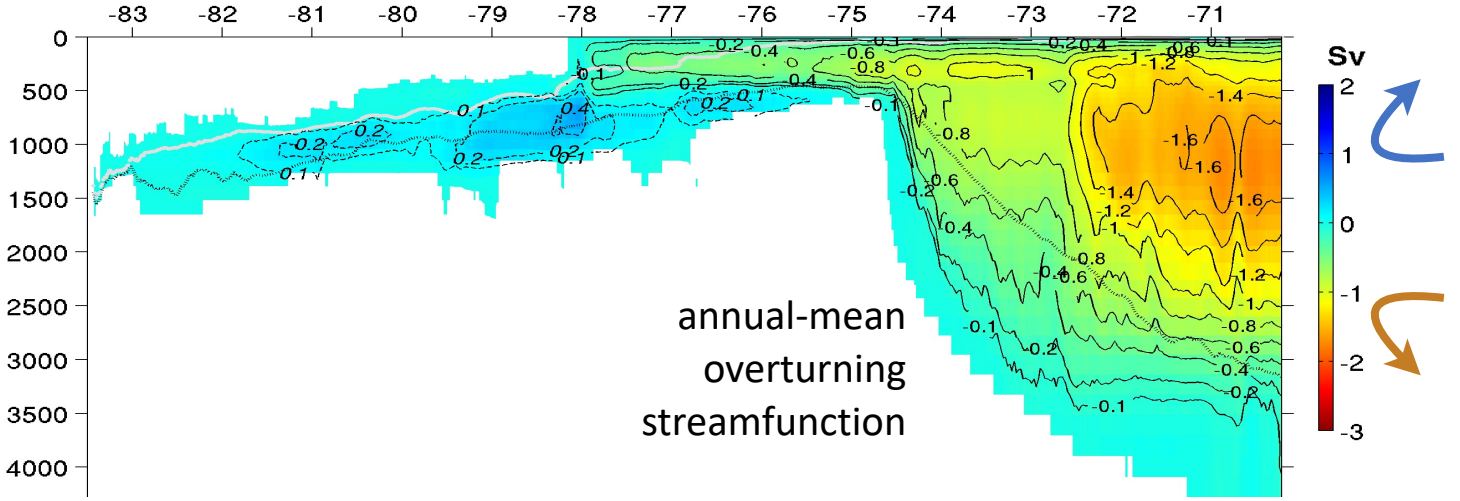
- NEMO 3.6
- interactive melt in resolved ice-shelf cavities (Mathiot et al. 2017)
- z* nonlinear free surface
- tides
- 75-level partial top & bottom cells
- eORCA12
- IBSCO/ BEDMAP2

Figure & more info @ Hausmann et al. 2020, *JGR Oceans*

➢ **illustration of reference experiment simulated properties (5yr-averages):**



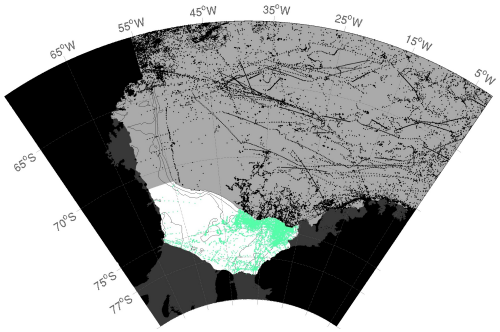




Figures & more info @ [Hausmann et al. 2020, *JGR Oceans*]

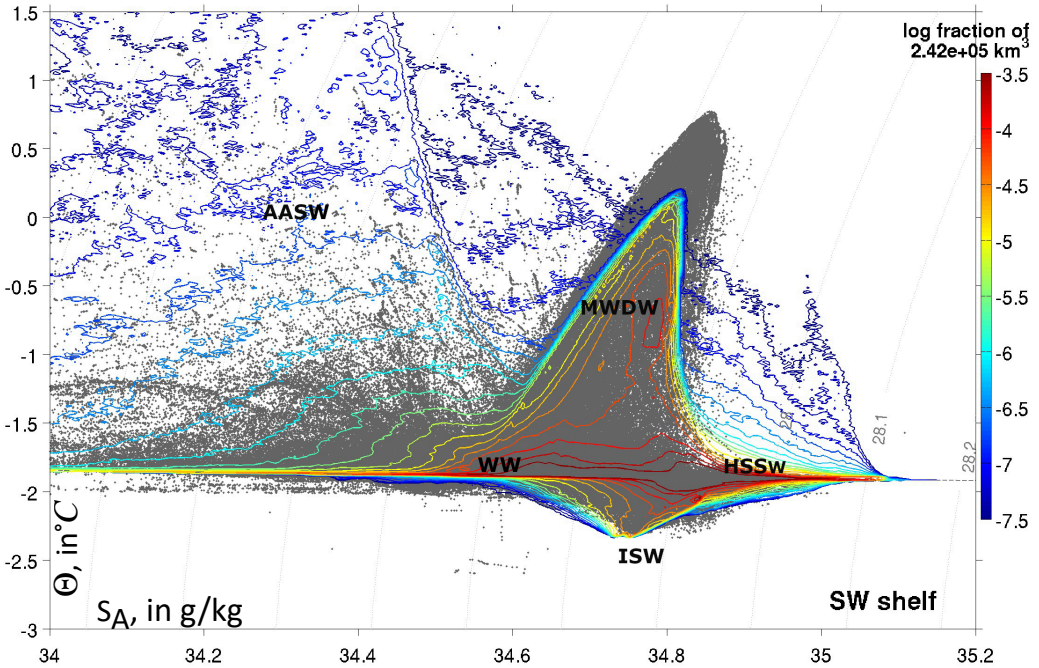
Filchner-Ronne open-ocean continental shelf & ice-shelf cavity water masses

