weaken the cap. If this occurs, we can realize the CAPE and strong/severe thunderstorms may occur.

14. Describe in your own words the concept of inertial instability.

An equation describing inertial instability is

$$\frac{dV}{dt} = -f\left(f - \frac{\partial u_g}{\partial y}\right) dy$$

Let dy be positive, i.e., a northerly displacement. Now, assume a case of anticyclonic shear. What possible stability or instability can occur?

Sol)

- Inertial instability: If a parcel is moving horizontally, its momentum must be conserved. We examine u, f, M_p, M_A, and $\frac{\partial V}{\partial y}$ to see if the parcel is inertially stable (whereby it returns to its initial position) or if the parcel is inertially unstable (whereby it will keep on moving in the direction it was moving)
- Anticyclonic shear

② → If the change in f from ① to ② is greater than $\partial u_g/\partial y$
① → ⇒ inertially stable as $dV/dt < 0$
If the u_g increases more than f ⇒ inertially unstable as $\frac{dV}{dt} > 0$
Neutral if shear term = f

15. Compare/contrast conditional symmetric instability with hydrostatic and inertial instability.

How do you diagnose CSI using cross sections?

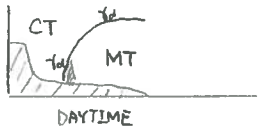
Sol)

One can have CSI without having hydrostatic instability or inertial instability. This is because CSI is a slantwise instability, while hydrostatic instability is vertical and inertial instability is horizontal. CSI is diagnosed by looking at cross sections of θ_e and M_g (absolute geostrophic momentum). If the M_g lines are more horizontal (less sloped) than the θ_e lines, one may expect CSI. If $\partial\theta_e/\partial z|_{M_g} < 0$ or if $\partial M_g/\partial x|_{\theta_e} < 0$, then we may expect CSI.

16. How do dry lines move during a typical 24h period?

Explain why this occurs. A cross section might help.

Sol) Dry lines move E during day as sun mixes out capped, moist layer near the surface. The dry line moves W during the night as winds decouple, mixing ends, and easterly wind don't die off as quickly within the moist side.



⇒ too brief

MET5511C – Final exam : Fuelberg (1997)

1. Describe the nocturnal low level jet stream. Do this through a numbered list of its characteristics. For each numbered item, provide a contrast with the polar jet stream. You should give at least 4-5 "meaty" characteristics

Sol)

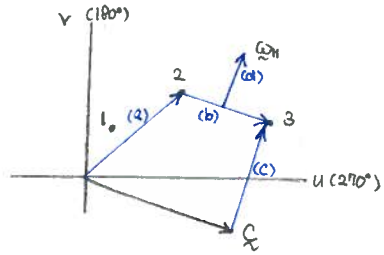
Nocturnal Low level jet	Polar jet
(a) found in low levels, usually below 700mb. At night, can be found as low as 500 m AGL (above ground level)	(a) found in the upper levels, usually near 300mb, but may be slightly higher.
(b) Strong diurnal variation: Subgeostrophic during day; supergeostrophic (e.g. $V_{obs} = 2V_{geos}$) during night	(b) no diurnal variation; ageostrophic circulations may be associated with jet streaks (Entrance & exit regions)
(c) found in midwest/Plains	(c) found at mid-high latitudes, practically everywhere around the earth
(d) can be accountable for rapid transport of moisture & airmass destabilization; Severe thunderstorms may be associated with this jet.	(d) no moisture transport at low levels, but may be associated with severe thunderstorms when jet is strong (jet streaks). Ageostrophic winds increase at low levels associated with upper jet streak
(e) Core of jet can be found near top of radiation inversion	(e) Core of jet found in area of strong upper level confluence → PJ is associated with tropopause inversion

2. The hodograph below has numbers showing the winds at 1 km intervals. The vector C indicates the motion of a storm cell.

a. Draw a vector indicating the ground relative wind at 2km.
b. " " " " " shear between 2-3km
c. " " " " " storm relative flow at 3km
d. " " " " " horizontal vorticity between 2-3km

Be sure that the above items are labeled clearly so I can distinguish them. You may draw the vectors directly on the hodograph below.

Sol)



3. On your own paper draw two hodographs. One contains unidirectional shear with cold air advection. The second contains clockwise shear. Each hodograph should show the surface wind and winds at altitudes of 1, 2, and 3 km (labeled S, 1, 2, 3). The shears between these levels also should be shown.

Sol)