Climate Dynamics
Summer Semester 2017

UNIVERSITÄT LEIPZIG

Homework 7
Due 7 June 2017

Problem 1 Ocean surface properties

The files `/home_local/quaas/data/gecco_temp.nc`, `gecco_salt.nc`, and `gecco_zeta.nc` contain temperature, salinity, and sea surface height data from the GECCO ocean synthesis (Köhl and Stammer, J. Climate, 2008).

(a) Plot the sea surface height, temperature, and salinity.

(b) Why is the North Atlantic so much saltier than the North Pacific?

Problem 2 Sea ice and Archimedes principle

(a) Consider an idealized rectangular ocean basin with horizontal side lengths w and sea level z. Floating at the surface of this ocean is a cubic ice berg of side length a. Show that the sea level does not change if the ice berg melts. *You may assume that the water density is constant throughout the ocean and that the water density change due to the melting of the ice berg is negligible.*

(b) Bonus: how does the situation change if the ice berg has a passenger in the form of an idealized cubic polar bear of density ρ_p and side length c?

(c) Bonus 2: how does the situation change if a Viking ship of density ρ_v and side length d is frozen into the ice berg?