EAS372 Mid-term Exam 11 Feb., 2016

Professor: J.D. Wilson Time available: 75 mins Value: 15%

Open book exam. Please answer in the booklet provided.

A. Equations, graphs & calculations (3 x 2 → 6%)

Answer any **three** questions in this section:

1. Plot the wind profile from the sounding of Table 1 on the blank hodograph, and draw on the thermal wind vector for the 850-500 hPa layer.

2. Give the components of the thermal wind vector $\vec{V}_T = \vec{V}_2 - \vec{V}_1$, if $\vec{V}_1$ is a south-westerly with speed $|\vec{V}_1| = 7\ \mathrm{m\,s^{-1}}$ and $\vec{V}_2$ is a north-westerly with speed $|\vec{V}_2| = 17\ \mathrm{m\,s^{-1}}$. (Hint: Pythagoras rule for right angle triangle with side lengths $\alpha, \alpha, \sqrt{2\alpha^2}$.)

3. Determine the components of $\vec{A} \times \vec{B}$ in the case that $\vec{A} = (1, -1, 0)$ and $\vec{B} = (-1, 1, 0)$

4. Referring to Fig. (1), if a surface parcel were lifted moist adiabatically to the 500 hPa level, then returned dry adiabatically to 700 hPa, what would its final temperature be?

5. Referring to Fig. (2), determine the geostrophic wind speed at the point marked by a circle over Vancouver Island (take the latitude as 50°, implying $f = 1.11 \times 10^{-4}\,\mathrm{s^{-1}}$).

B. "Live" web weather data (4 x 1 → 4%)

1. Retrieve and record today's 15Z METAR for CYEG (in standard format). Decode the low cloud type(s) and base height(s).

2. Give three values for today's 12Z thickness (1000-500 hPa) in the NE corner of Alberta: (i) Fort Smith (YSM) sounding, (ii) RDPS 0h prog and (iii) NAM 0h prog.

3. Compute the vapour pressure and absolute humidity corresponding to the 850 hPa level on today's 12Z Fort Smith (YSM) sounding. (For a sub-zero dewpoint temperature T_d, use the equilibrium vapour pressure over ice.)

