



Dynamical landscape and noise-induced transitions in a **box model** of the **Atlantic Meridional Overturning Circulation**

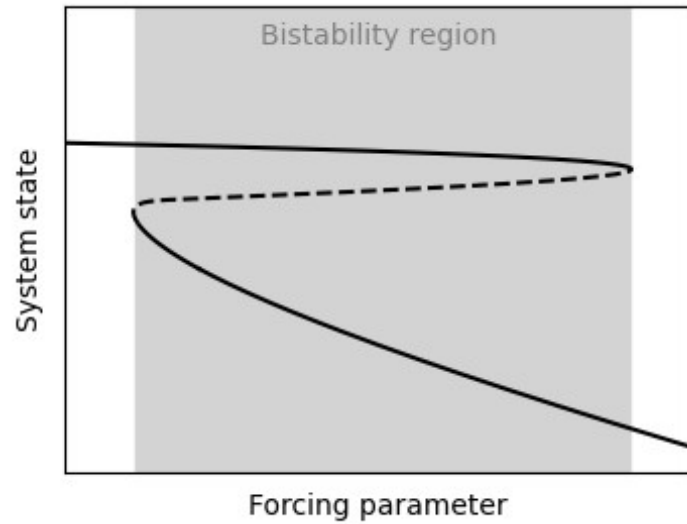
Reyk Börner, Valerio Lucarini, Larissa Serdukova

Department of Mathematics and Statistics
Centre for the Mathematics of Planet Earth
University of Reading

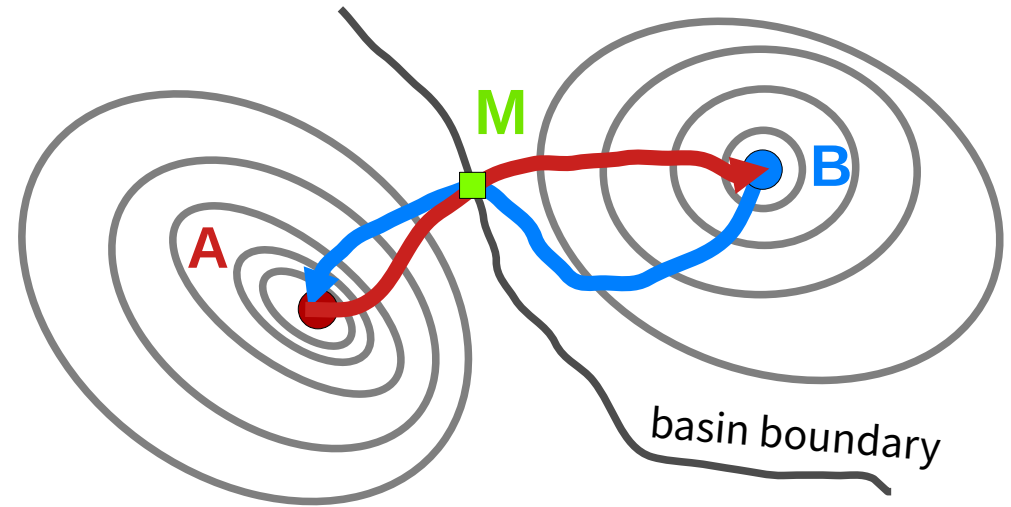
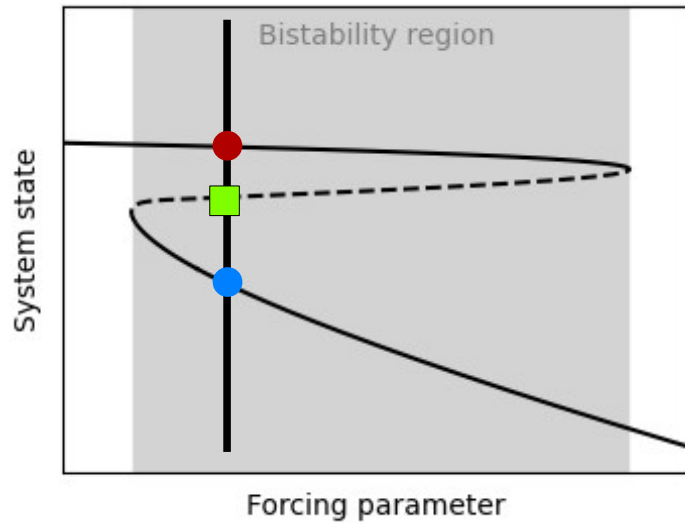
EGU General Assembly
Vienna, May 2022



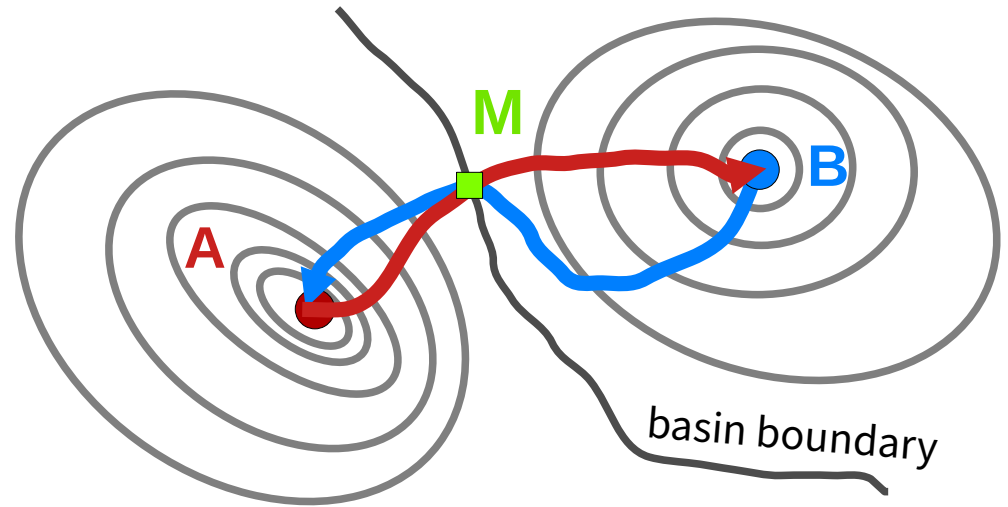
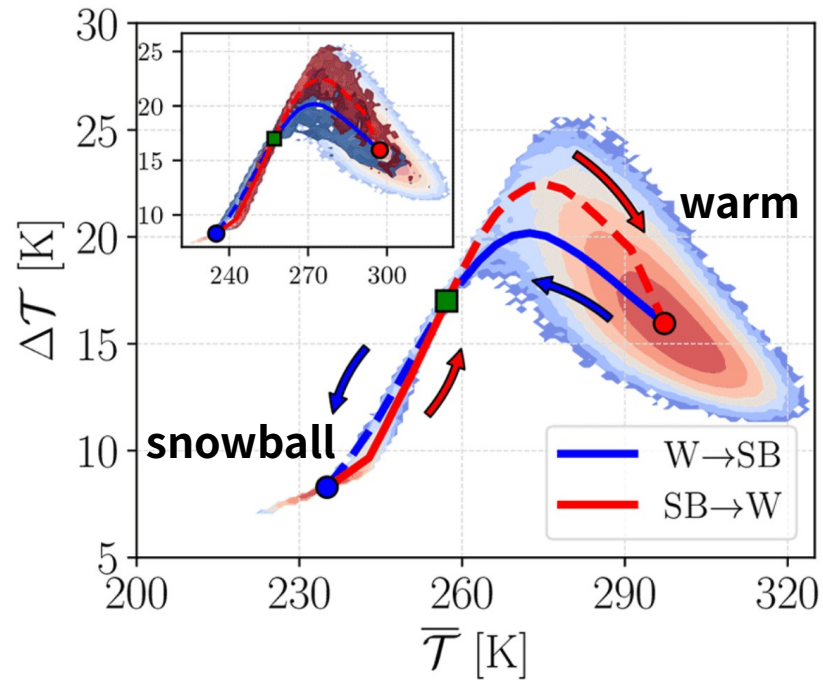
Noise-induced transitions in **bistable systems**



