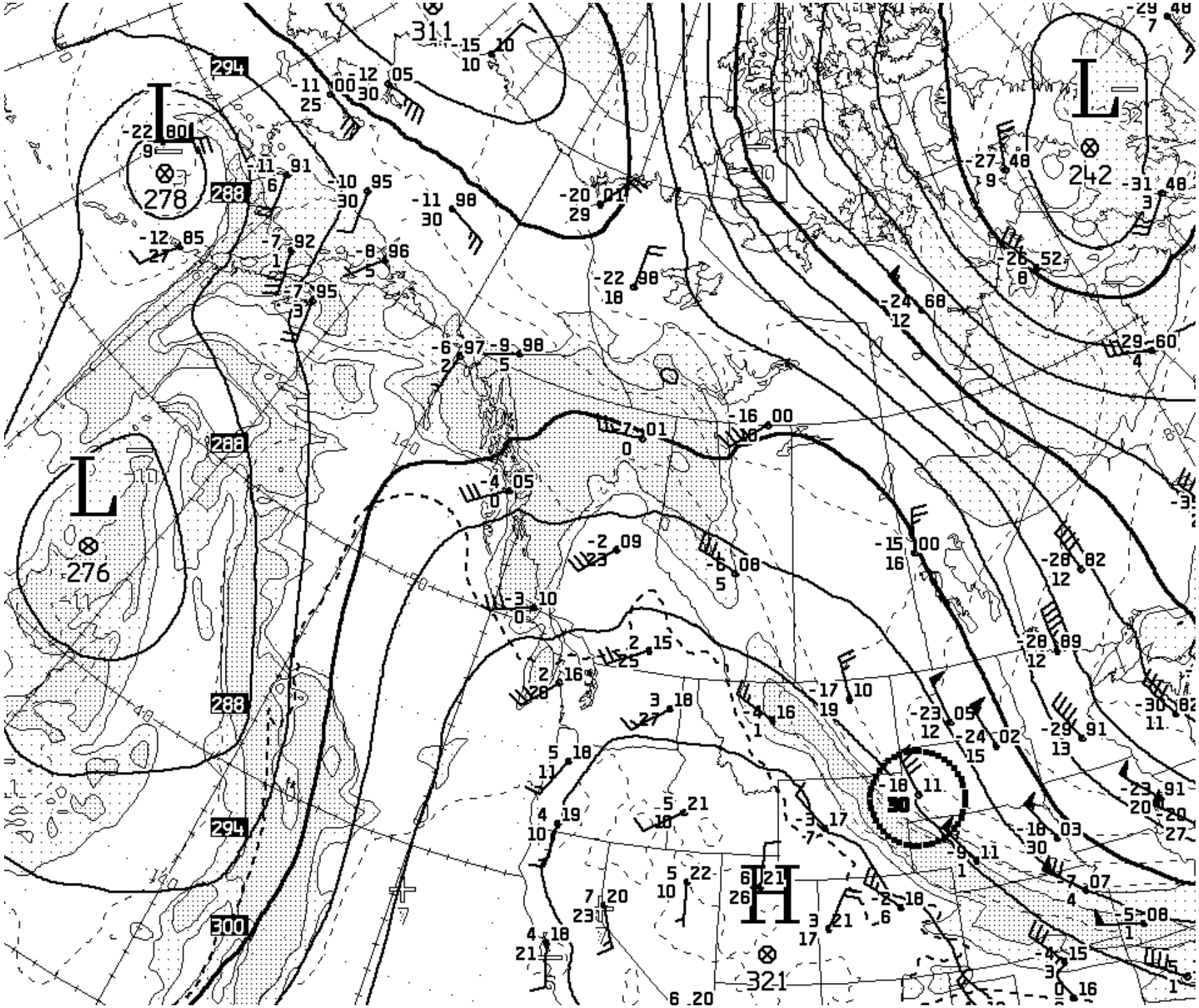
Discussion:

- changes to the upper flow over Ab relative to last class
- brief interlude of freezing rain

