

Spring 2020 GEOL1820
Homework 5 (Last One!), due Monday, April 27, 9AM

1 **Wyngaard (2010) Problem 8.2**

8.2 Calculate $p_0(z)$ and $\rho_0(z)$.

NOTE: Wyngaard (2010) is accessible at <https://login.revproxy.brown.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&scope=site&db=e000xna&AN=324086>

2 **Wyngaard (2010) Problem 8.6**

8.6 Show that mixing ratio is a conserved variable.

3 **Wyngaard (2010) Problem 9.6**

9.6 Sketch the profile of vertical temperature flux in a quasi-steady convective ABL capped by an inversion.

4 **Wyngaard (2010) Problem 9.15**

9.15 Write an expression for a turbulence Rossby number, the ratio of typical inertial and Coriolis forces on energy-containing eddies. Estimate its magnitude in the ABL.

5 **Wyngaard (2010) Problem 10.3**

10.3 Derive an expression like Eq. (10.21) but for the surface temperature flux.

6 Wyngaard (2010) Problem 10.12

10.12 Explain the role of the second-moment budgets in turbulent flow calculation.

7 Wyngaard (2010) Problem 11.2

11.2 Develop a criterion for the negligibility of the effects of horizontal inhomogeneity and time changes on mixed-layer similarity.

8 Wyngaard (2010) Problem 12.2

12.2 A surface is cooler than the air above and is evaporating water so that the vertical flux of water vapor is positive. The virtual temperature flux is zero. What is the stability index z/L ? Using M-O similarity, write the expression for the vertical gradient of potential temperature.

References

Wyngaard, J. C. (2010). *Turbulence in the Atmosphere*. Cambridge University Press.