➢ **simulated water mass properties (colors):**
5yr volumetric census in conservative temperature (Θ) — absolute salinity (S_A) space



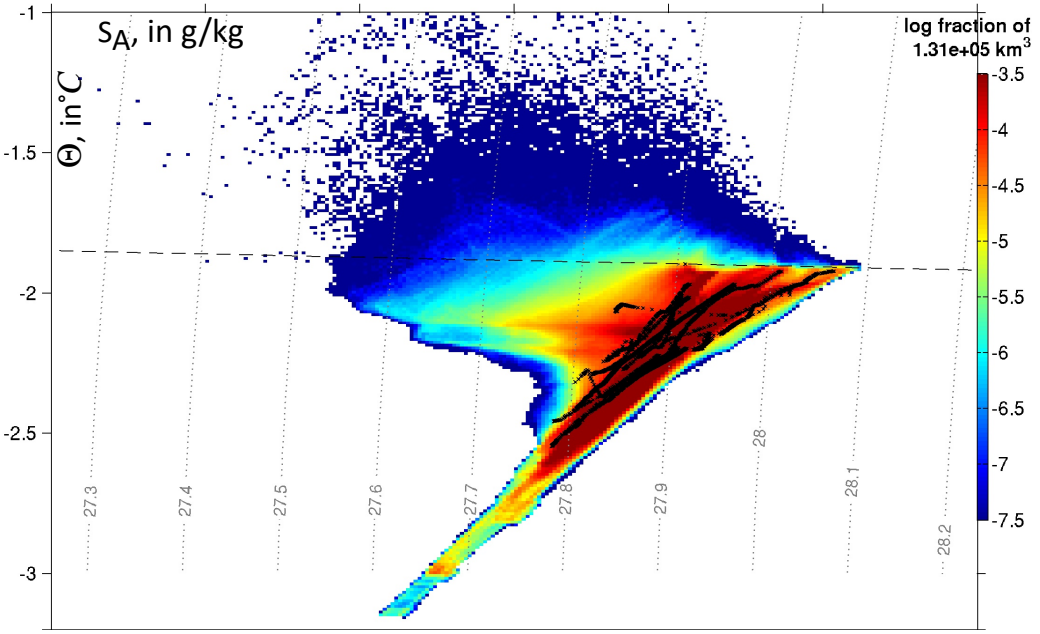
Southwestern Weddell Sea open-ocean continental shelf

versus all available in-situ observations (grey dots) from ships & seals (mapped green above)



