DIAGNOSING SPURIOUS DIAPYCNAL MIXING AND ITS SPATIAL DISTRIBUTION IN Z-COORDINATE OCEAN MODELS USING DISCRETE VARIANCE DECAY

TRR 181, M5, Tridib Banerjee[1,2], Sergey Danilov[1,2], Knut Klingbeil[3]

1. Department of Mathematics, Jacobs University, Bremen, Germany **2.** Department of Climate Dynamics, Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany **3**. Department of Physical Oceanography and Instrumentation, Leibniz Institute for Baltic Sea Research, Rostock, Germany

Theory

$$\partial_t T^2 + \partial_x (uT^2 - \nu \partial_x T^2) = -2\nu(\partial_x T)^2$$

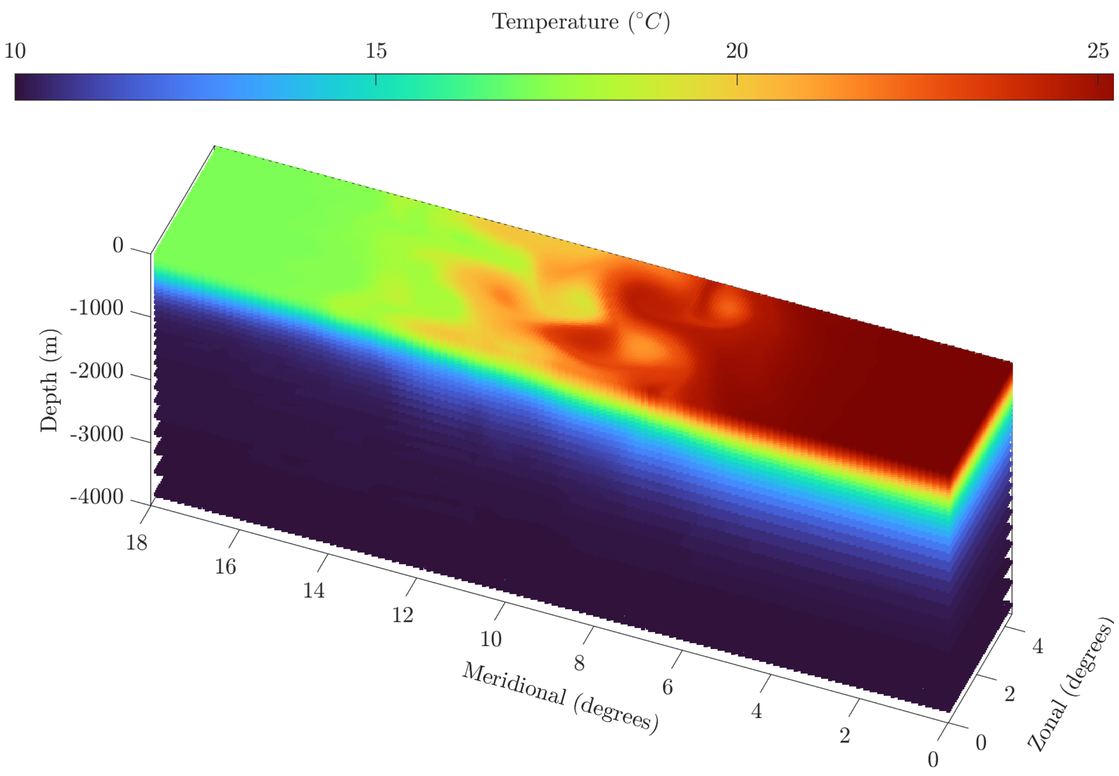
$$\chi^{\text{net}} = -\nabla \cdot F^{\text{2nd}} - \frac{1}{dt}[hT^2]_n^{n+1}$$

