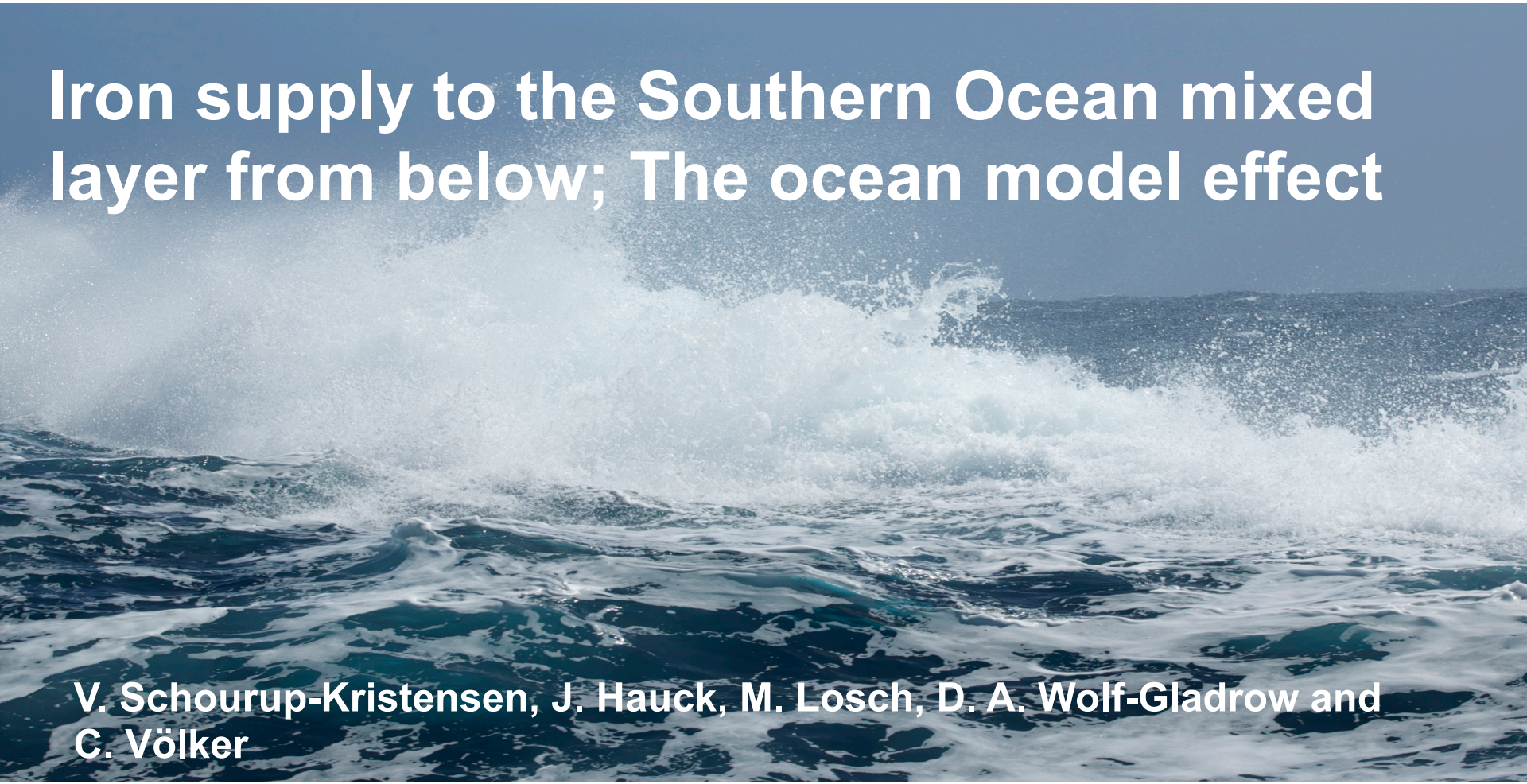
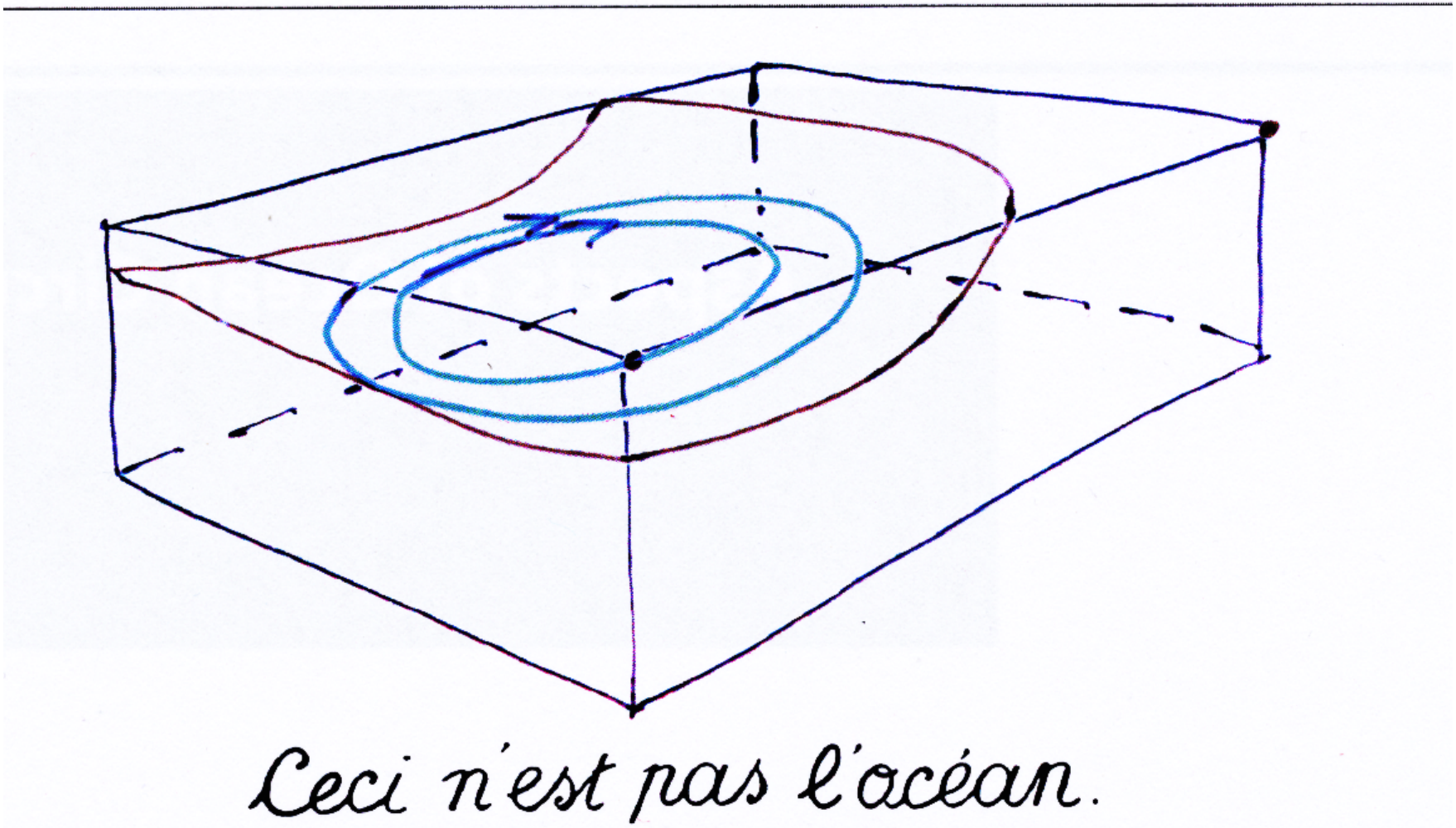
ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR- UND MEERESFORSCHUNG