Filchner-Ronne ice-shelf cavity

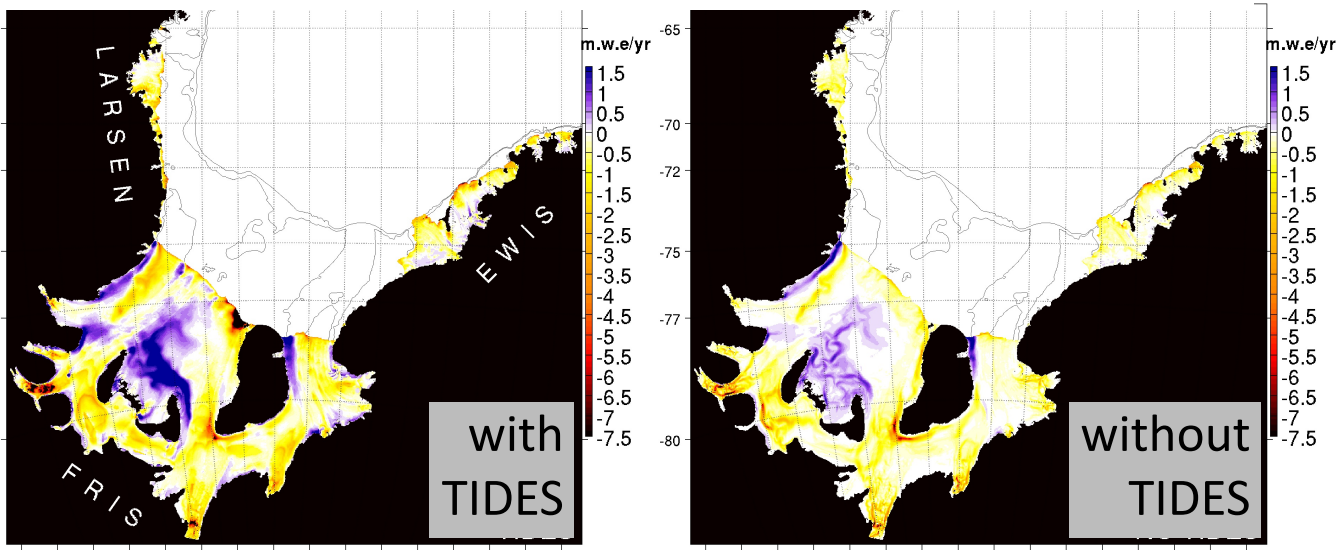
versus sub-ice-shelf CTD profile observations (black dots) from hot-water drill borehole sites (mapped with crosses on slide 2)



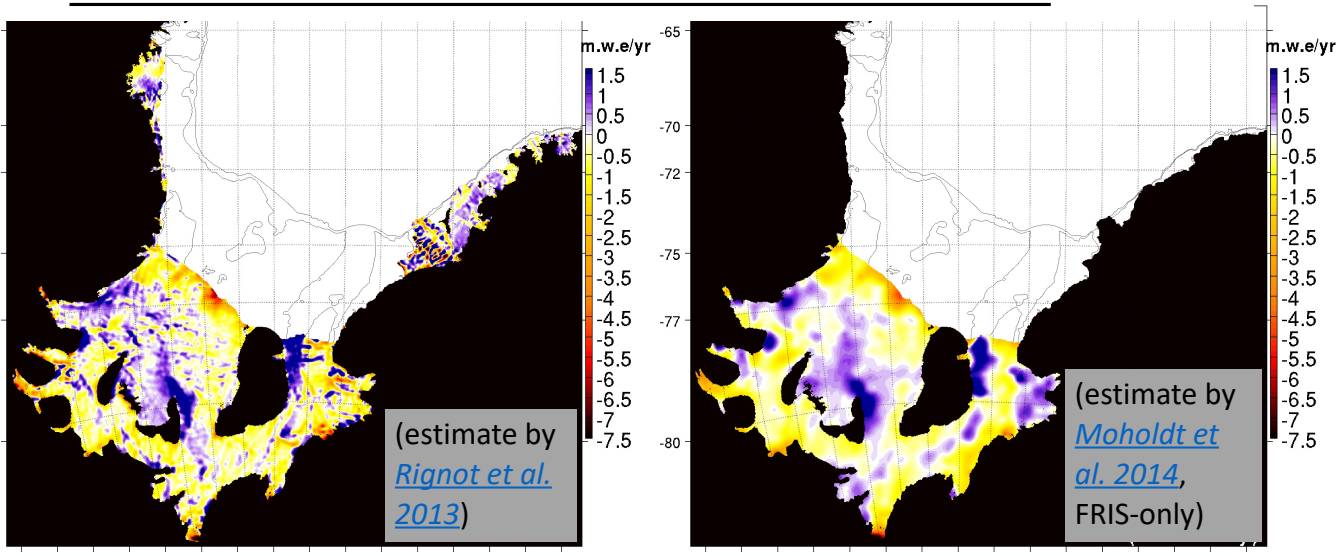
Figures, observational data references & more info @ Hausmann et al. 2020, *JGR Oceans*

Role of tides in Weddell Sea ocean—ice-shelf interactions

simulated basal melt rates (<0 melt, >0 refreeze):



satellite-observation derived basal melt estimates:



Ocean tides:

- instrumental in shaping observed melt: intensify basal melt/refreeze pattern, thereby **increase net mass loss** by 50%
- primary mechanism driving is enhanced time-varying kinetic energy at ice draft, with thermal adjustment substantially damping the melt response (by 85-90%)
- **associated meltwater fluxes feedback on** melt-driven **circulation**, sea-ice distribution **&** deep **water mass properties**
- **key to adequately represent** in the next generation of climate models & future coupled climate – ice sheet modelling

Figure & **to find out more:** Hausmann et al. 2020, *JGR Oceans*