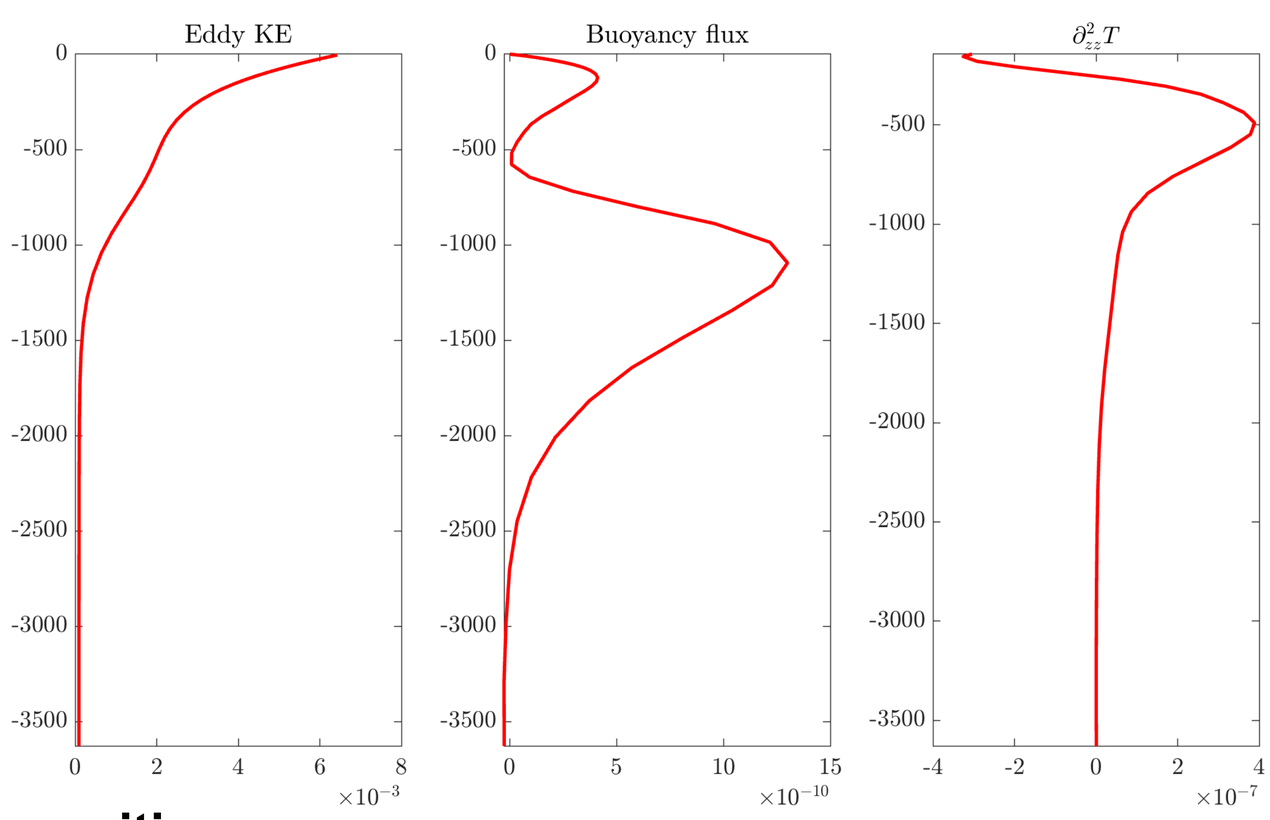
$$\chi^{\text{net}} = \chi^{\text{advc}}_{\text{hor+ver}} + \chi^{\text{diff}}_{\text{hor+ver}} = \chi^{\text{Physical}}_{\text{iso+dia}} + \chi^{\text{Spurious}}_{\text{iso+dia}}$$

Questions

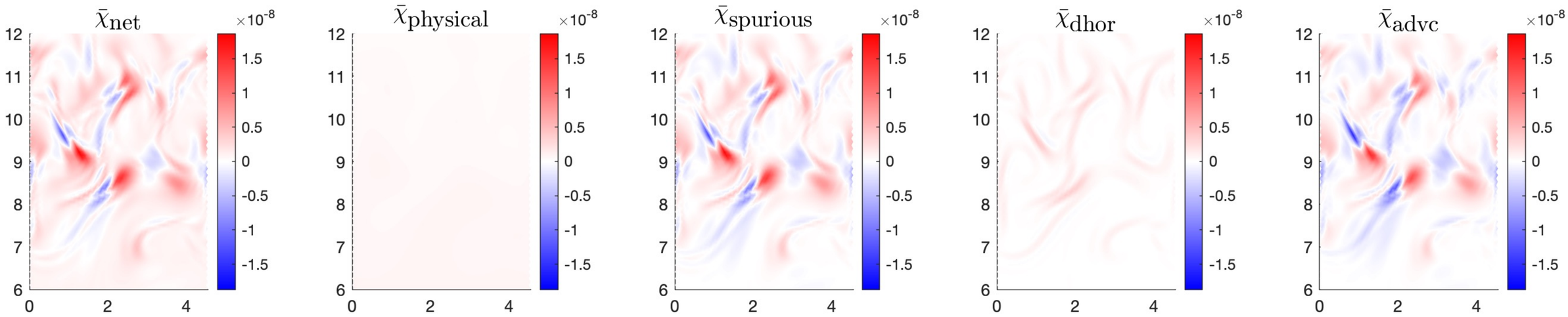
1. What are these second moment fluxes F^{2nd} for processes like advection and diffusion?
2. How such processes individually contribute to net spurious diapycnal mixing $\chi^{\text{net}}_{\text{dia}}$?
3. How spurious diapycnal mixing from different advection schemes compare to physical mixing

