Bachelor Thesis

(Bakkalaureatsarbeit)

on the topic

"Oceanic and Atmospheric Fluid Dynamics"

- **Title:** Oceanic and Atmospheric Fluid Dynamics
- **Supervisor:** DI Peter Gangl
- **Student:** Michaela Lehner
- **Abstract:** The motion and state of both the ocean and the atmosphere can, under certain assumptions, be modeled by the so-called *primitive equations (PEs)*. The PEs comprise the equations of thermodynamics and the Navier-Stokes equations, as well as some physical effects caused by the rotation of the earth ($\hookrightarrow$ Coriolis force) and by a diffusion process (salinity of the water). The goal of this Bachelor thesis is the rigorous derivation of the PEs for both the large-scale ocean and the atmosphere as well as the discussion of several special settings (approximations).
- **Road Map for the Bachelor Thesis:**
  1. Introduction
  2. Derivation of thermodynamic equations
  3. Derivation of the Navier-Stokes Equations
  4. Description of physical effects: Coriolis force, diffusion of salinity
  5. Derivation of primitive equations (ocean, atmosphere)
  6. Special Settings
  7. Conclusions
  8. References
- **Literature:** Lectures and Seminars (Proseminar) on Mathematical Models in Engineering
- **Additional Literature:** [1], [2], [3], [4], [5]

References

[1] C. Hu, R. Temam, and M. Ziane. The primitive equations on the large scale ocean under the small depth hypothesis. *Discr. Cont. Dynam. Sys.*, 9(1):97–131, 2003.

[2] J.L. Lions, R. Temam, and S. Wang. New formulations of the primitive equations of atmosphere and applications. *Nonlinearity*, 5:237–288, 1992.

[3] J.L. Lions, R. Temam, and S. Wang. On the equations of the large-scale ocean. *Nonlinearity*, 5:1007–1053, 1992.

[4] J. Pedlosky. *Geophysical Fluid Dynamics*. Springer New York, 1986.

[5] G. K. Vallis. *Atmospheric and Oceanic Fluid Dynamics*. Cambridge University Press, 2006.