Iron supply to the Southern Ocean mixed layer from below; The ocean model effect



V. Schourup-Kristensen, J. Hauck, M. Losch, D. A. Wolf-Gladrow and C. Völker

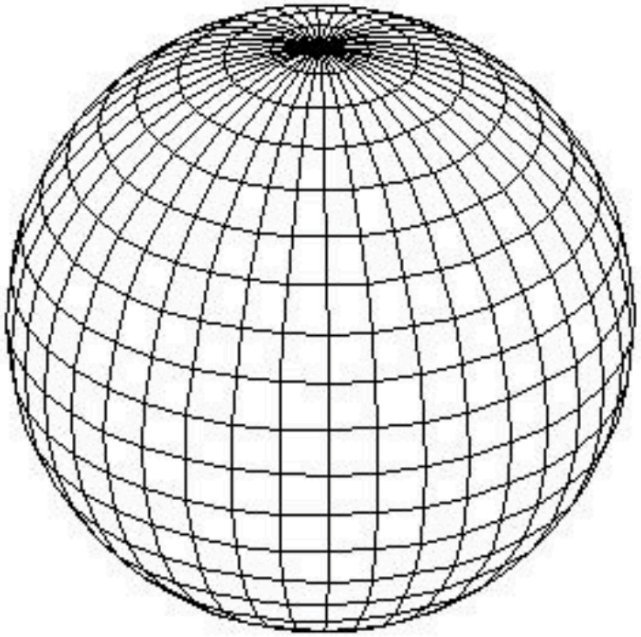
HELMHOLTZ ASSOCIATION



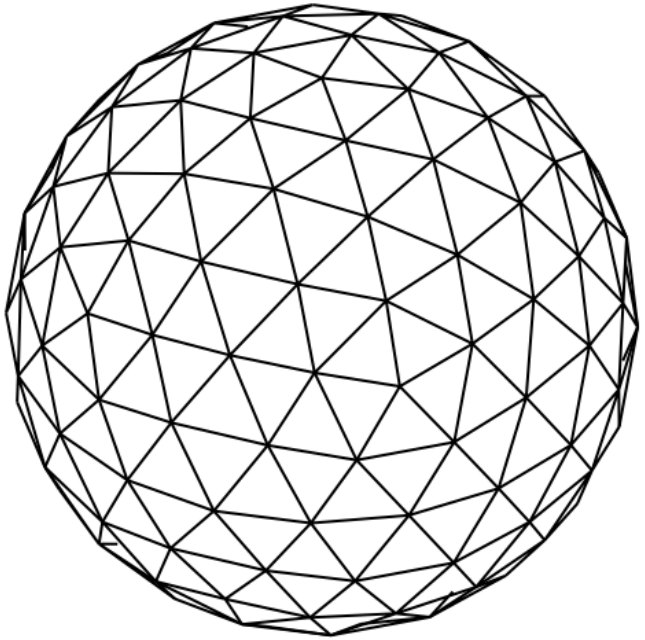
Olbers et al. (2012)

