Homework 6 - Ocean and Climate

1. Calculate the density of ocean water for the water temperatures in the warm Gulf current with $T=20^\circ\text{C}$ and a salinity of $S=36\text{psu}$ and the cold Humboldt current of $T=12^\circ\text{C}$ and a salinity of $S=34\text{psu}$ using the approximate empirical relation with a reference density for pure water $\rho_{\text{ref}}=1000\text{kg/m}^3$. Perform the same calculation using the Equation of State of seawater as defined in 1980 by UNESCO for density and reference density! What is the difference in values in percent.

2. What is the temperature of the water in both cases at a depth of 1000m, assuming the empirical assumptions for the thermocline?

3. Calculate the temperature of the ocean water at a depth of $z=50\text{ m}$ in the mixed zone, at $z=600\text{ m}$ in the thermocline, and at $z=3000\text{ m}$ in the abyssal zone.

4. Because of its salinity polar ocean water has a considerably higher density $\rho_{\text{H}_2\text{O}}=1028\text{ kg/m}^3$ than ice with a density of $\rho_{\text{ice}}=916.7\text{ kg/m}^3$. Calculate the buoyancy force $F_B$ and the fraction $x$ of the submerged volume of a typical iceberg with a total volume of $V=900,000\text{ m}^3$. 