Noise-induced transitions in **bistable** systems



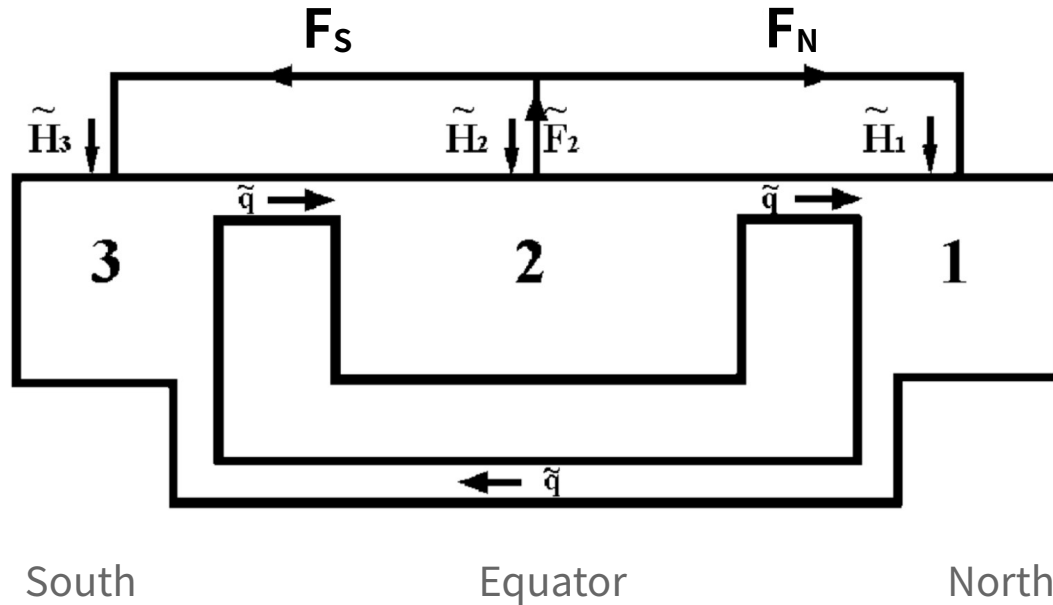
Noise-induced transitions in **bistable** systems



Lucarini, Serdukova, Margazoglou (2022)

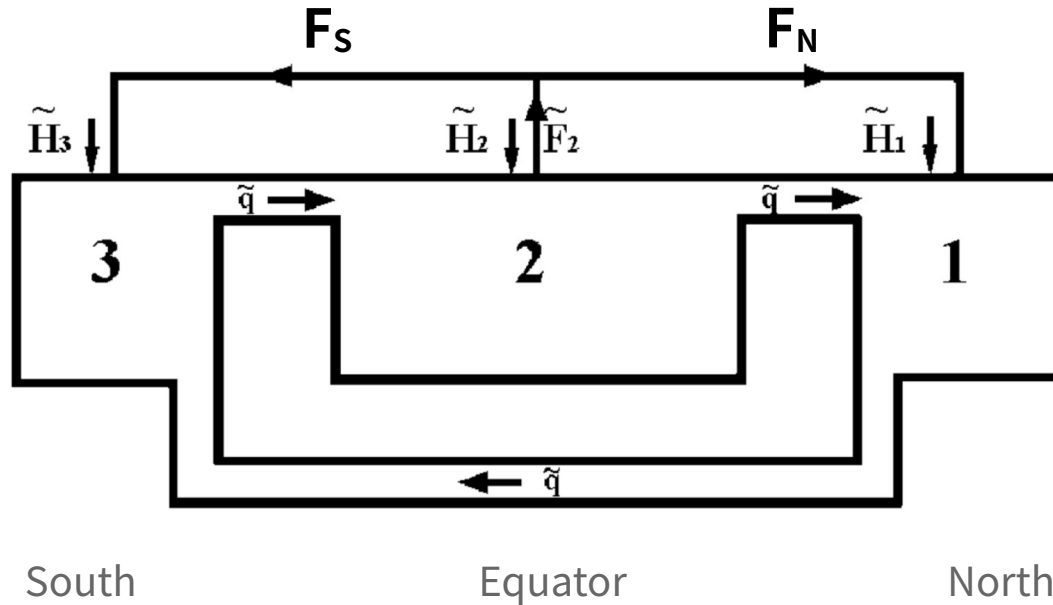
3-box model of the AMOC

Lucarini and Stone (2005)
Scott, Marotzke, Stone. (1999)
Rooth (1982)



3-box model of the AMOC

Lucarini and Stone (2005)
Scott, Marotzke, Stone. (1999)
Rooth (1982)