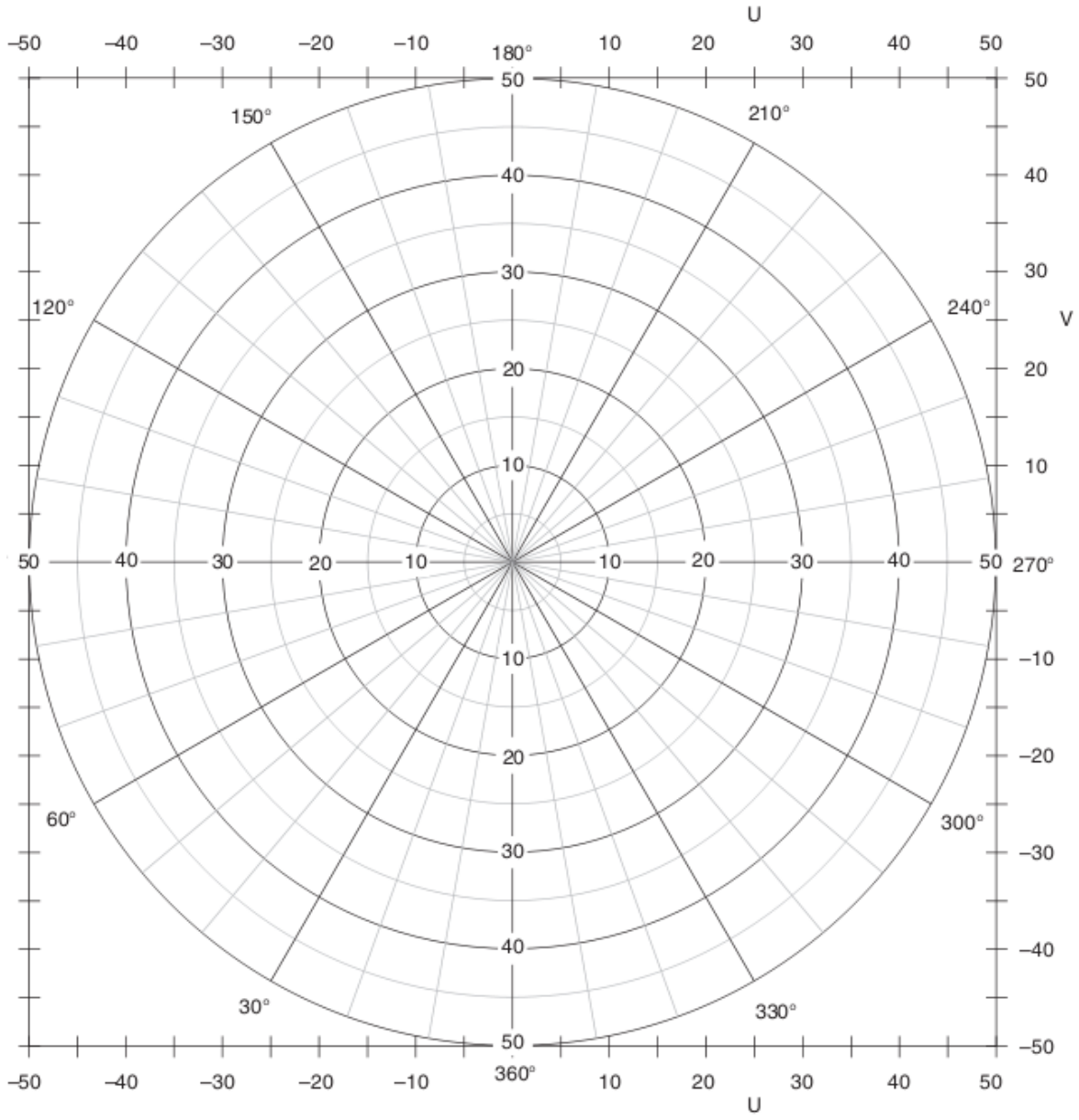
4. Based on the GDPS prog. initialized at 00Z today (Thursday 11 Feb.), give a range for the cumulative precipitation over Edmonton for the 24 hours ending 00Z Friday 12 February.

C. Interpretation of Weather Charts (→ 5%)

Referring to Fig. (3), describe and contrast the meteorological regimes over Alberta on the two occasions.

Table 1: Stony Plain sounding, 12Z Monday 8 Feb. 2016.

P [hPa]	z [m ASL]	T [°C]	T_d [°C]	DIR	SPD [knots]	θ
935.0	766	-1.5	-10.5	230	5	276.9
850.0	1539	0.2	-0.8	320	26	286.3
700.0	3079	-7.3	-7.6	310	56	294.4
500.0	5650	-20.3	-21.7	300	63	308.2