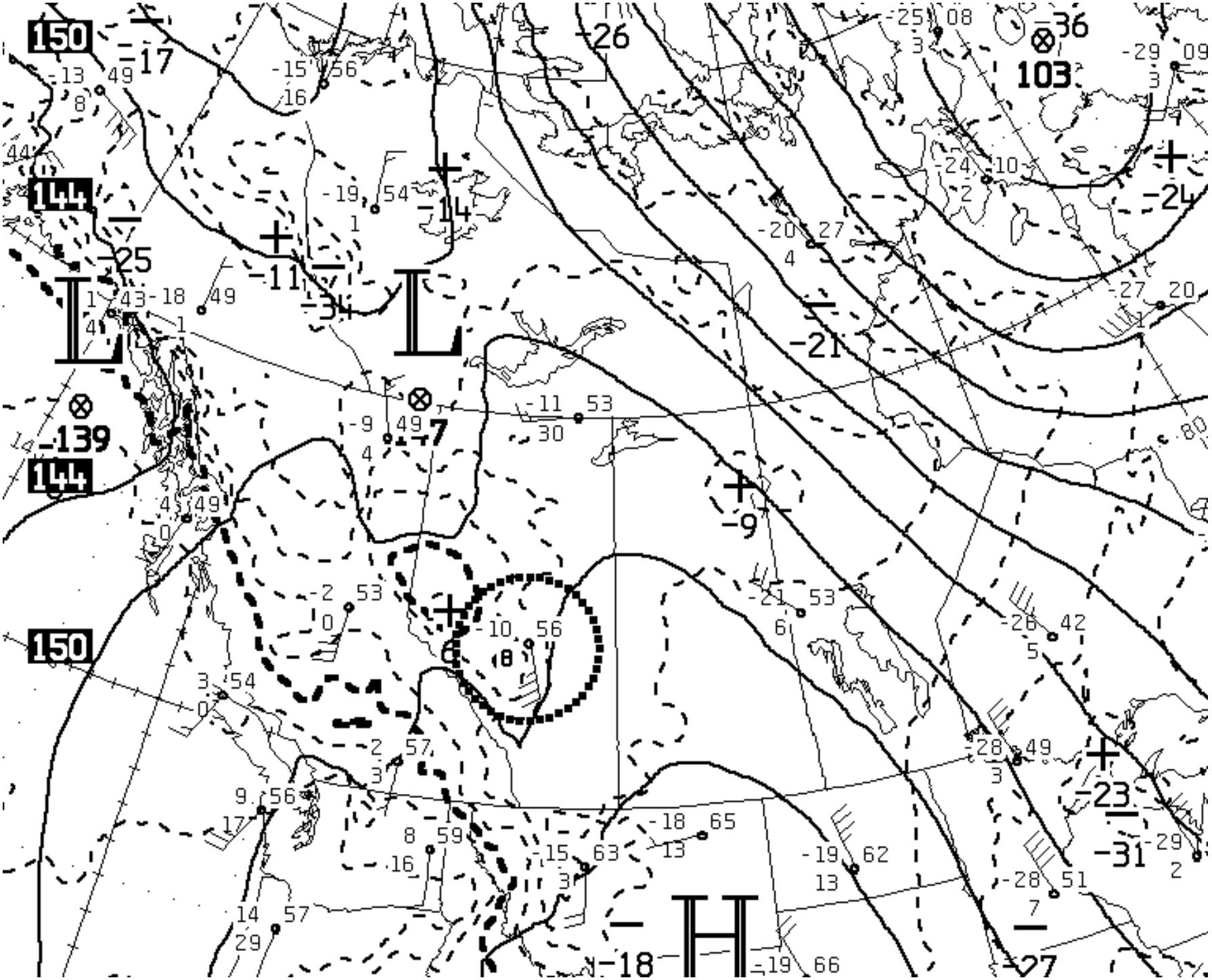
Exercises:

- prepare a forecast for C. Alberta valid 18Z Saturday 10 Jan.
- estimate rate of thermal advection