Two identical model runs

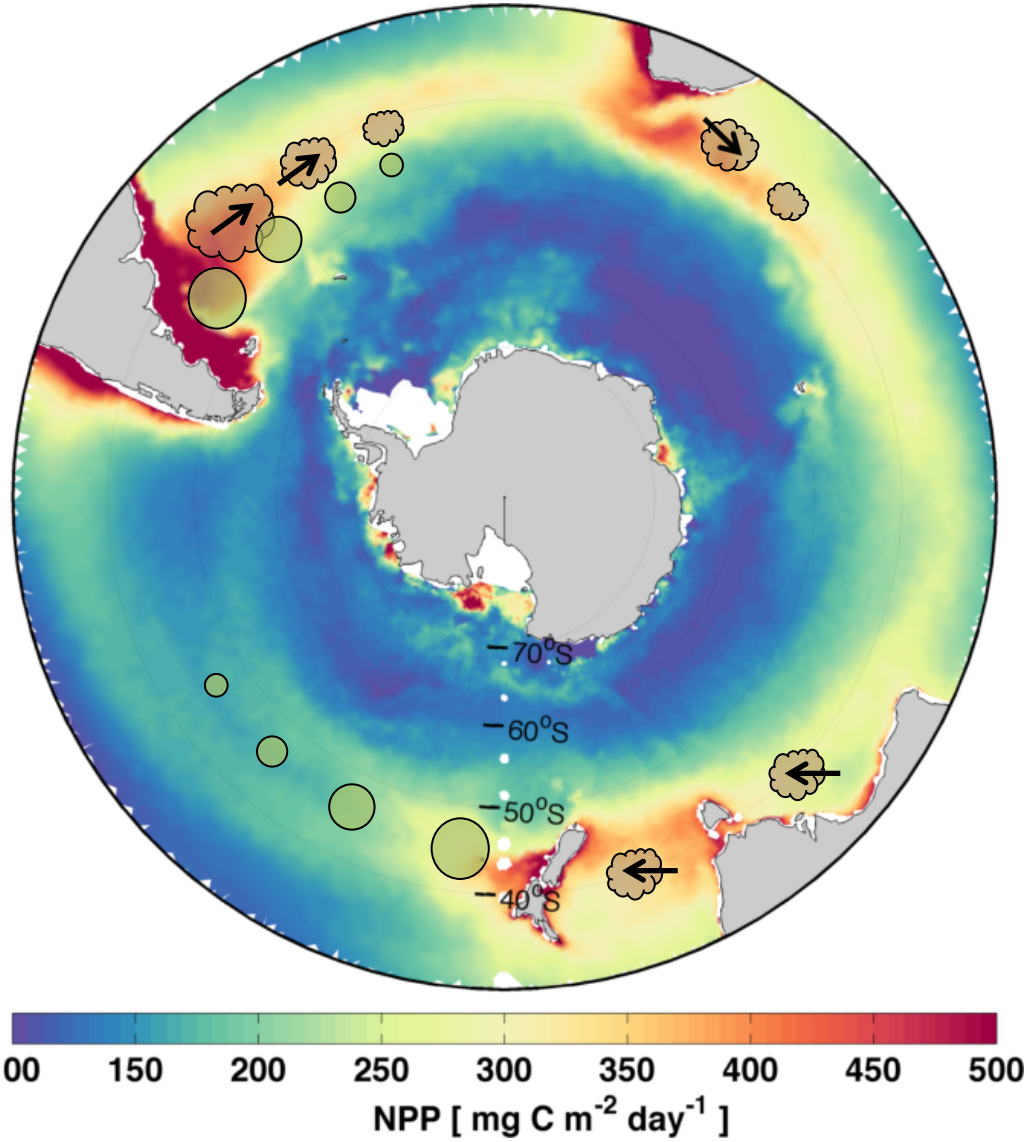
MITgcm - REcoM2



FESOM - REcoM2



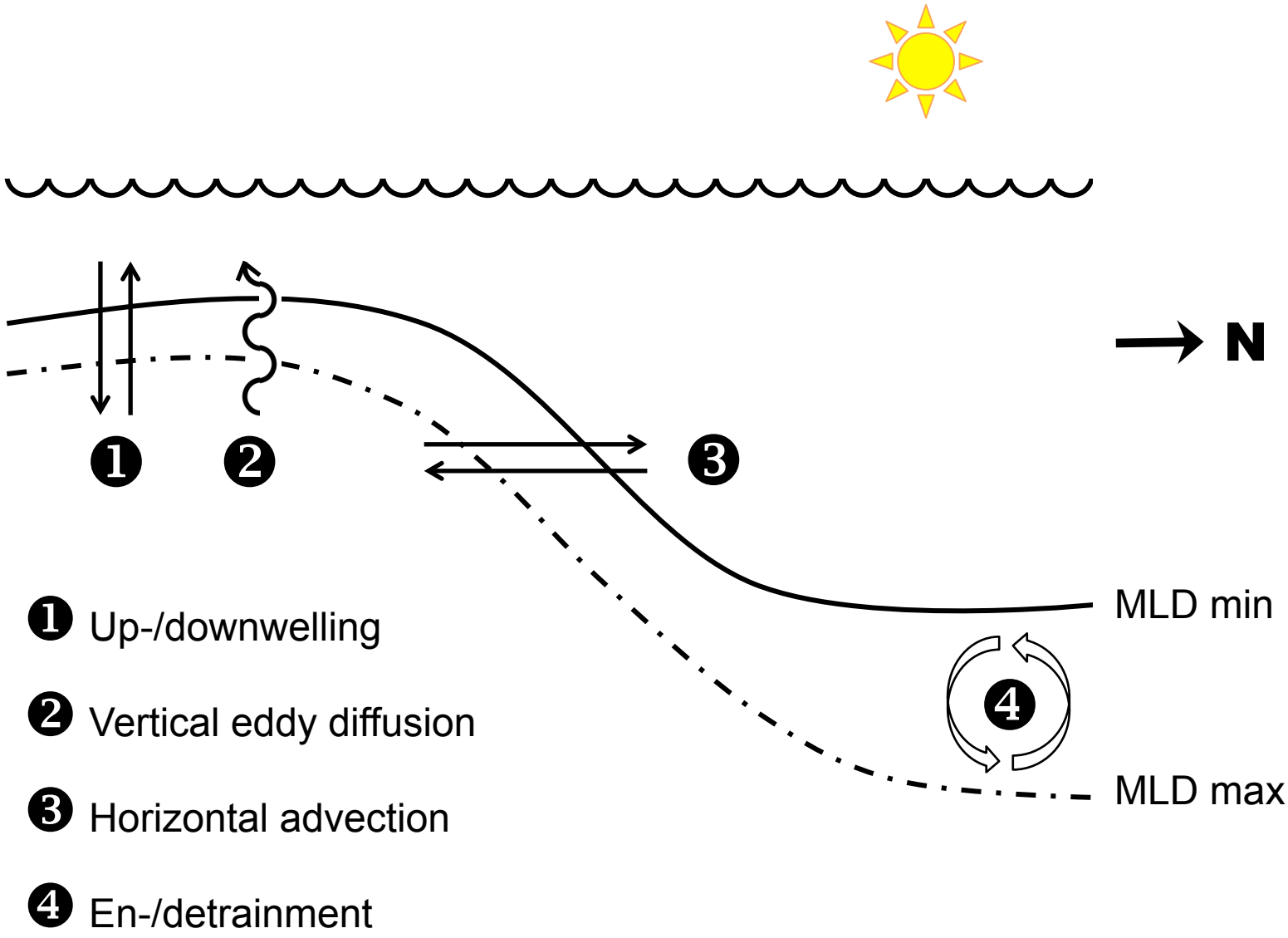
The Southern Ocean; and HNLC area



Dust

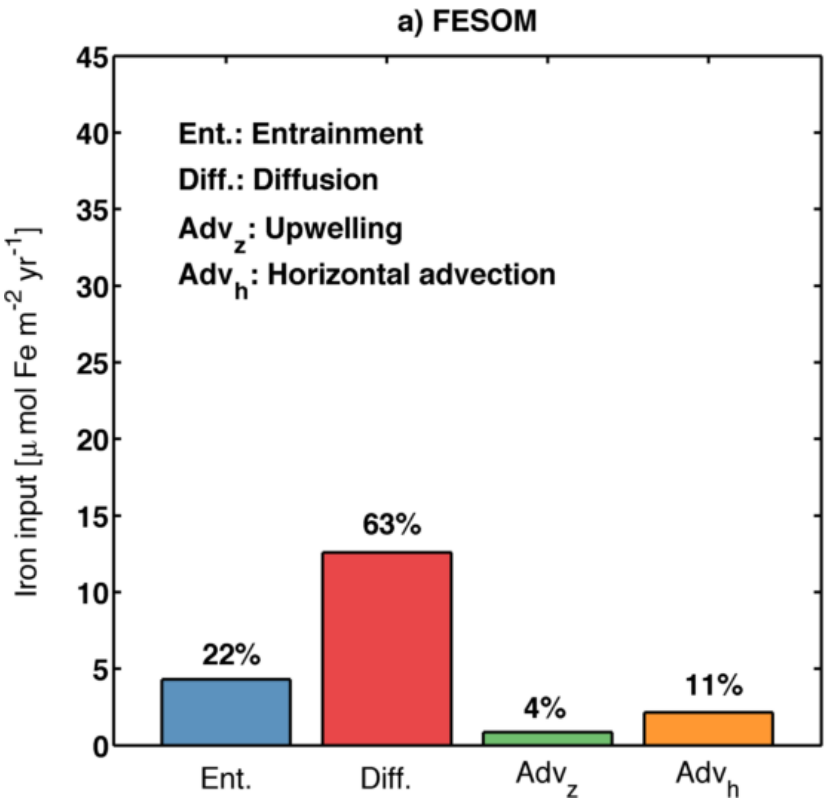
Sediments

Physical iron supply

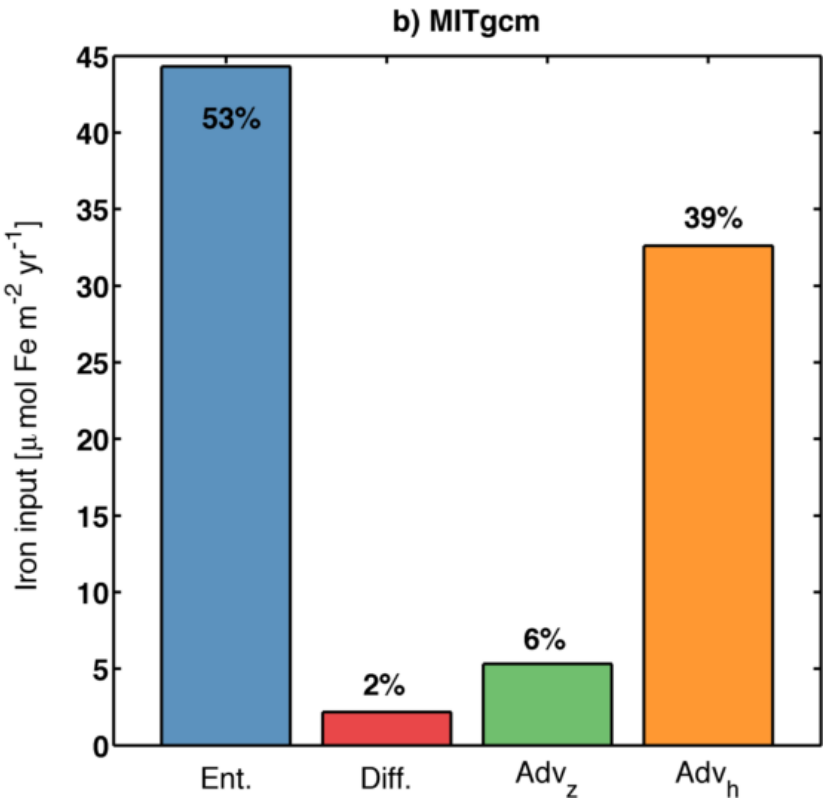


1. Up-/downwelling
2. Vertical eddy diffusion
3. Horizontal advection