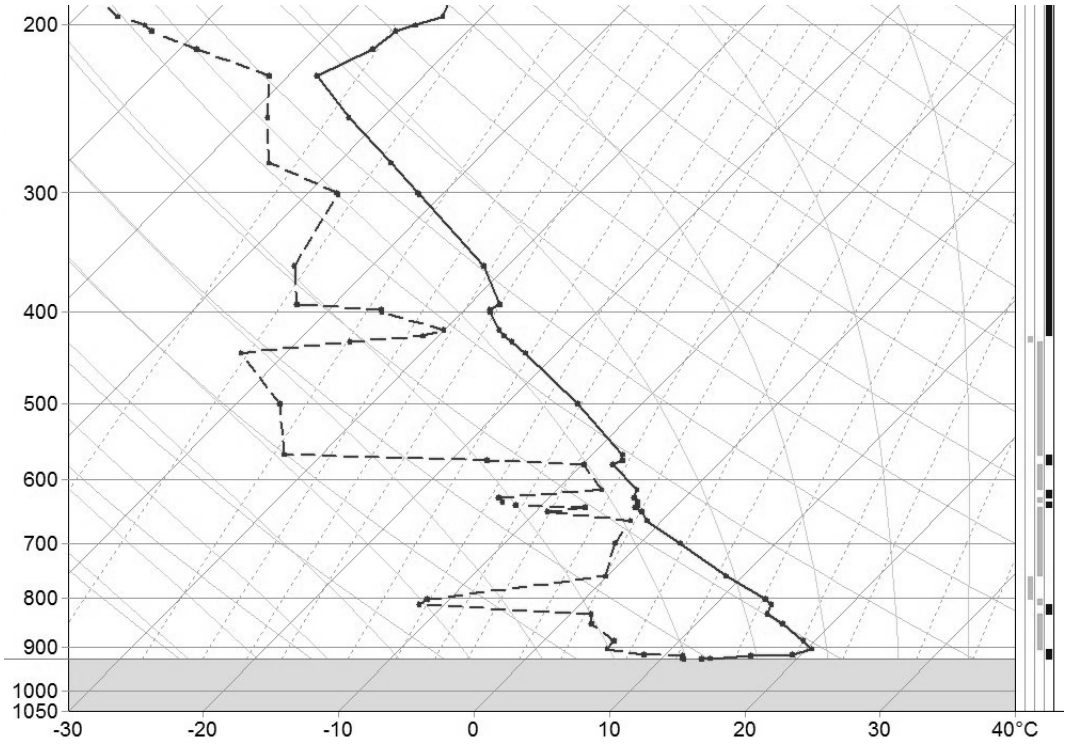


Figure 1: Stony Plain sounding, 12Z August 27, 2011.

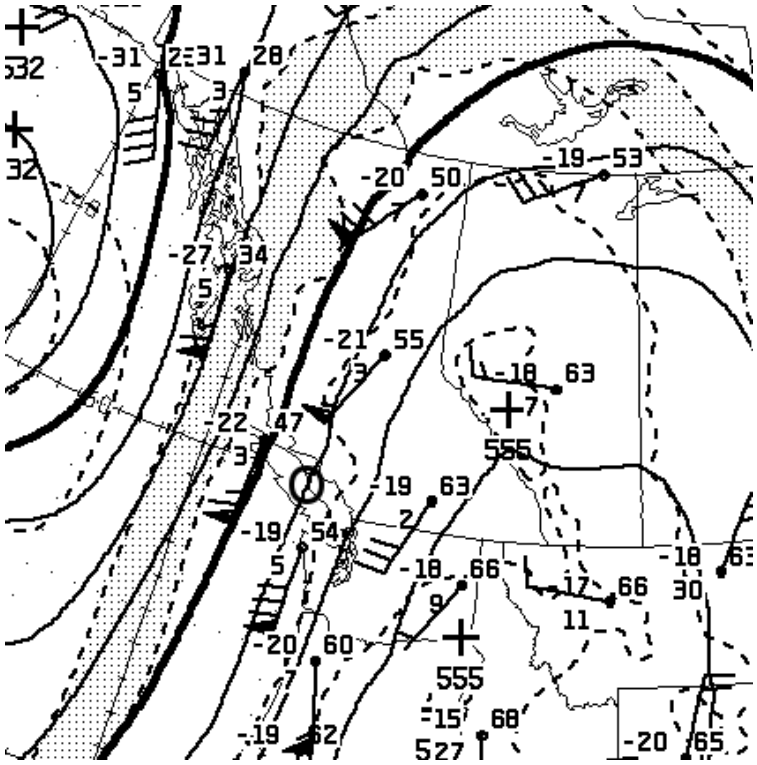


Figure 2: CMC 500 hPa analysis (cropped), 2 March 2010 at 00 GMT.