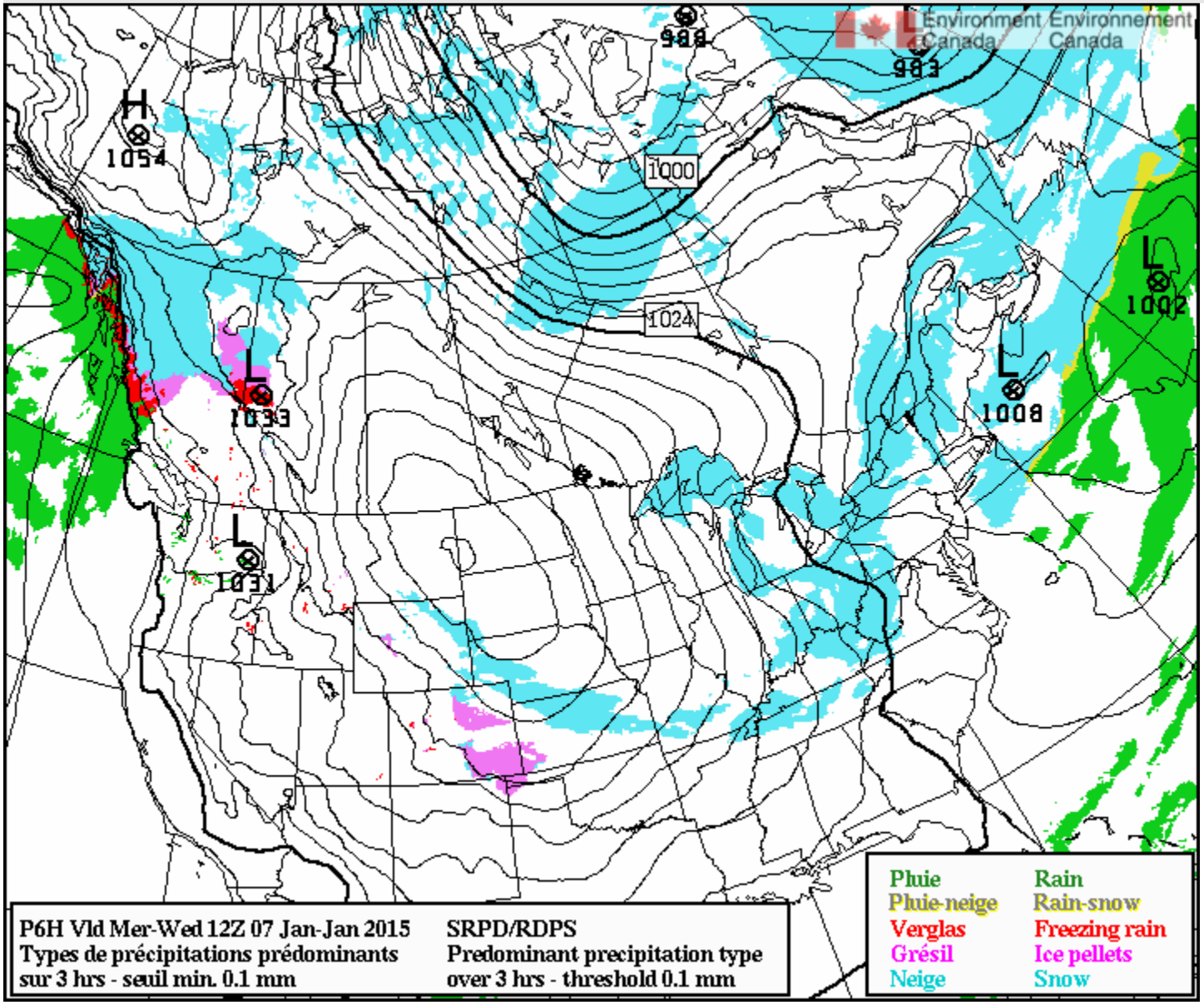
CMC 700 hPa analysis, 12Z Wed. 7 Jan. 2015 (cropped)