4. En-/detrainment

Total iron supply from below

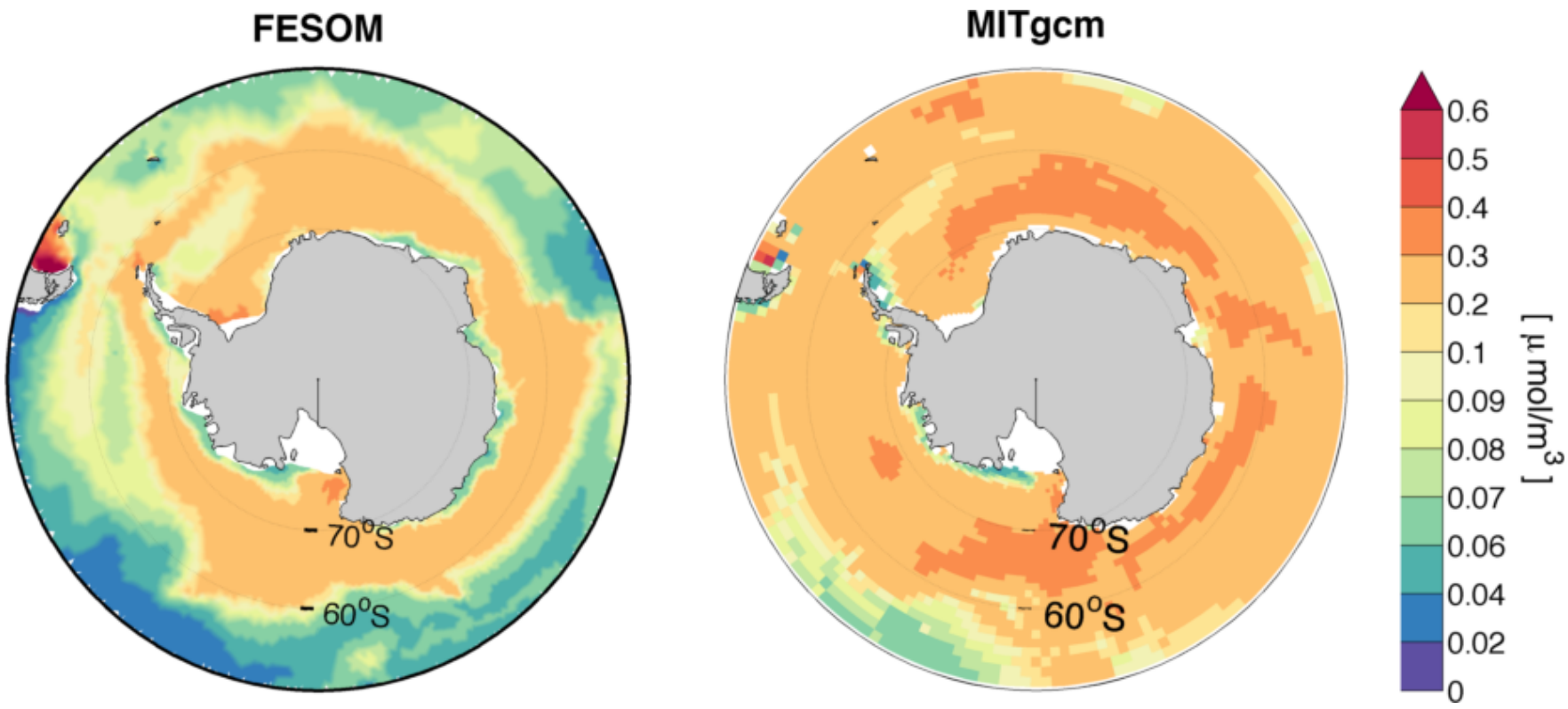


20 μmol Fe m^{-2} yr^{-1}

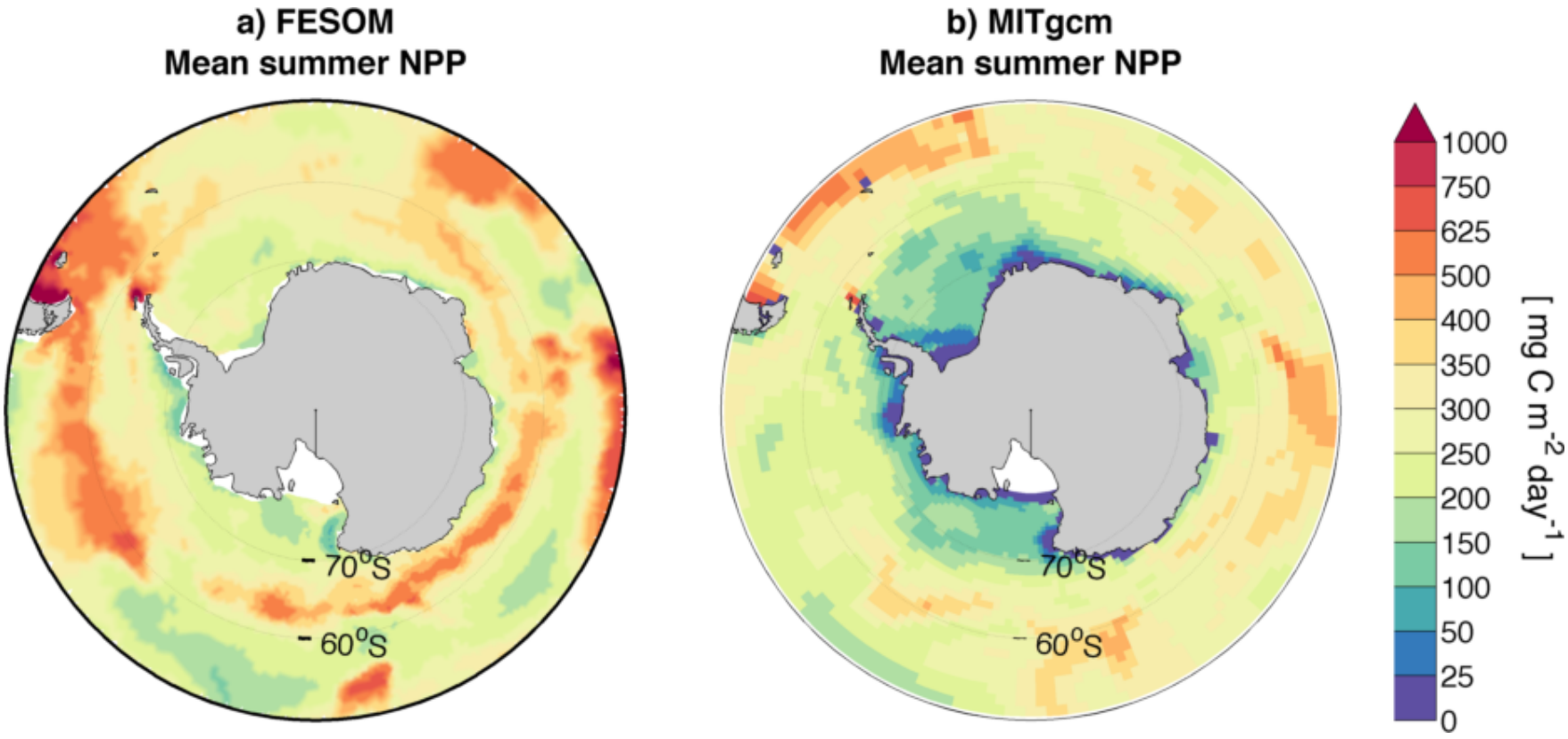


84 μmol Fe m^{-2} yr^{-1}

Surface iron concentrations



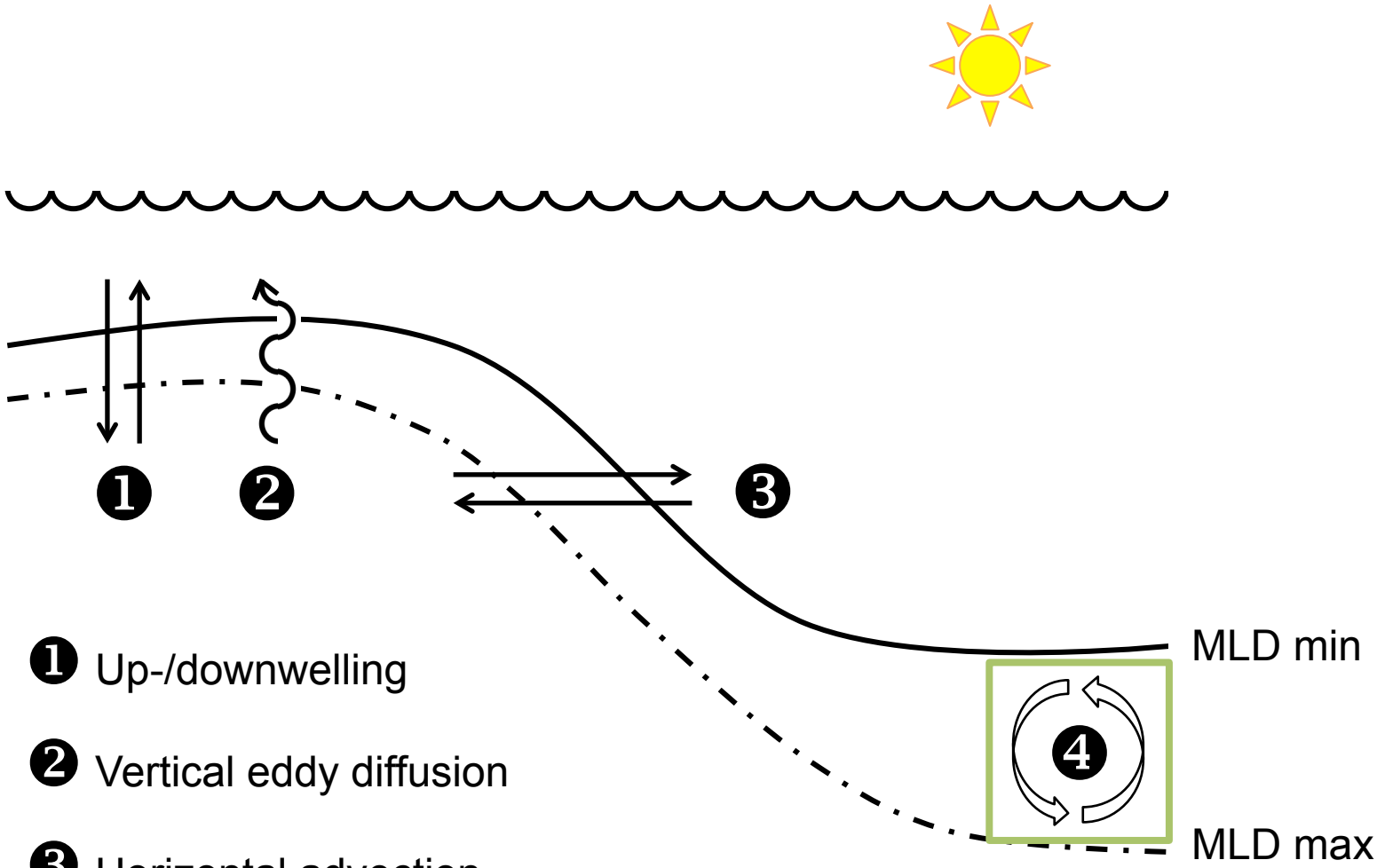
Net primary production



NPP : 3.1 Pg C yr^{-1}
EP : 1.1 Pg C yr^{-1}

NPP : 2.1 Pg C yr^{-1}
EP : 1.2 Pg C yr^{-1}