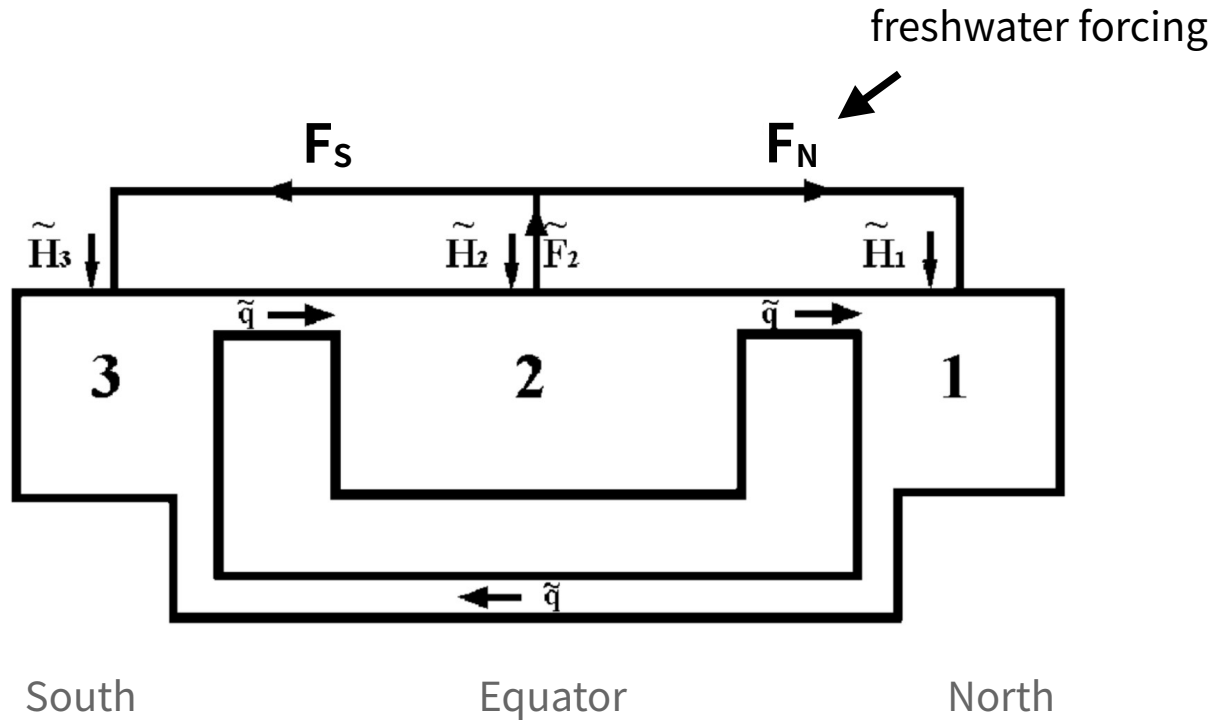
5 dimensions:

T1, T2, T3

S1, S3

3-box model of the AMOC

Lucarini and Stone (2005)
Scott, Marotzke, Stone. (1999)
Rooth (1982)

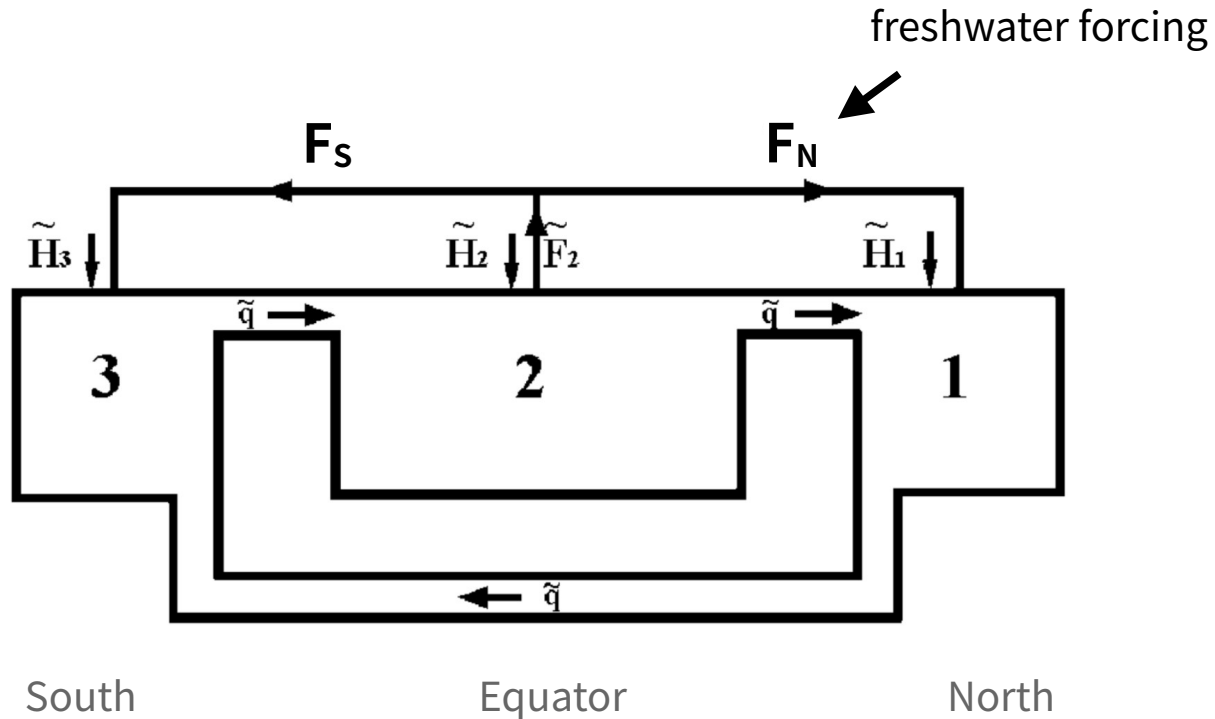


5 dimensions:

T1, T2, T3

S1, S3

3-box model of the AMOC



5 dimensions:

T_1, T_2, T_3

S_1, S_3

Bistability:

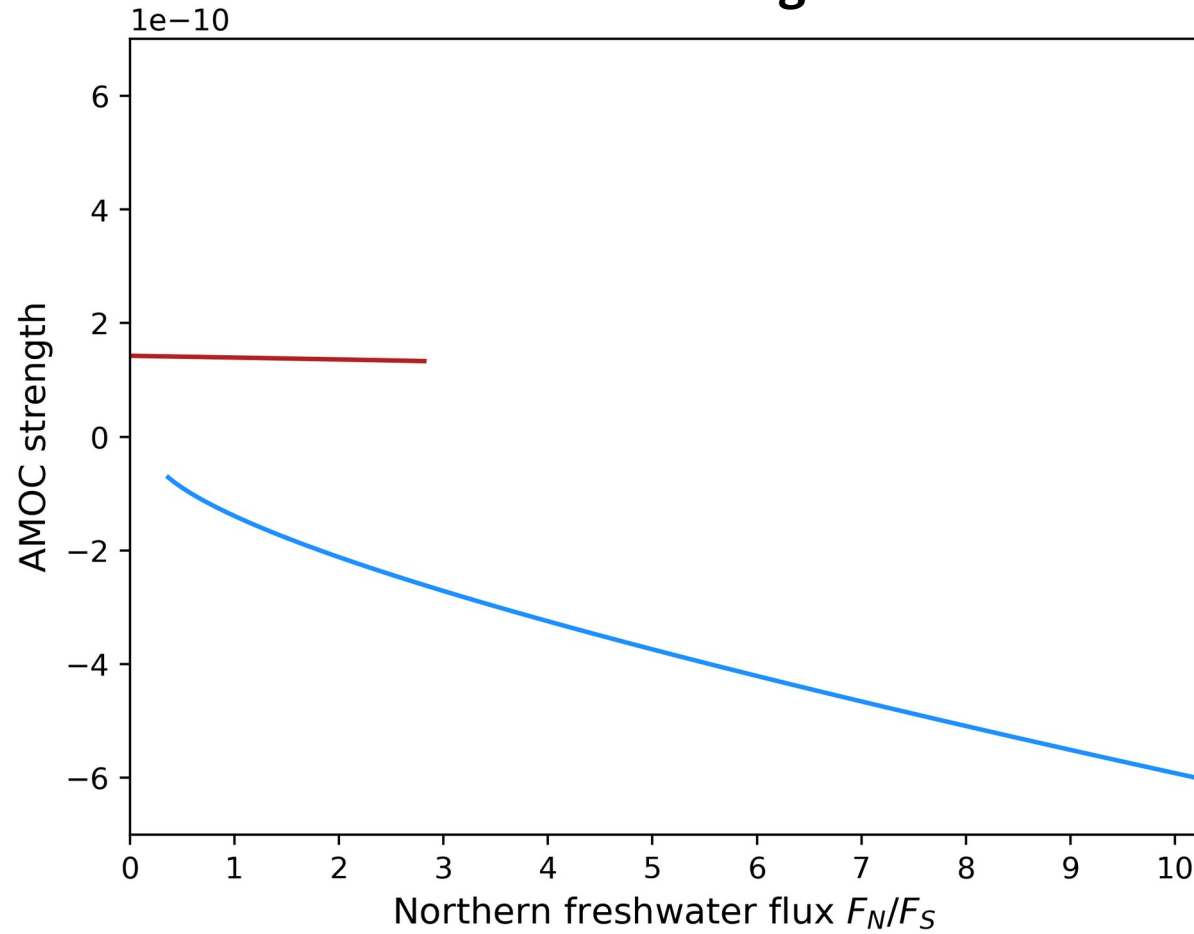


Northern sinking state

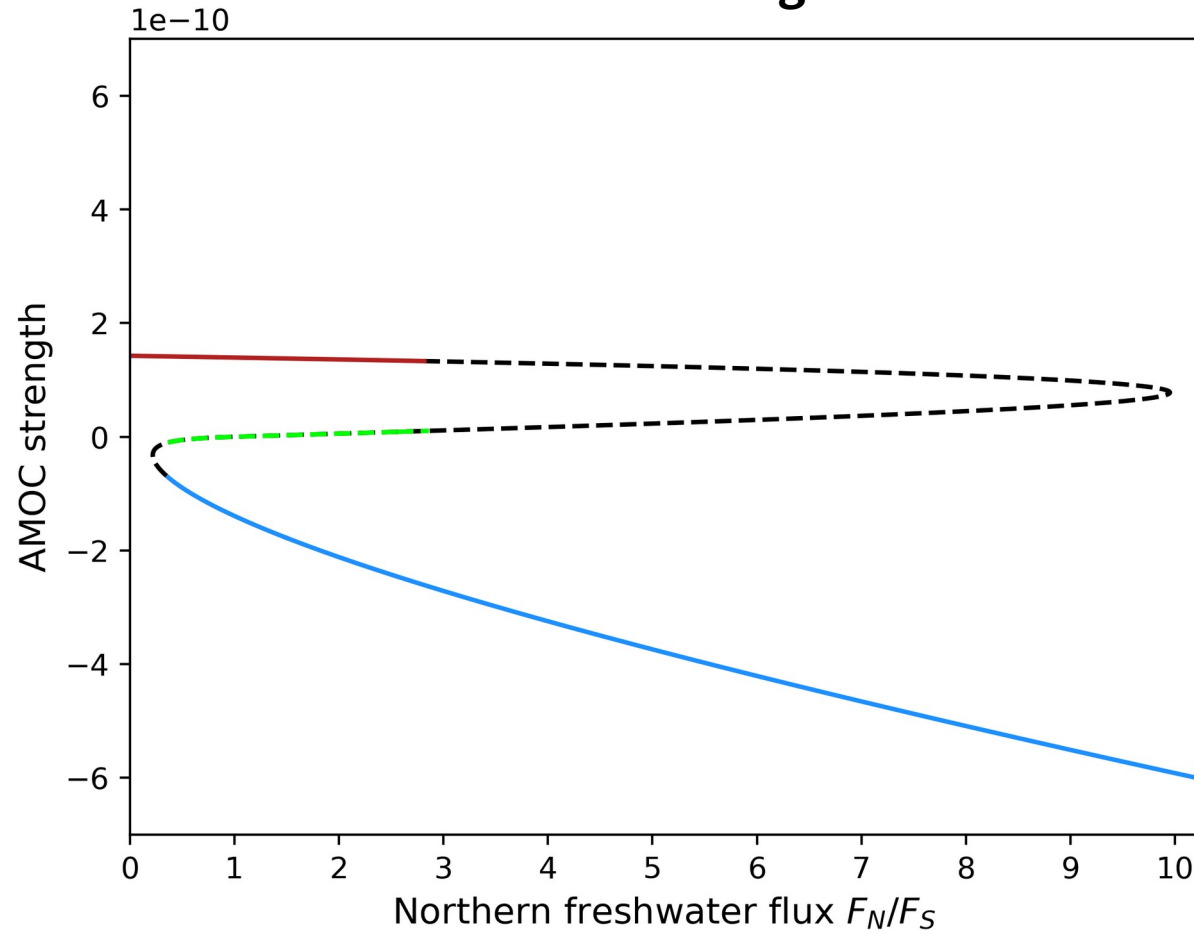


Southern sinking state

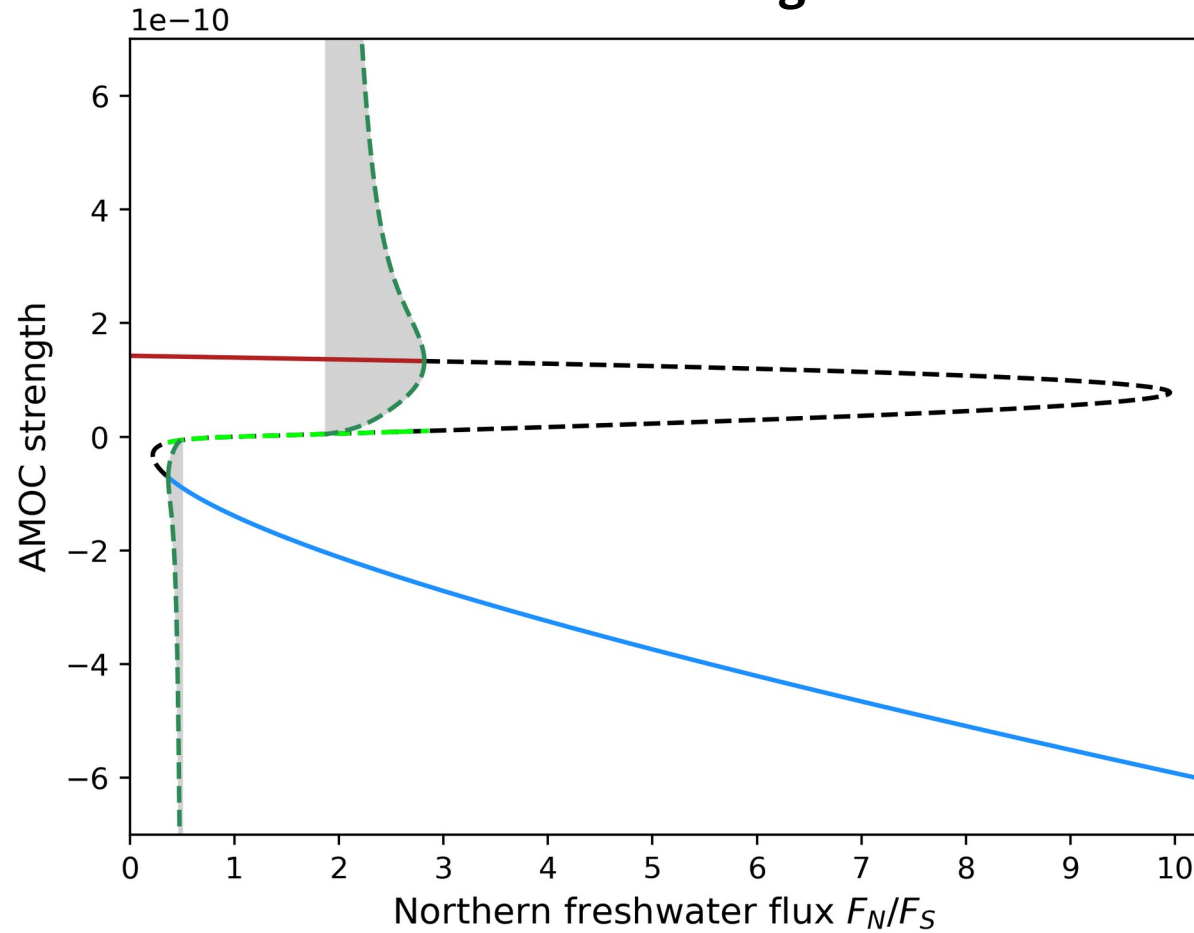
Bifurcation diagram