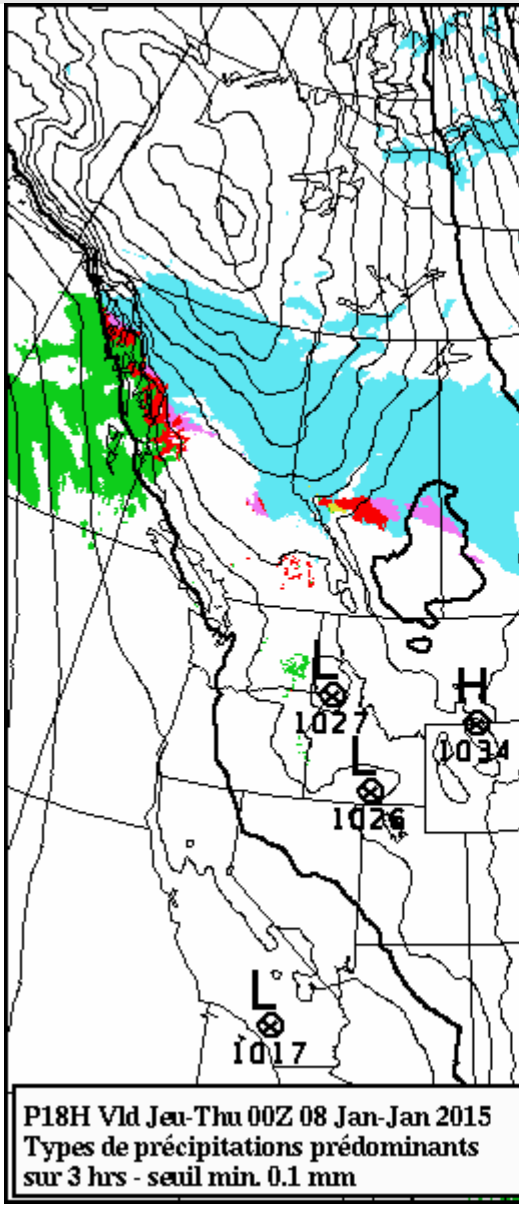


CMC 850 hPa analysis, 12Z Wed. 7 Jan. 2015 (cropped)