Physical iron supply



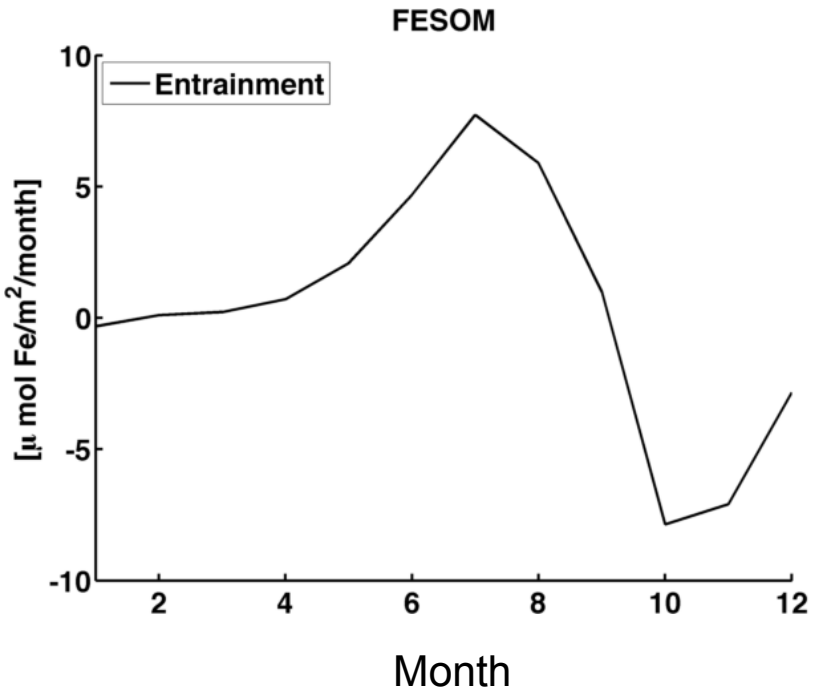
❶ Up-/downwelling

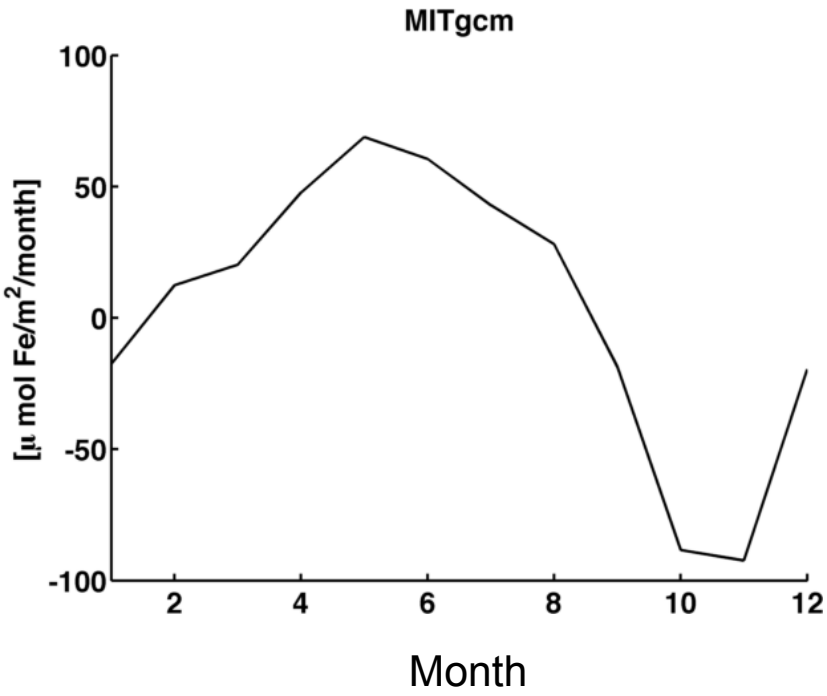
❷ Vertical eddy diffusion

❸ Horizontal advection

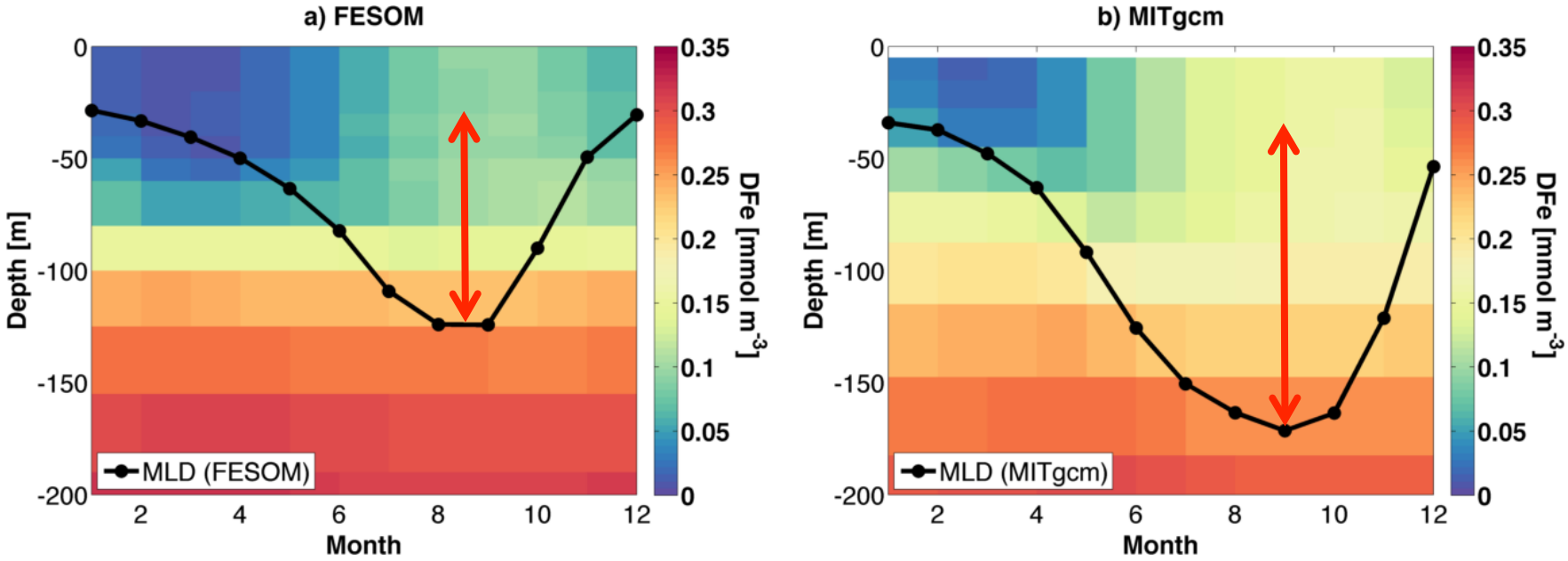
❹ En-/detrainment

Seasonal iron supply; Entrainment

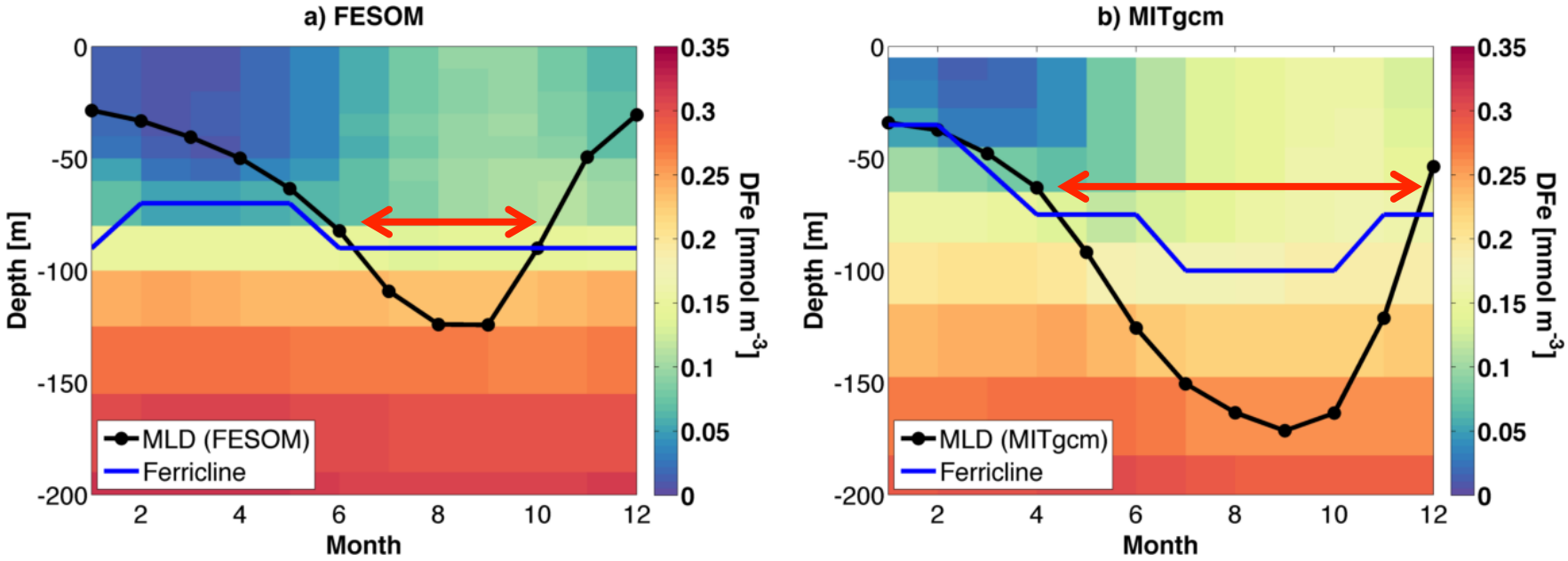




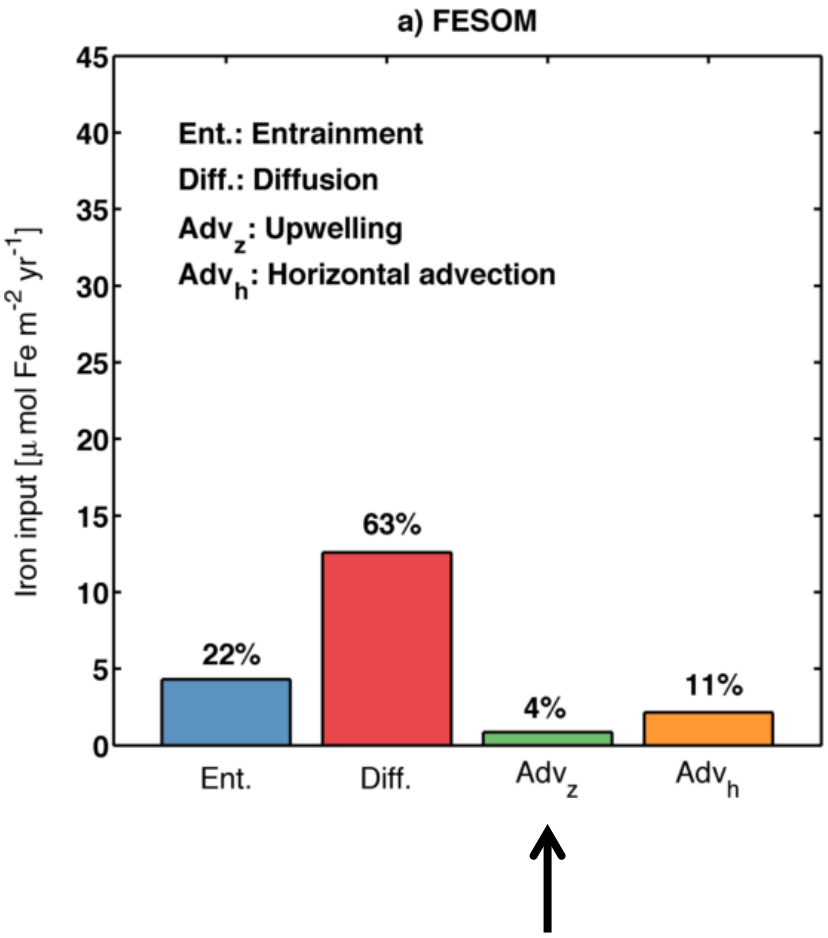
