

(Question 3)

Part II. Procedure

Put (b), (c), (d), (e) and (f) into equation (2) to obtain

$$(\Delta T)_{\text{advection}} = - (100 \text{ km /h})([15^\circ\text{C} - 30^\circ\text{C}]/100 \text{ km})(1 \text{ h})$$

(g) $(\Delta T)_{\text{advection}} = +15^\circ\text{C}$

Put (g) and (a) into equation (1)

$$\begin{aligned} T_f &= T_i + (\Delta T)_{\text{advection}} \\ T_f &= 15^\circ\text{C} + 15^\circ\text{C} = 30^\circ\text{C} \end{aligned}$$

Part III. Results Analysis

Here you examine the result and decide if it is physically realistic given the constraint of the problem. This one is easy. You already know that if the air parcel at A moved to San Francisco the person at San Francisco would notice that the temperature would go up to 30°C by looking at Figure 1.

If your answer was a temperature fall, or that some unrealistic forecast temperature would occur (like -40 or 154) then you know you messed up somewhere.

(Question 2)

Concept Plan for Getting Answer to Question: *how will temperature change at San Francisco due to temperature advection alone.*

Part I: Governing Expressions

The governing equations tell us what we need to know. To find the forecast temperature, we use the expression that relates the initial temperature to the final temperature by the change in temperature due to advection.

The change in temperature due to advection is calculated from a map that shows temperature gradients and wind.

Here are the two expressions.

$$\text{(Equation 1)} \quad T_f = T_i + (\Delta T)_{\text{advection}}$$

$$\text{(Equation 2)} \quad (\Delta T)_{\text{advection}} = -V (\Delta T/\Delta s) (\Delta t)$$

For Equation 1, Need to know T_i , and ΔT (from Equation 2)

For Equation 2, Need to know V , Δt and $(\Delta T/\Delta s)$

Given:

(a) $T_i = 15^\circ\text{C}$

(b) $V = 100 \text{ km/h}$

(c) $\Delta t = 1 \text{ h}$

(d) $\Delta s = 100 \text{ km}$

For $\Delta T/\Delta s = [T_2 - T_1]/\Delta s$ need to know (figure 1):

(e) $T_2 = 15^\circ\text{C}$

(f) $T_1 = 30^\circ\text{C}$