

Errata for
A First Course in Atmospheric Numerical Modeling
A. J. DeCaria and G. E. Van Knowe
August 31, 2017

This page documents errors that were discovered after the book went to press, and which will be corrected in the next printing. To reduce the potential for confusion, instructors assigning this book are encouraged to distribute this page to their students. An up-to-date copy can be found at www.sundogpublishing.com/AtmosModErrata.pdf

If you find errors not listed here, please send a message describing the error to feedback@sundogpublishing.com.

p. 9: Bullet number 3 should read “The vertical scale of the circulation, L_z , must be much less than the pressure scale height of the atmosphere, H_p ($L_z \ll H_p$).”

p. 12, Equation (2.28): There should be a negative sign in front of the g .

p. 24, Table 3.3: The values in the fifth column for $\Delta t = 0.1$ s should be: 0.0, 4.5, 19.0, 43.5, 78.0, and 122.5.

p. 43, Equation (4.13): The imaginary term should be preceded by a negative sign.

p. 75, Section 5.4.1: The second sentence should read “For example, the expression $4/3$ would return a value of ‘1’.”

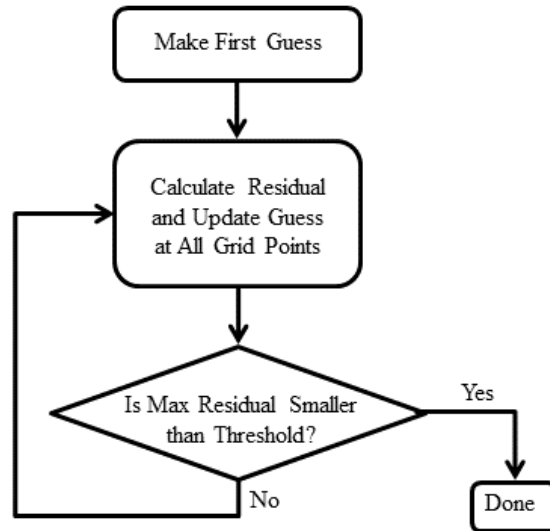
p. 85, 88 and 104: The right-hand sides of (6.11), (6.27), and (6.29) should be divided by $R_d T_s$, rather than multiplied by $R_d T_s$. This is also true for the last terms in (7.30) and (7.31).

p. 91, Ex. 6.5, Equation (6.43): The equation should read
$$\frac{\partial}{\partial t} \left(\frac{\overline{\zeta_g^2}}{2} \right) = 0$$

pp. 98 – 100: The steps for the general algorithm for relaxation (Steps 1 through 7) should be replaced/corrected with the following:

- Step 1: No change
- Step 2: Omit
- Step 3: Omit
- Step 4 (new Step 2): Replace with:
Iterate through the grid. At each grid point calculate the residual $R_{i,j}$ using (7.16) and then update the guess, $G_{i,j}$, using (7.20).
- Step 5 (new Step 3): Replace with:
After Step 2 has been performed at every grid point, check to see if any residual has an absolute value greater than the threshold. If so, then repeat Steps 2 and 3. If not, then the most recent guess is the solution.
- Steps 6 and 7: Omit

p. 99: Fig. 7.1 should look like this:



p. 105, Equation (7.35): The second and third terms within the curly braces should have plus signs in front of them, rather than minus signs.

p. 106, Ex. 7.1: In the equation for $\psi_{i,j}$ the term AJ should be Aj .

pp. 107 – 115: The exponents for the units on several of the figure captions are of the wrong sign. The correct exponents are: Fig. 7.6 ($\times 10^7$); Fig. 7.7 ($\times 10^{-5}$); Fig. 7.9 ($\times 10^{-5}$); Figs. 7.10 – 7.15 ($\times 10^7$); Figs. 7.17 and 7.18 ($\times 10^7$).

p. 112: In Ex. 7.6 the terrain term should be $\frac{fg}{R_d T_s} [J(\psi, z_s)]_{i,j}^n$.

p. 112: In Ex. 7.6, in the equation for z_s the second exponential term should be

$$\exp\left[-\frac{(j-25)^2}{2\sigma_y^2}\right].$$

p. 120, Equation (8.8): This equation should read $K = 2\pi/\lambda$.

p. 133, Equation (8.54): The last u term on the second line should have indices $u_{i,j-1}^n$, and the numerator in the first term on the third line (after the equals sign) should be $(\eta_{i+1,j}^n - \eta_{i,j}^n)$.

p. 136: In the second line of text λ_R/f should be replaced with λ_R/d .

p. 137: The first line after Equation (8.61) should reference Exercise 8.4, not 8.3.

p. 152, Equation (9.7): The indices and denominator on the right-hand-side of the equation are incorrect. The correct equation is

$$\frac{u_i^{n+1} - u_i^n}{\Delta t} = -\frac{g}{12d} \left[23(\eta_i^n - \eta_{i-1}^n) - 16(\eta_i^{n-1} - \eta_{i-1}^{n-1}) + 5(\eta_i^{n-2} - \eta_{i-1}^{n-2}) \right]$$

p. 152, Equation (9.8): The indices and denominator on the right-hand-side of the equation are incorrect. The correct equation is

$$\frac{\eta_i^{n+1} - \eta_i^n}{\Delta t} = -\frac{H}{12d} \left[23(u_{i+1}^n - u_i^n) - 16(u_{i+1}^{n-1} - u_i^{n-1}) + 5(u_{i+1}^{n-2} - u_i^{n-2}) \right]$$

p. 161, Ex. 9.3: The dimensions of the η grid should be (100, 100).

p. 196: The second and third sentences should read: “The order m may be either positive or negative, and its absolute value corresponds to how many maxima (or minima) are encountered in one complete circle along a line of latitude. The difference between the degree and order, $n - |m|$, indicates how many transitions between positive and negative values occur along one complete meridian circle.”

p. 199, Ex. 11.3: The last sentence should reference Fig. 11.1, not Fig. 11.2.

p. 296-297: The arguments to the exponentials in (C.1), (C.2), (C.6), (C.7), (C.8) and (C.9) should all be divided by N .

p. 298, Figure C.1: The numerical values on the horizontal axes for the second and third panels should all be multiplied by 2π . Also, the horizontal axis label at the bottom of the figure should be k_m rather than m .