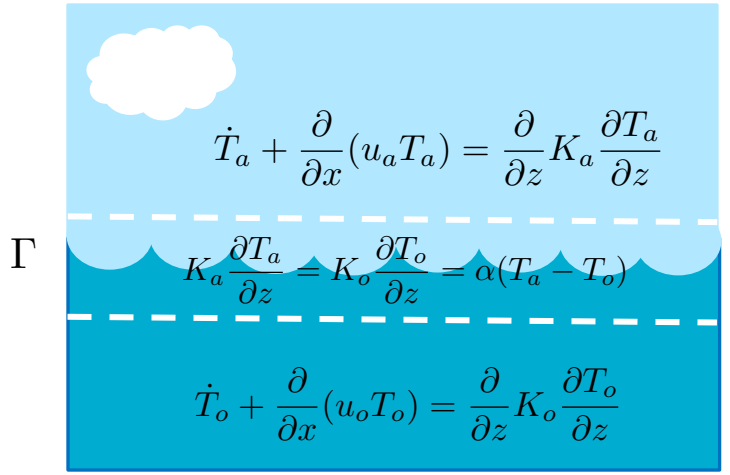
Interface Flux Recovery Method for Ocean-Atmosphere Coupling

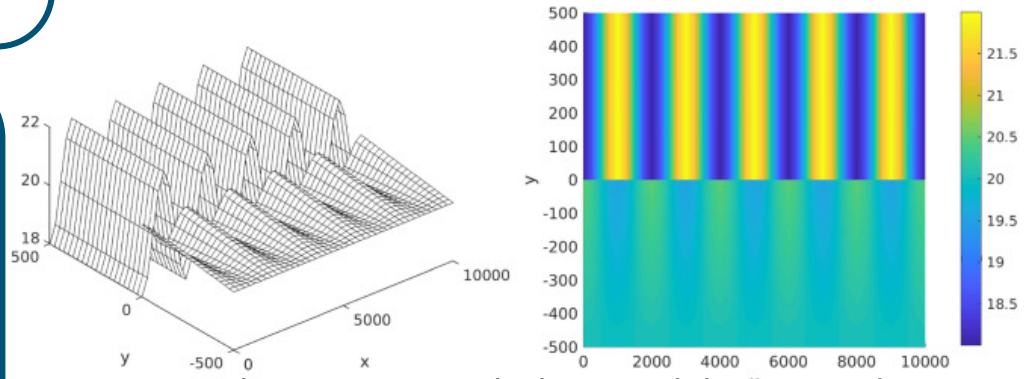
- ***Objective***:
  - Develop efficient, accurate, and stable coupling schemes for Earth system models that allow for partitioned solves of each component, but retain stability properties of an underlying monolithic problem.

- ***Approach***:
  - Start with a well-posed monolithic mixed-like formulation
  - Use a Schur complement to isolate and obtain an accurate estimate of the flux across the interface between the models
  - Decouple the individual components resulting in a non-iterative partitioned scheme with special treatment of the flux

- ***Impact***:
  - Derived IFR method for coupling a simple heat transfer model in the ocean-atmosphere with a bulk condition at the interface
  - Demonstrated on a simplified test case with an exact solution for the bulk condition system
  - Achieved expected convergence rates for matching and non-matching grids



Governing equations for simplified atmosphere/ocean heat transfer



Test case combining a wave in the horizontal direction with a discontinuity driving the bulk condition at the interface

K. Chad Sockwell, Kara Peterson, Paul Kuberry, Pavel Bochev, Nat Trask, (2020) Interface Flux Recovery coupling method for the ocean-atmosphere system, *Results in Applied Mathematics*, 8, https://doi.org/10.1016/j.rinam.2020.100110.

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