Seasonal MLD and ferricline

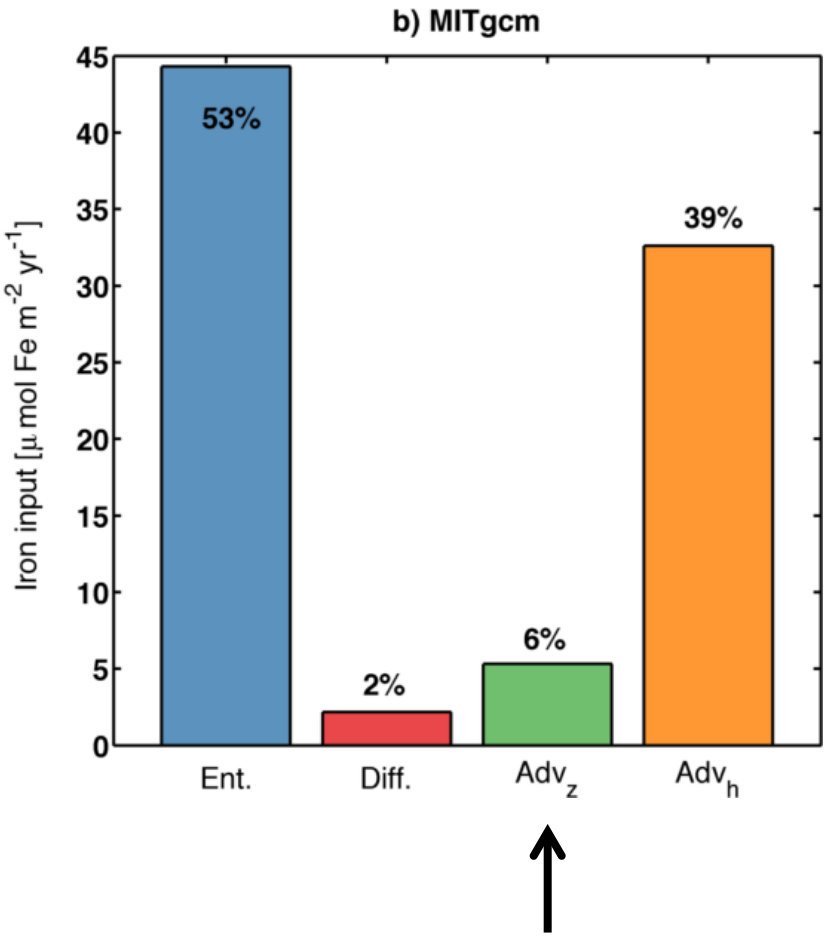


Seasonal MLD and ferricline

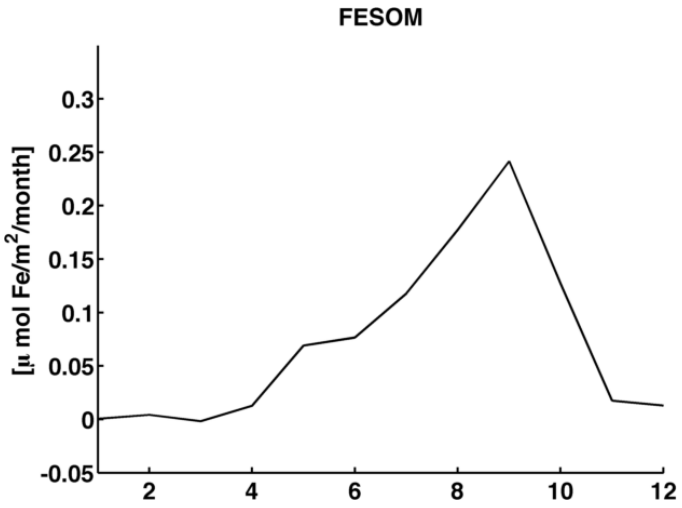


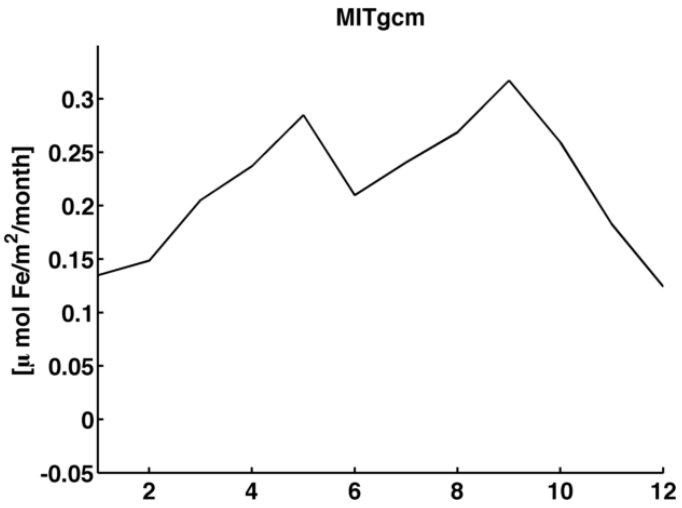
Total iron supply from below

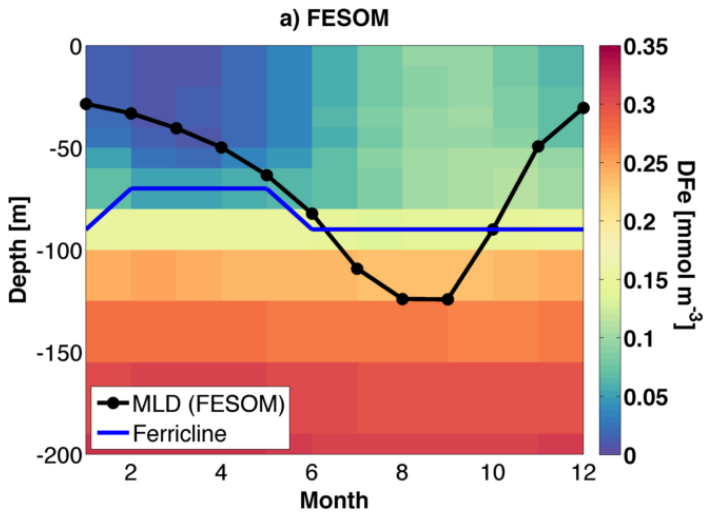


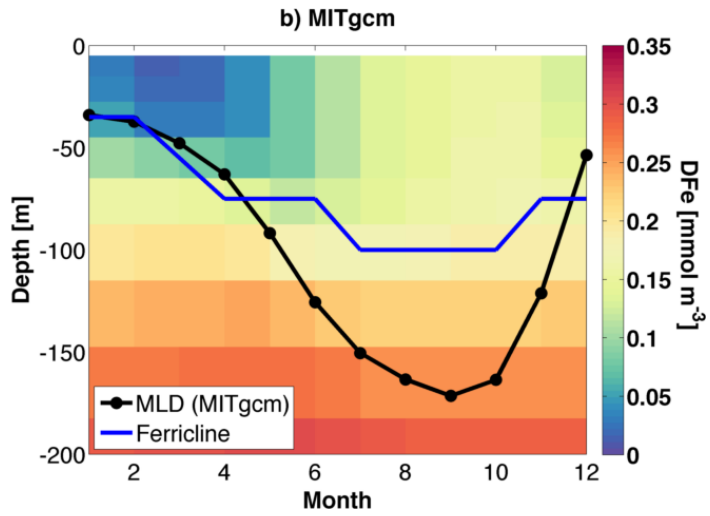


Upwelling of iron

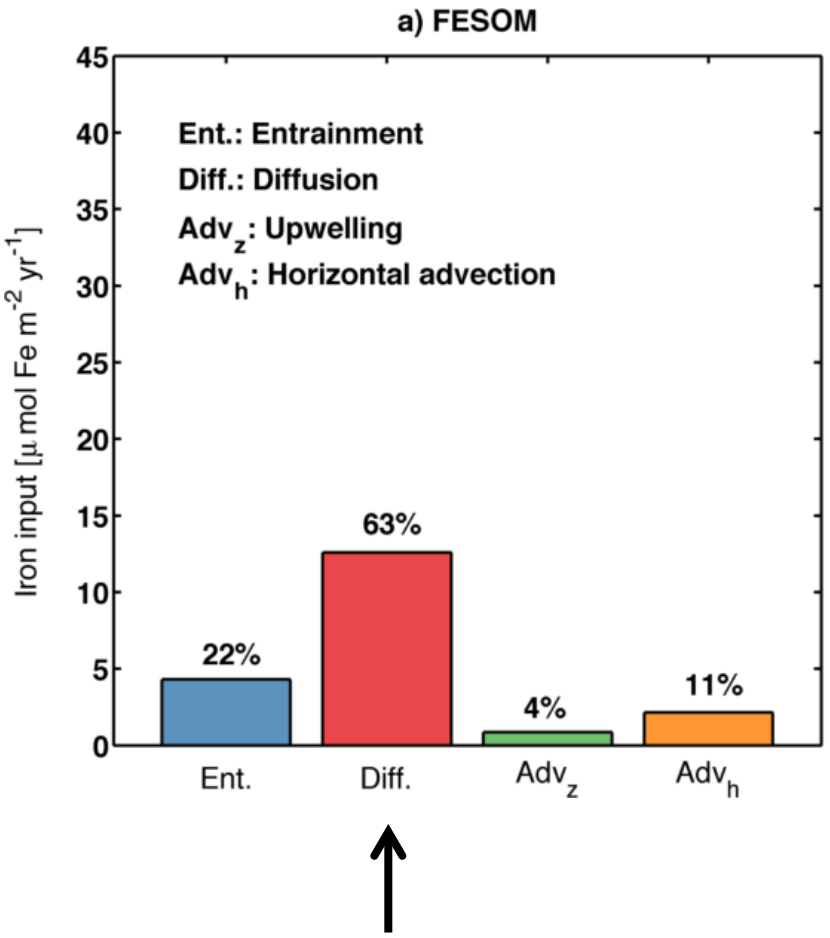