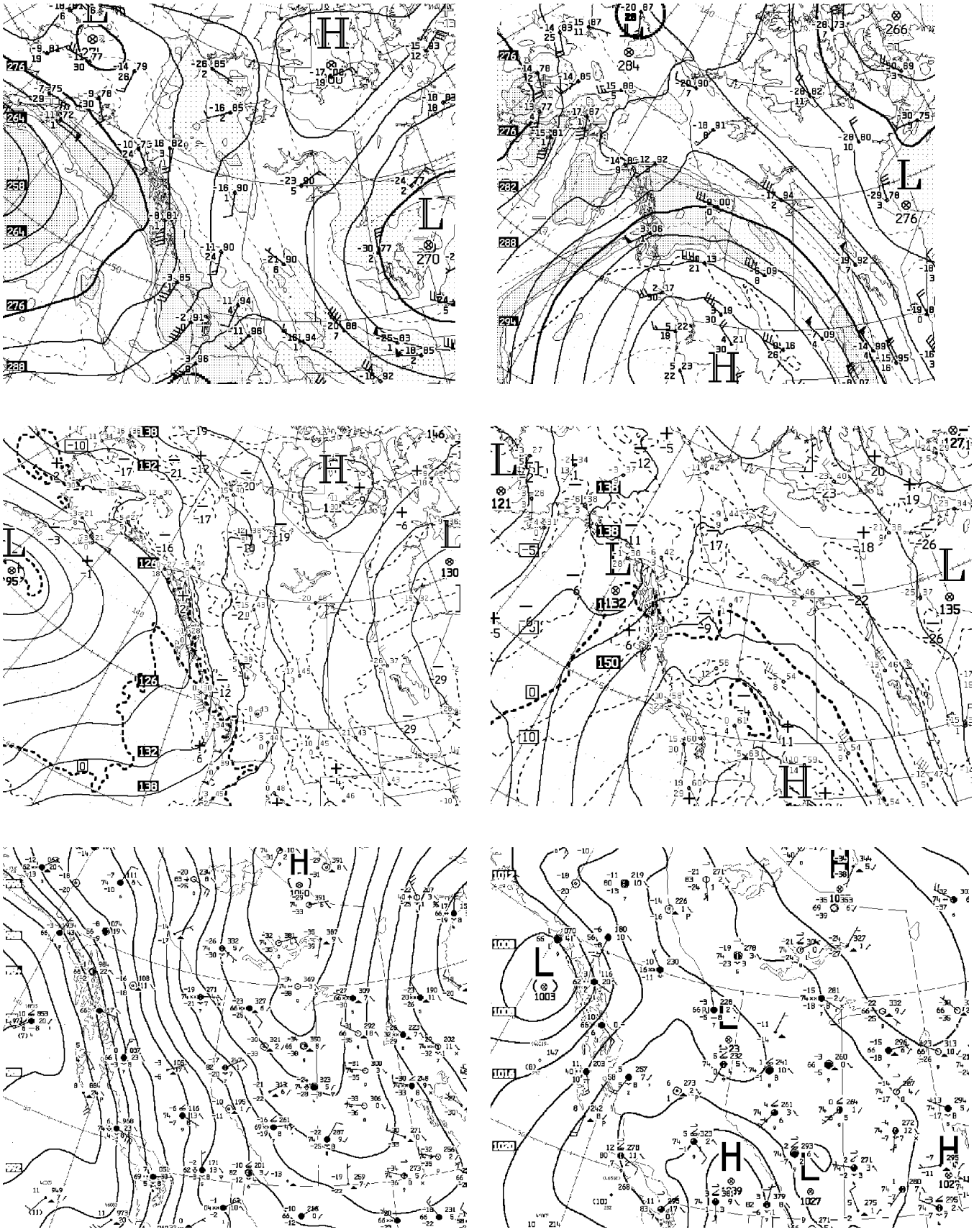


Figure 3: CMC analyses at 12Z on 16 Jan (left) & 00Z on 9 Feb (right), 2016.