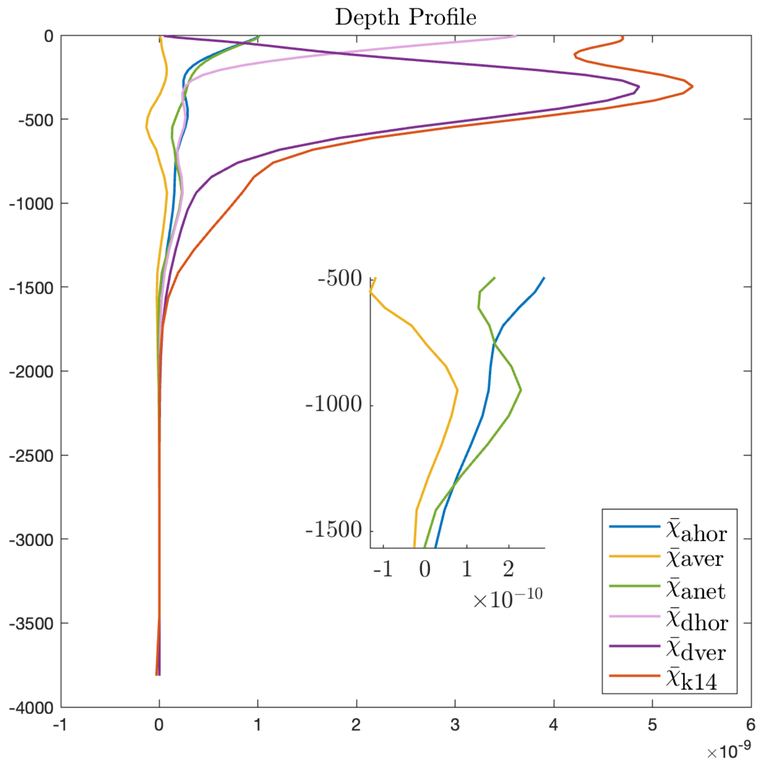
Idealized Channel

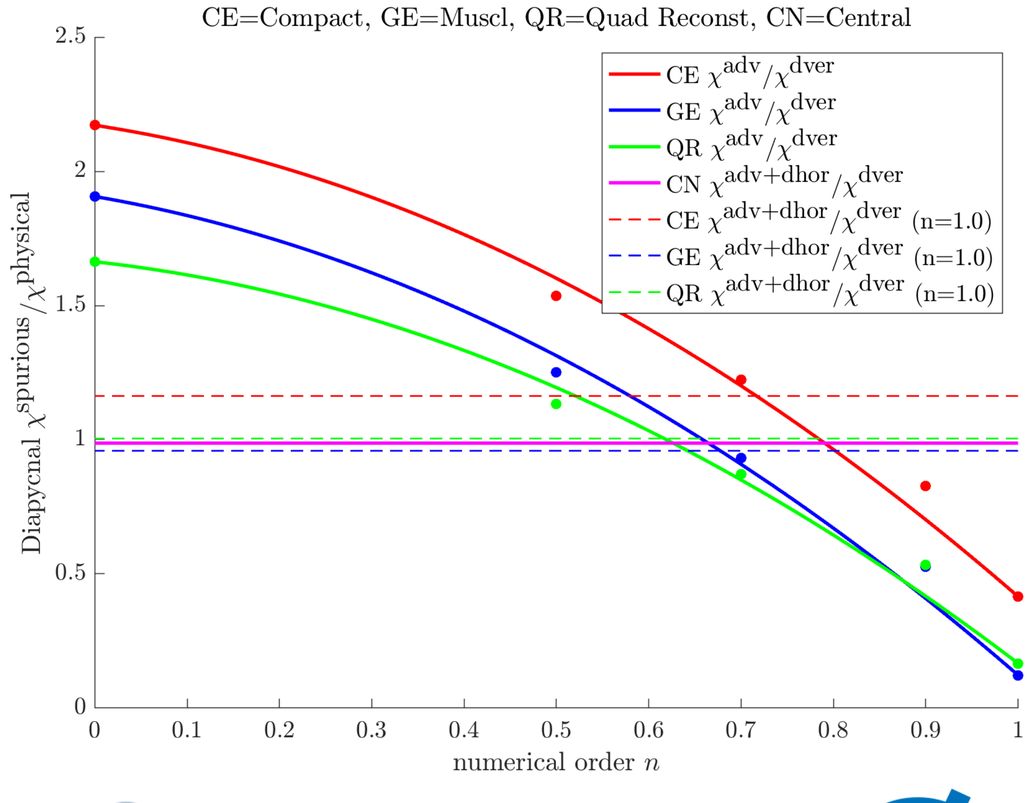




Decomposition







References

1. Soufflet, Y., Marchesiello, P., Lemarié, F., Jouanno, J., Capet, X., Debreu, L., & Benshila, R. (2016). On effective resolution in ocean models. *Ocean Modelling*, *98*, 36-50.

2. Klingbeil, K., Mohammadi-Aragh, M., Gräwe, U., & Burchard, H. (2014). Quantification of spurious dissipation and mixing–Discrete variance decay in a Finite-Volume framework. Ocean Modelling, 81, 49-64.

Sharing is encouraged