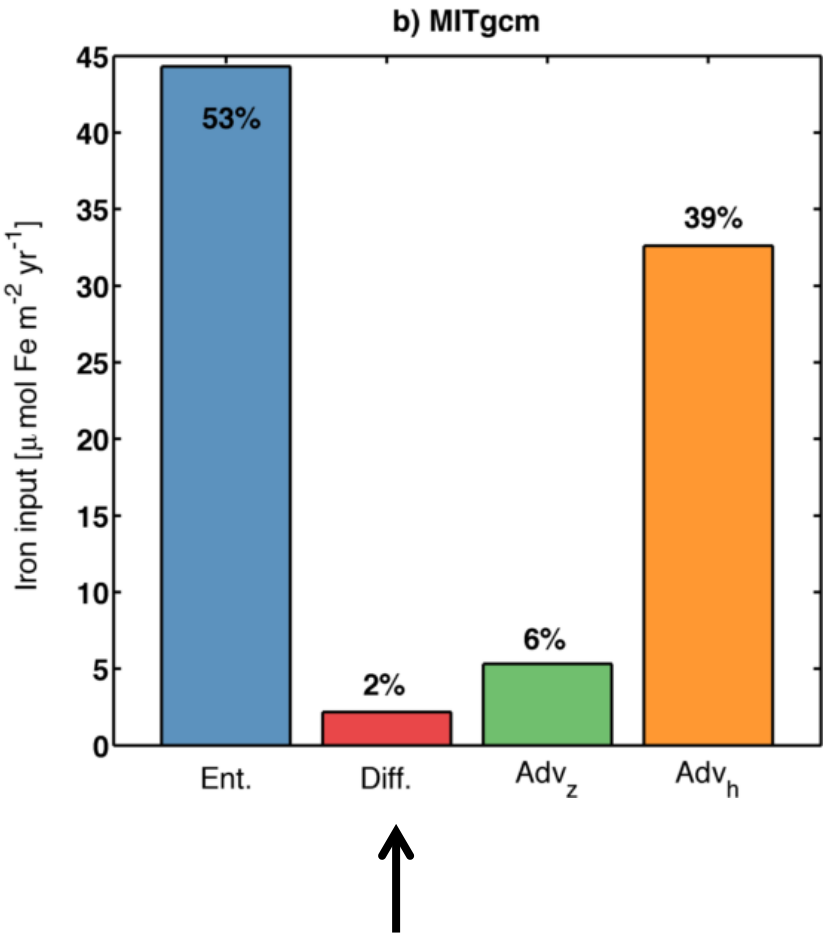




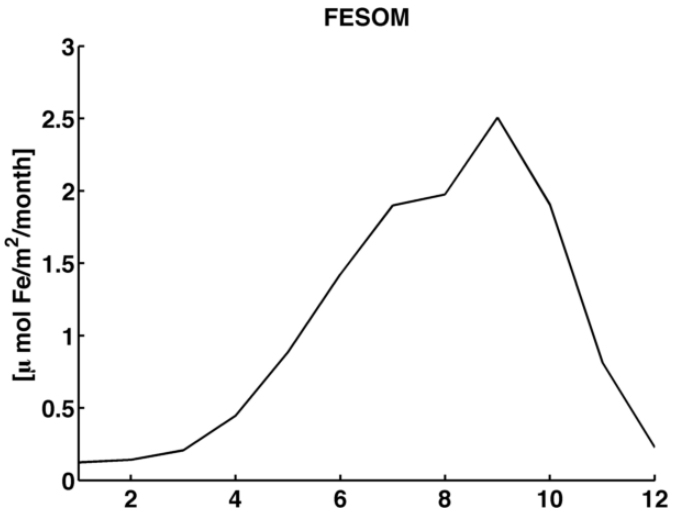


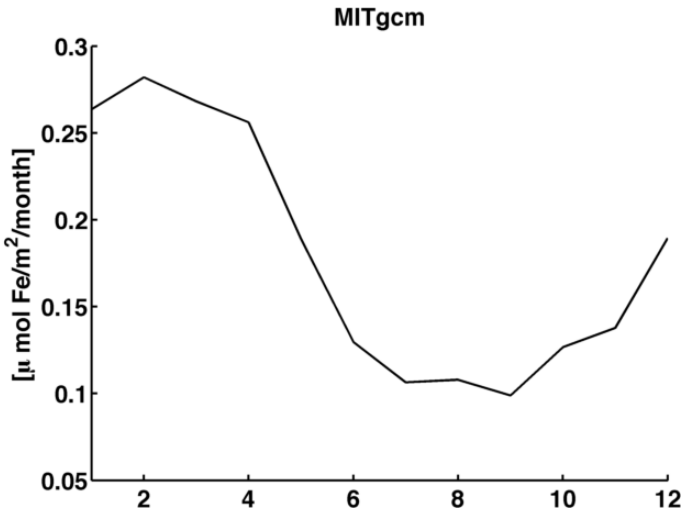
Total iron supply from below

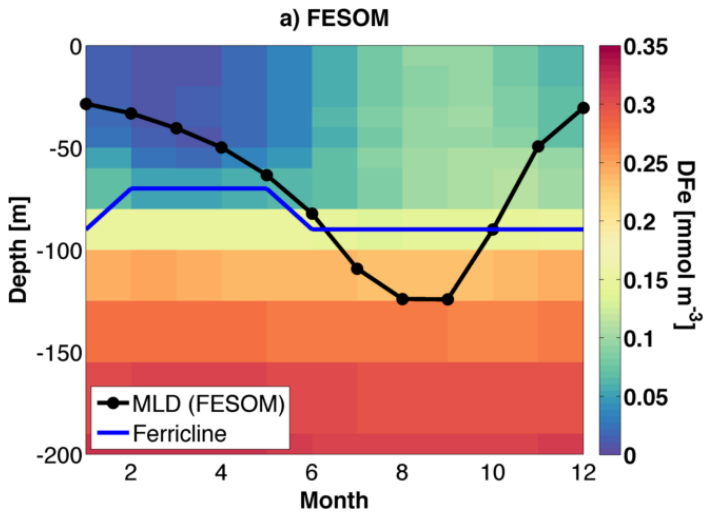


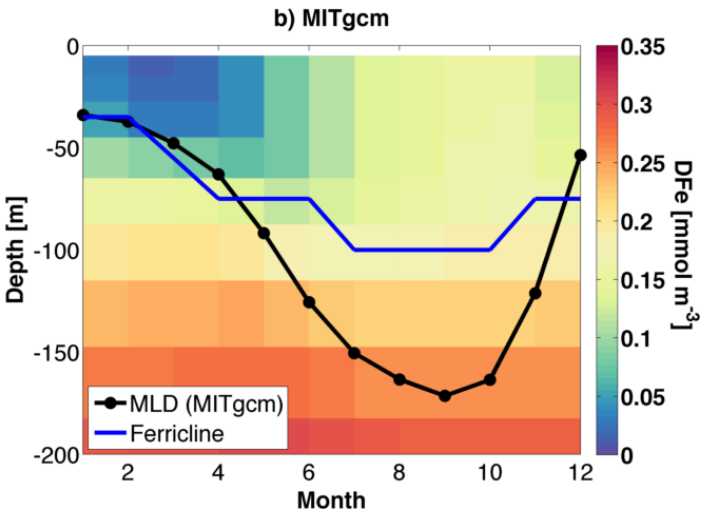


Turbulent diffusion

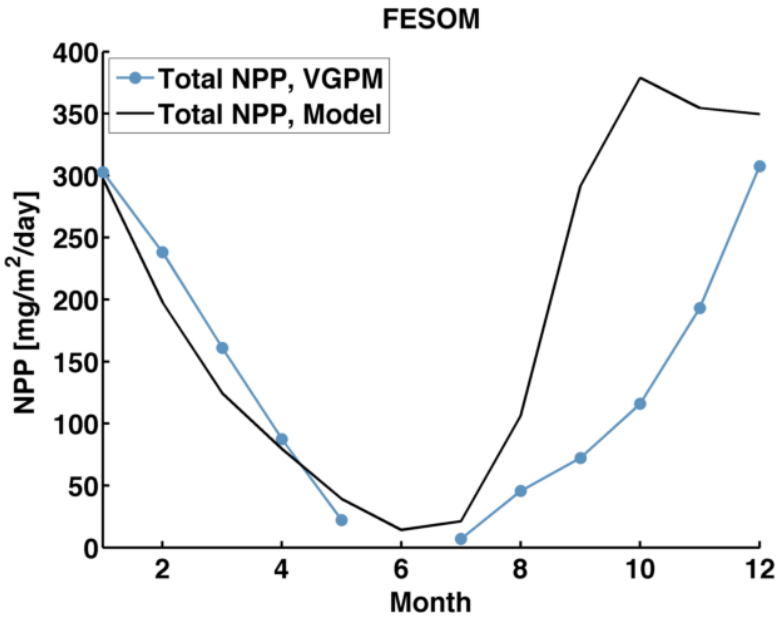


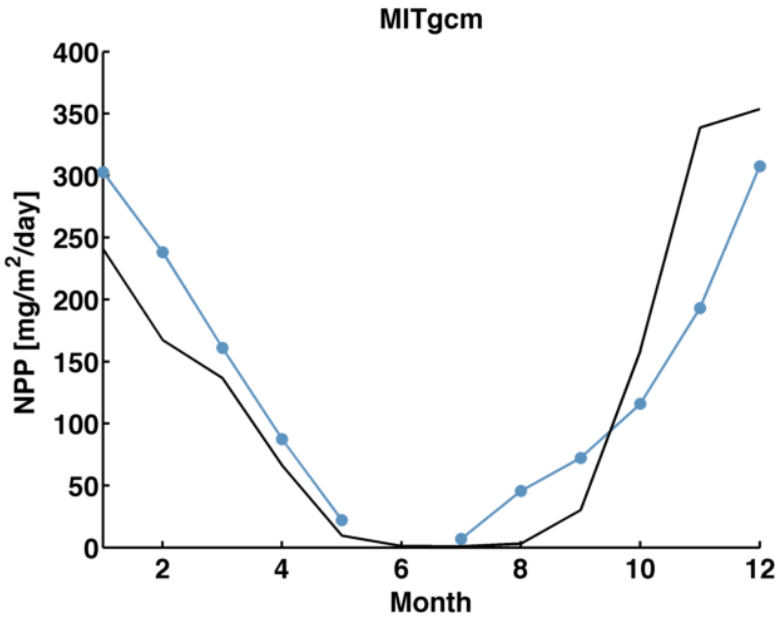




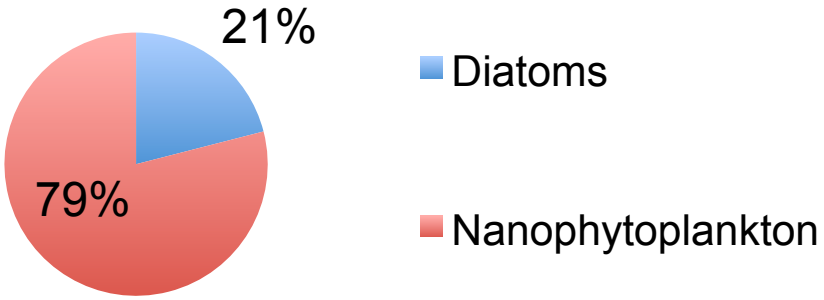