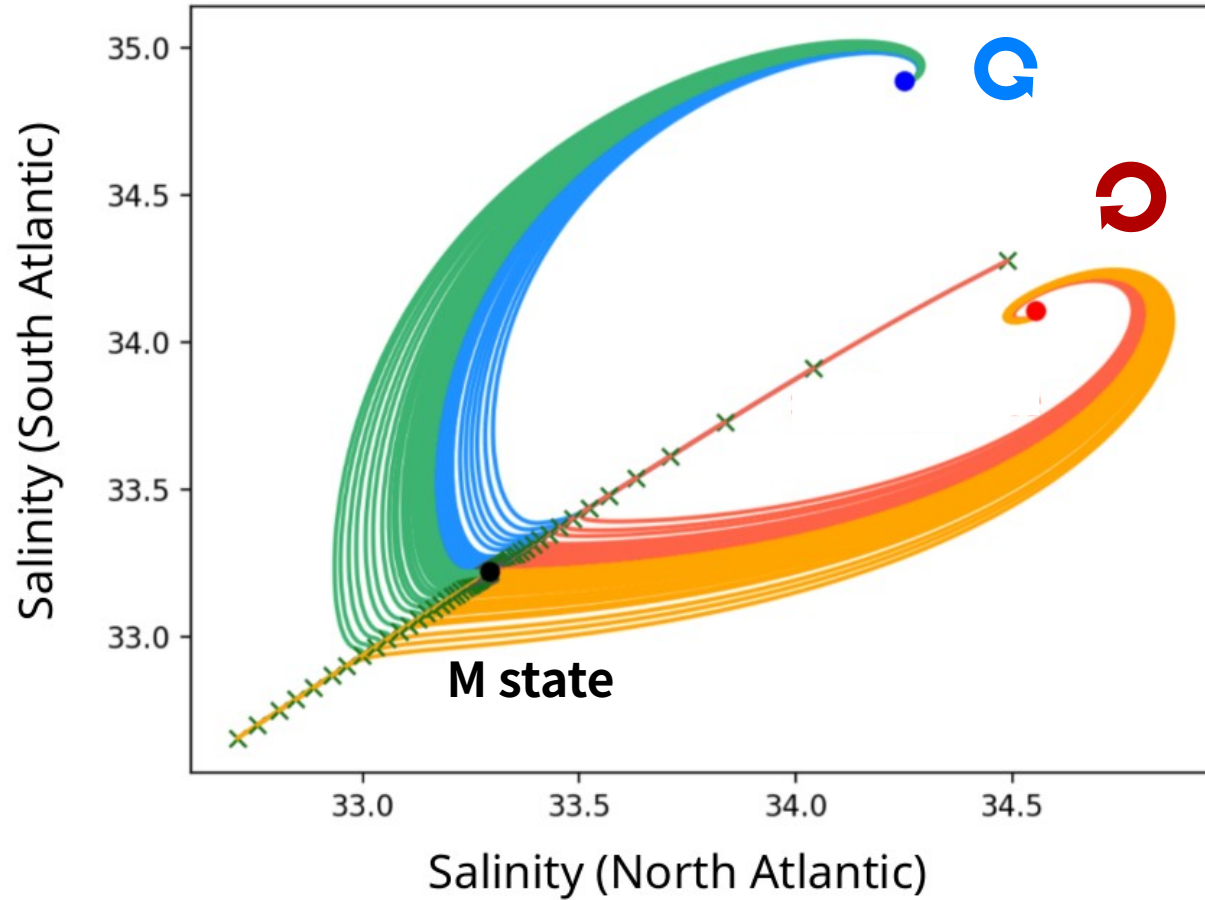
Bifurcation diagram

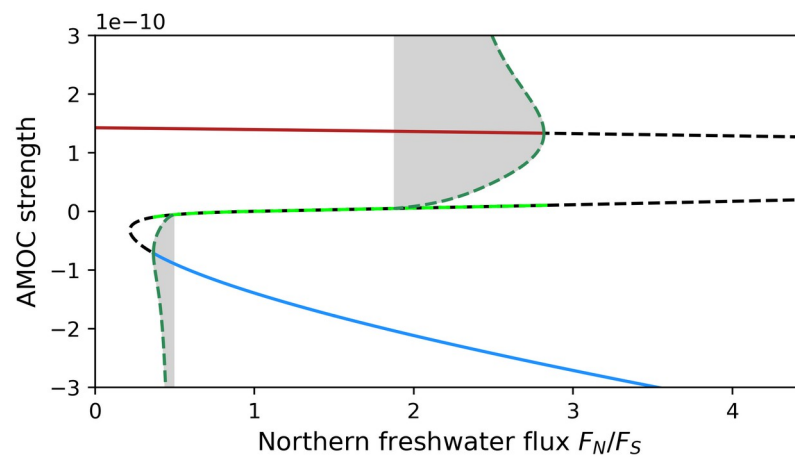


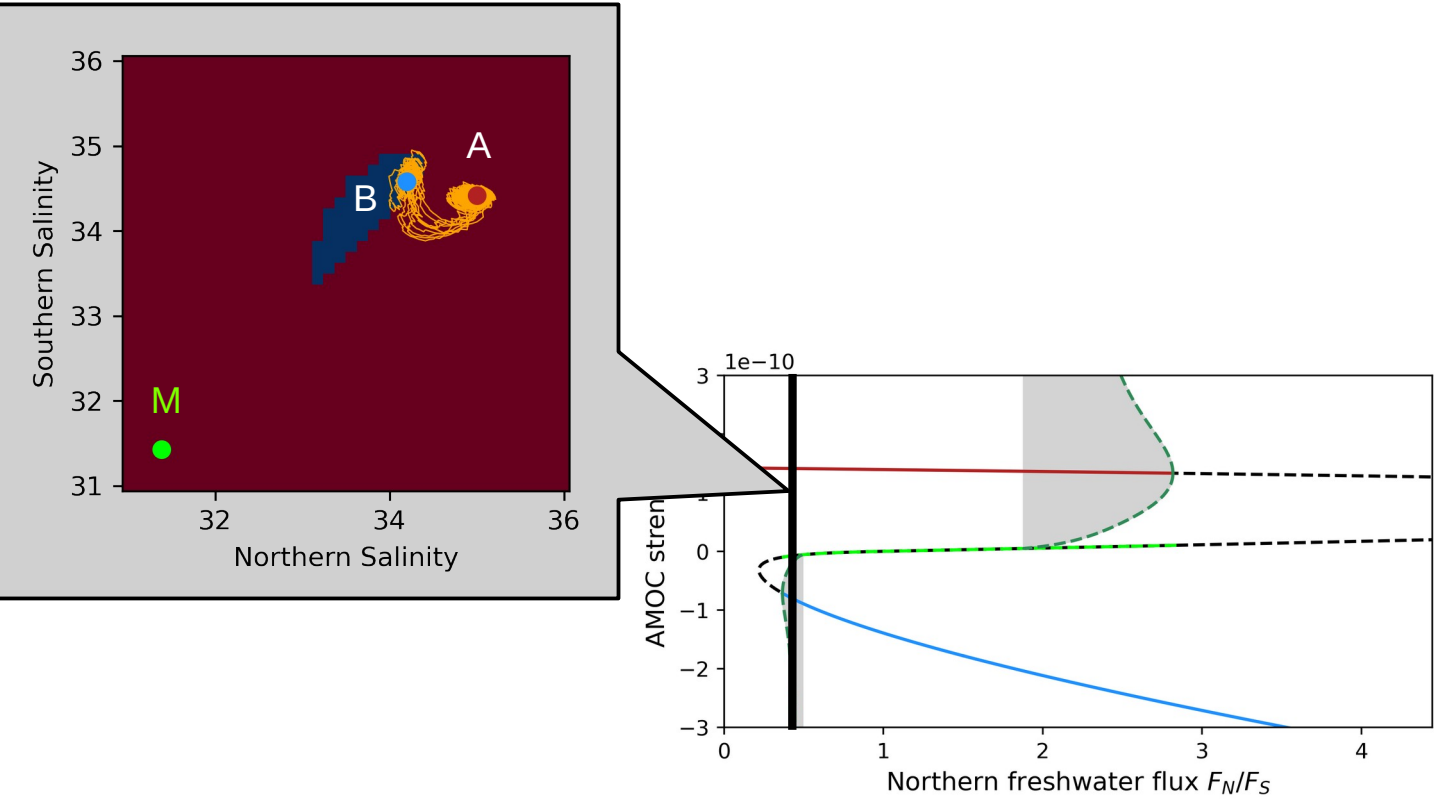
Bifurcation diagram

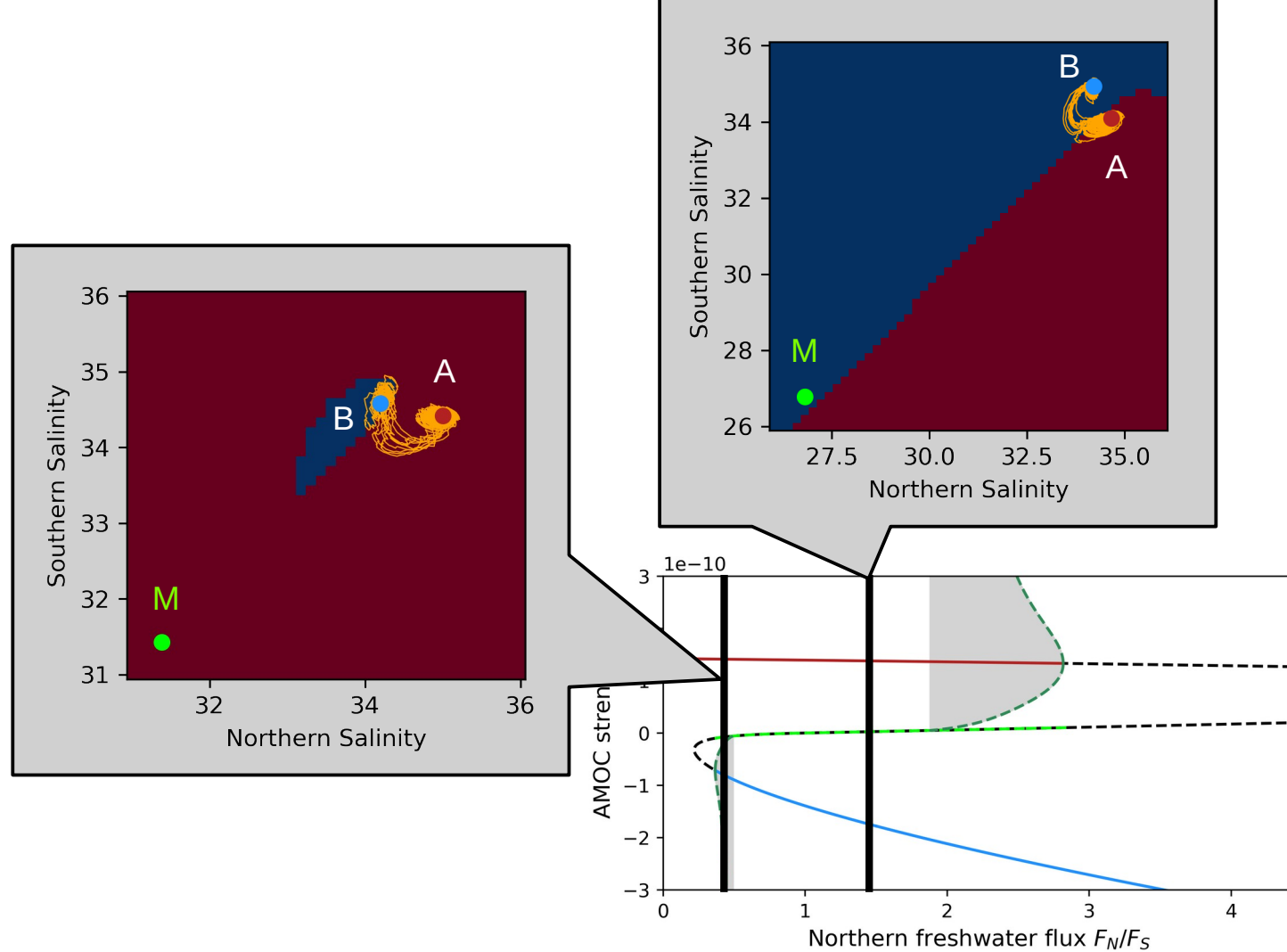