CMC GDPS 6h & 18h progs (MSLP+dominant precip type) init. 06Z Wed 7 Jan. 2015

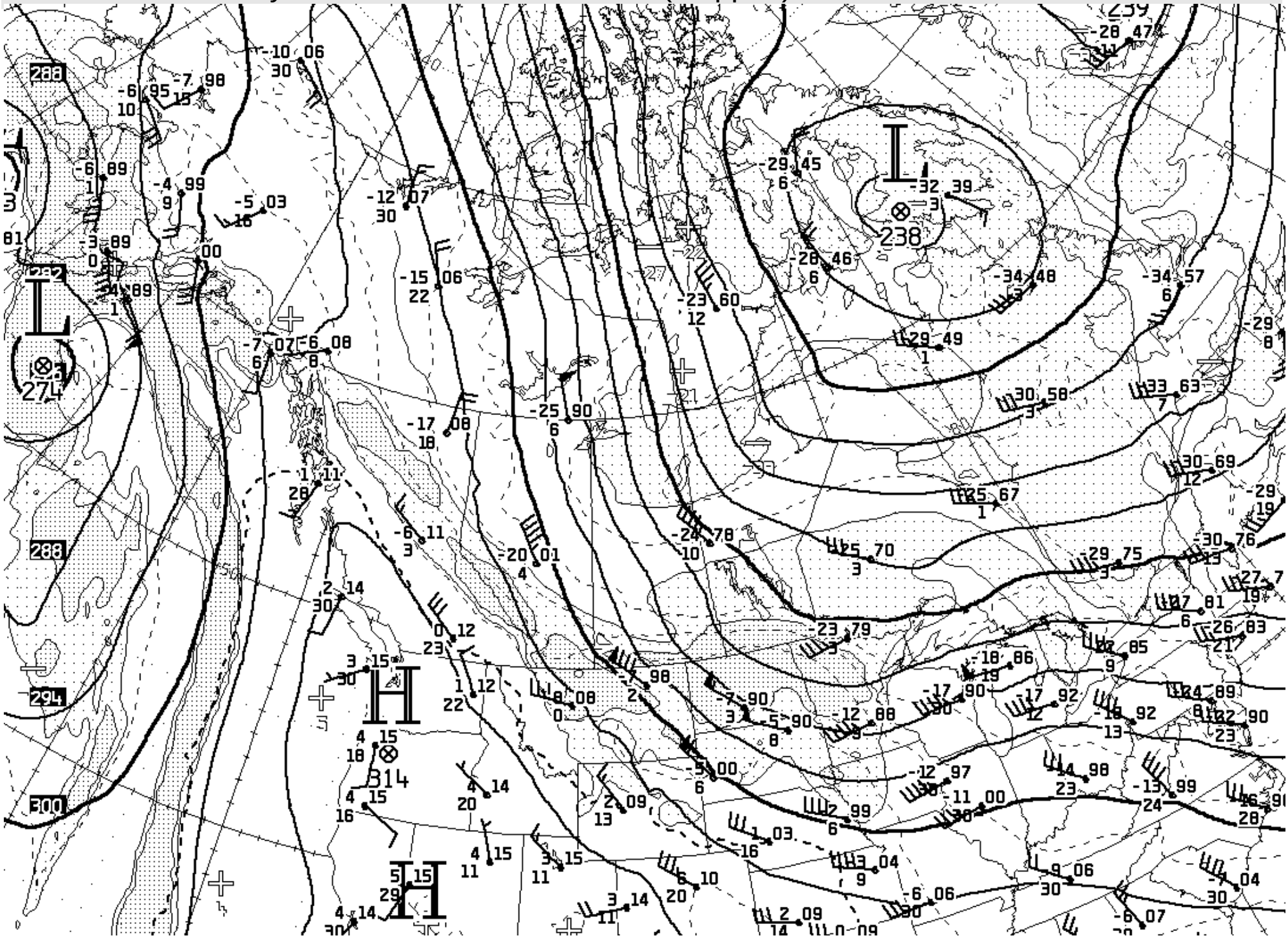




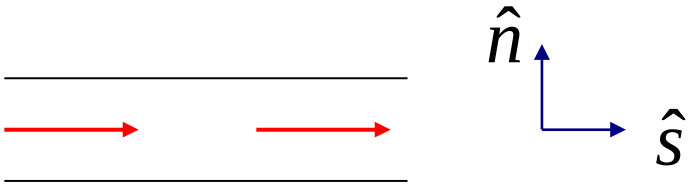
PRAIRIE & ARCTIC STORM PREDICTION CTR 7:00 AM CST WEDNESDAY JANUARY 7 2015.

... WITH THE NEXT WEAK LOW DEVELOPING IN THE ALBERTA ELBOW AND MOVING ACROSS CENTRAL ALBERTA TODAY, THE THREAT OF FREEZING RAIN PERSISTS FROM THE ELBOW THROUGH LLOYDMINSTER AS FAR SOUTH AS RED DEER AND CORONATION...

CMC 700 hPa analysis, 12Z Thurs. 8 Jan. 2015 (cropped)

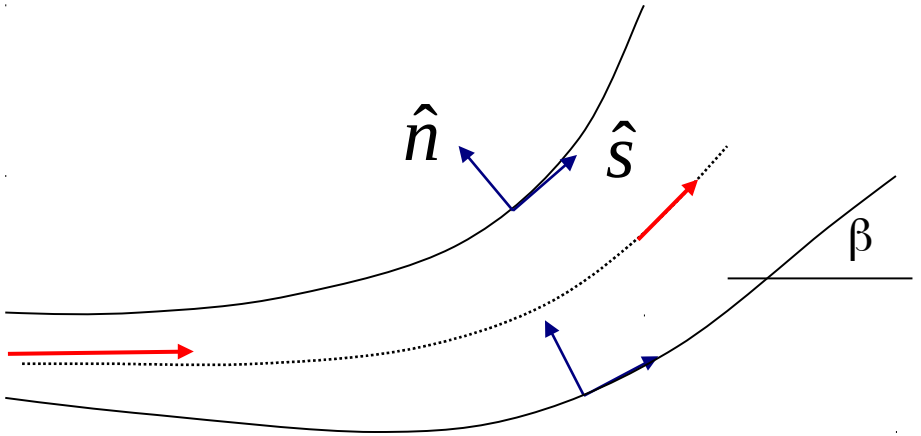


Natural Coordinate System



(magnitude of the horiz. wind vector is: v or V)

We'll let n denote a coordinate in the direction of the unit vector $\hat{n}$ (etc).