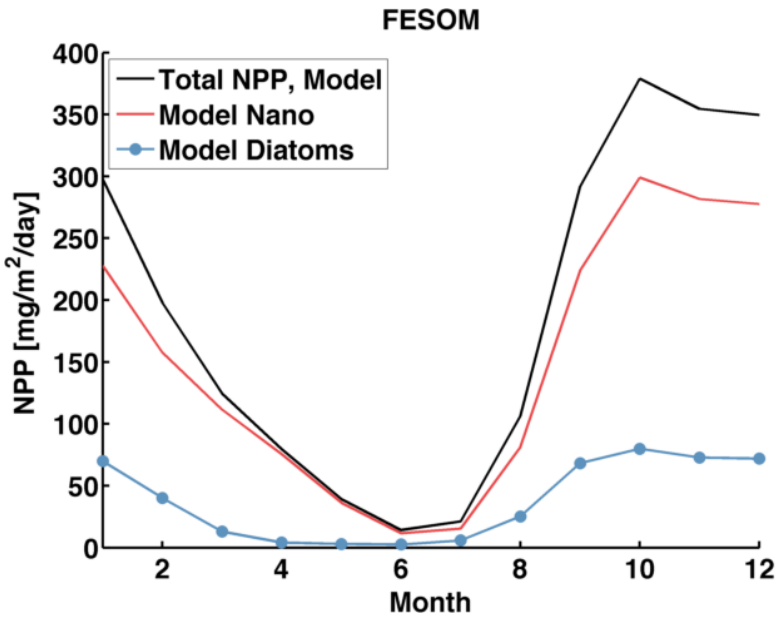
Seasonal NPP

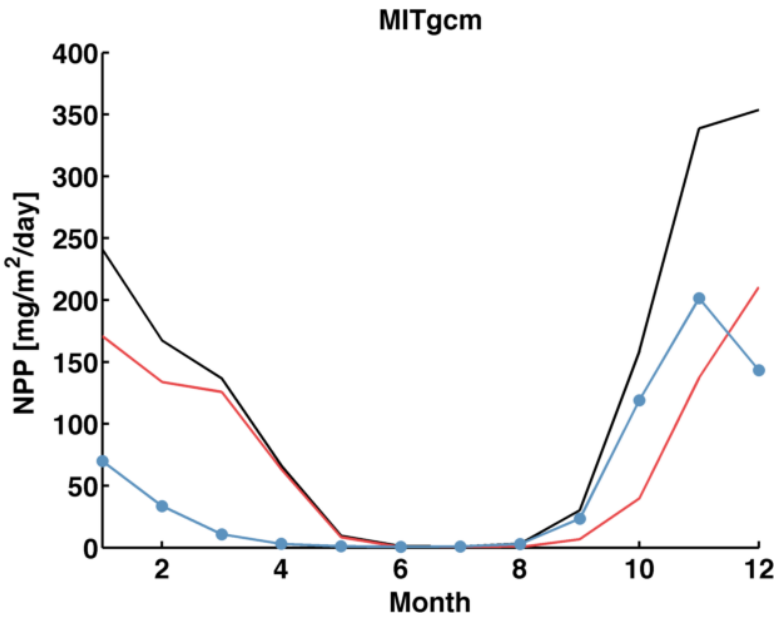




Seasonal NPP







Conclusion

- The ocean model has a large impact on the biogeochemical results in the Southern Ocean
- It affects:
  - The vertical iron supply
  - The phytoplankton species composition
  - The timing of the spring bloom
- Future scenarios