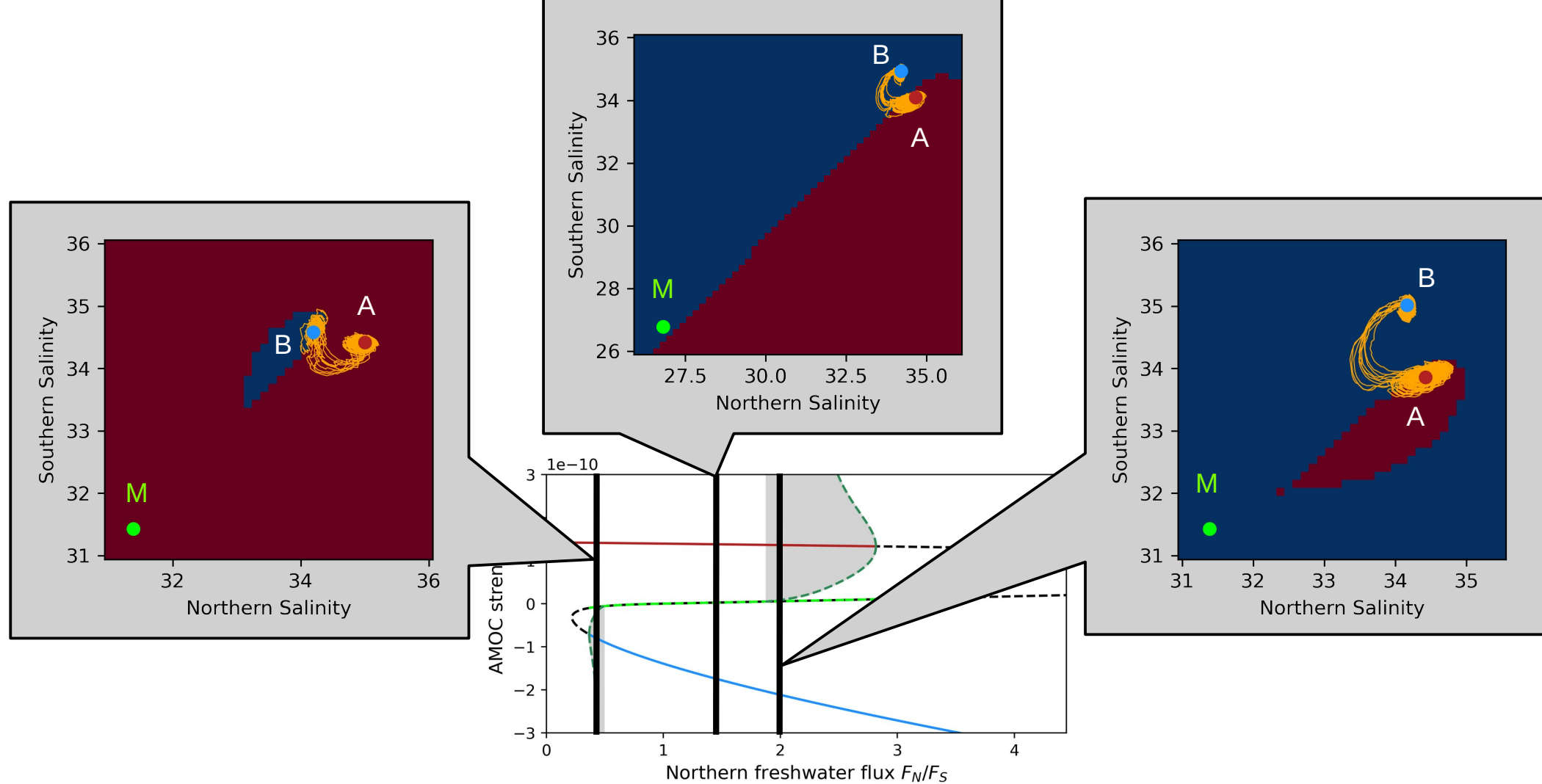
Edge tracking algorithm

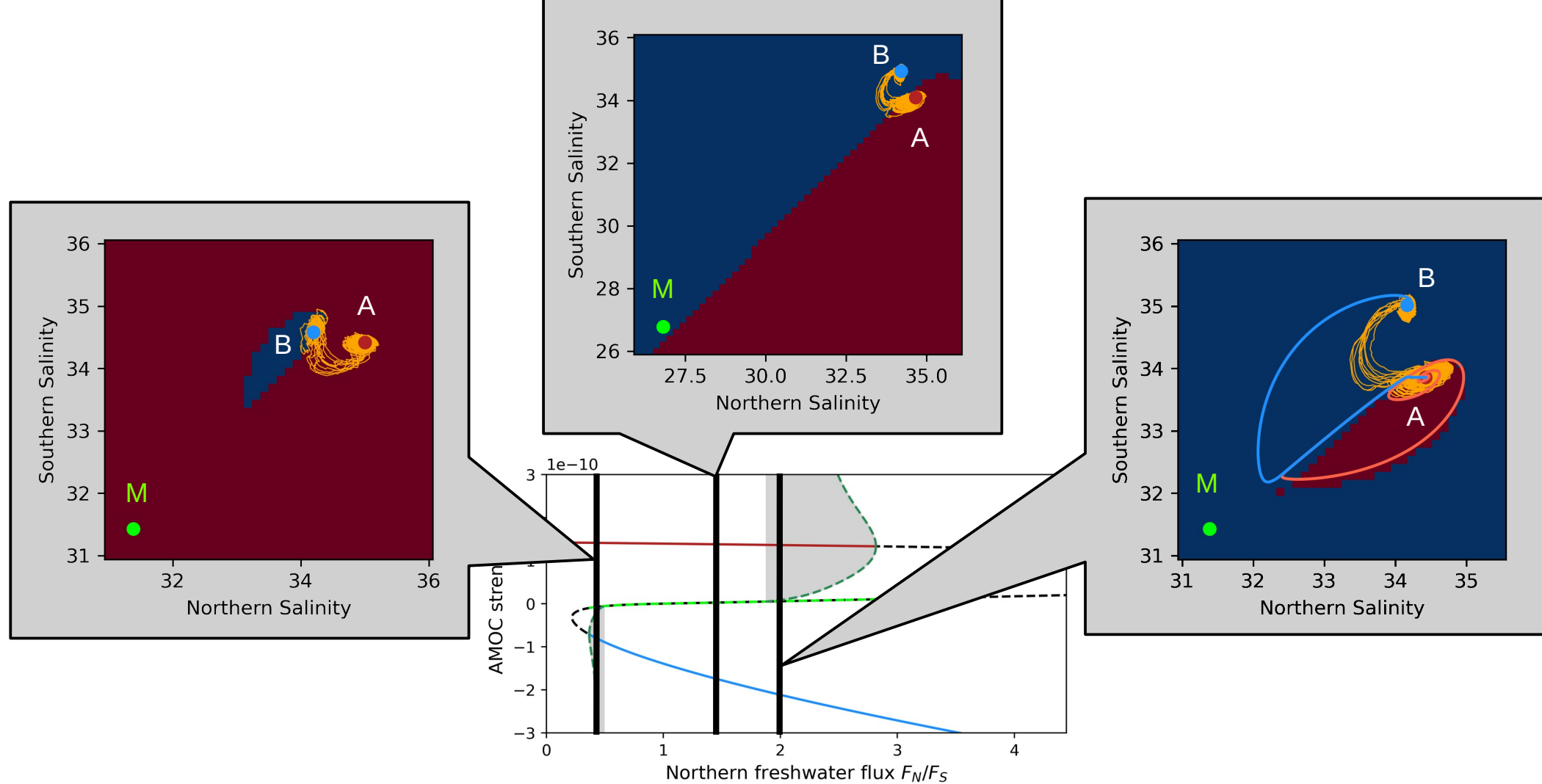












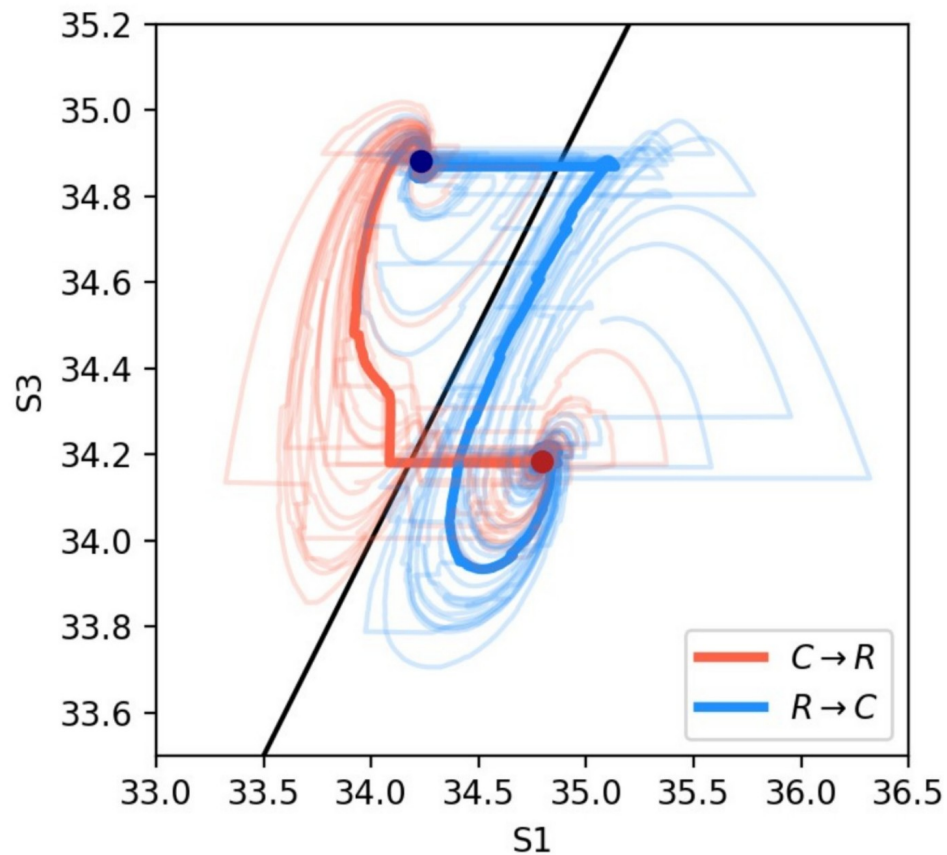
Thank you for your attention!

Contact: reyk.boerner@reading.ac.uk

References:

- Scott et al. (1999) J. Phys. Oceanography
- Lucarini and Stone (2005) J. Climate
- Titz et al. (2002) Tellus A: Dyn. Met. and Oceanography
- Alkhayuon et al. (2019) Proc. R. Soc. A
- Lucarini and Bodai (2017) Nonlinearity
- Margazoglou et al. (2021) Proc. R. Soc. A
- Lucarini et al. (2022) Nonlinear Proc. Geophysics
- Freidlin and Wentzell (1998) Springer

Levy noise



Gaussian noise