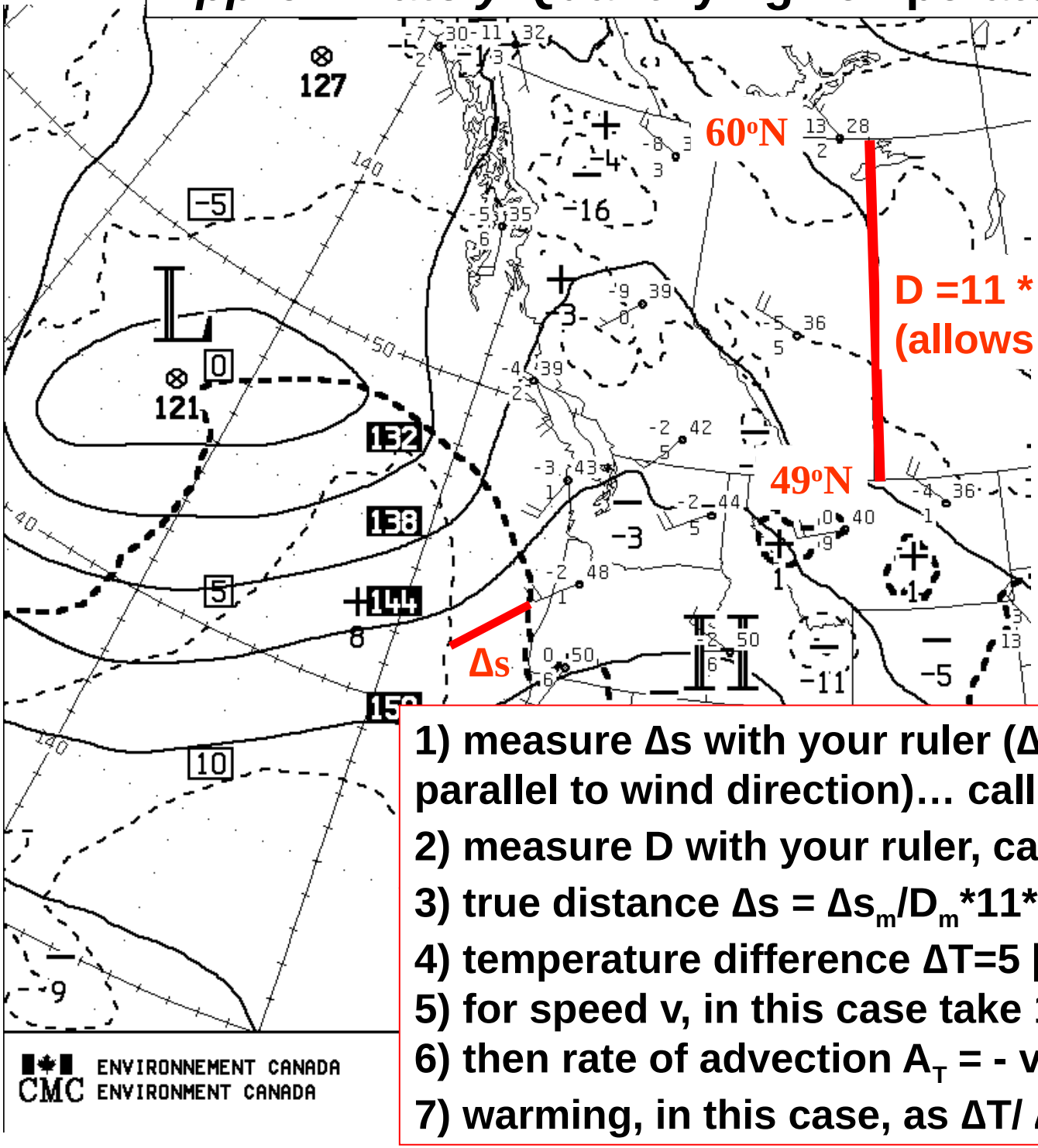
Rate of temperature change due to horizontal advection (acting alone) is

$$A_T = -V\frac{\partial T}{\partial s}$$

or in terms of finite differences

$$A_T = -V\frac{\Delta T}{\Delta s}$$

Approximately Quantifying Temperature Advection



$$\frac{\partial T}{\partial t} = -v \frac{\partial T}{\partial s}$$

D =11 * 111,000 [m]
(allows to calibrate your ruler)

11 degrees latitude
1 degree ↔ 111 km

1) measure Δs with your ruler (Δs should be oriented parallel to wind direction)… call the measure Δs_m

2) measure D with your ruler, call it D_m

3) true distance $\Delta s = \Delta s_m / D_m * 11 * 111000$

4) temperature difference $\Delta T = 5$ [°C]

5) for speed v, in this case take 10 m s^{-1}

6) then rate of advection $A_T = - v \Delta T / \Delta s$

7) warming, in this case, as $\Delta T / \Delta s < 0$

CMC 850 hPa analysis, 12Z Thurs. 8 Jan. 2015 (cropped)

Estimate the rate of thermal advection [K hr^{-1}] at YQD (The Pas, Manitoba)