Name: _____

MEA 443 WEATHER ANALYSIS AND FORECASTING, Fall 2011
Quiz 8, 20 October 2011

Don't forget to enter your last RIW forecast today, and that we switch to DAY on Monday. Have a great weekend.

___ 1.) The U.S. Weather Bureau was slow to adopt the ideas of Norwegian cyclone model into their forecasting process. Which of the following contributed significantly to this situation?

a.) The problem was communication. The Norwegians published only in European journals, and so people in the U.S. had no chance to hear about this work.

b.) The U.S. university training program for meteorologists presented U.S. techniques in the 1920s; as graduates entered the Weather Bureau with a BS in meteorology, their training did not include Norwegian ideas.

c.) The head of the U.S. Weather Bureau was not supportive because the difference in latitude between Norway and the U.S. made the ideas irrelevant.

d.) All of the above.

___ 2.) What is the "valley of death", and how does it relate to V. Bjerknes and the Norwegian School? Select the best explanation below.

a.) The "valley of death" was World War I, which led Bjerknes to move his operation back to Norway after several of his graduate students were killed in the war.

b.) The "valley of death" describes the inability of scientists to make an accurate numerical weather forecast. After initial failed attempts at NWP, the project essentially died due to the lack of computer power and human resources.

c.) "Valley of death" describes the separation between the research and operational communities in science. Bjerknes recognized the needed to bridge this gap.

d.) The "valley of death" was essentially the Atlantic Ocean, which isolated U.S. meteorologists from European advances in meteorology. Bjerknes traveled to the U.S. to improve this situation.

3.) True/ False:

___ a.) For a given pressure gradient, the geostrophic wind speed would be **stronger** the farther poleward you go.

___ b.) Over water, the turbulent fluxes of heat and moisture increase with wind speed in part due to increased surface roughness associated with wind waves.

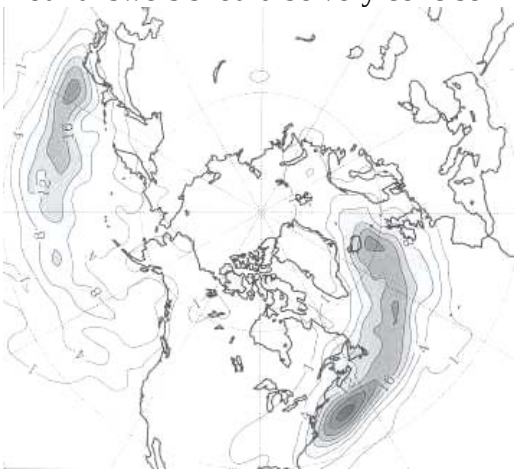
___ c.) Numerical simulations of a strong marine cyclone that ***eliminate latent heating*** would tend to exhibit *lower* values of upper-tropospheric geopotential height downstream of the cyclone relative to "full physics" simulations.

___ d.) Computer simulations of the Presidents' Day cyclone of 1979 showed that even without including latent heat or turbulent fluxes, modern computer models were able to fully capture the storm development.

4.) Suppose that an upper trough, with ascent and surface convergence ahead of its axis, is approaching a surface frontal zone. Consider only the action of the stretching term on the right side of the QG vorticity equation: $\frac{d\zeta_{ga}}{dt_g} = -f_0\left(\nabla\cdot\vec{V}\right)$.

Assuming that the value of convergence is *constant*, integrate this expression to obtain an expression for vorticity as a function of time. Hint: Integrate from time t = 0, at which time $\zeta_{ga} = \zeta_{ga\,0}$ to time t, at which time $\zeta_{ga} = \zeta_{ga}(t)$.

___ 5.) The figure below, derived from NCAR/NCEP reanalysis data, shows the spatial distribution of the frequency of *explosively deepening* cyclones. The more darkly shaded areas see more explosively deepening storms. Based on your knowledge of cyclone dynamics, ***list two reasons*** why rapidly deepening storms are favored in these areas. Your answers should be very concise – fit them in the box below at right.

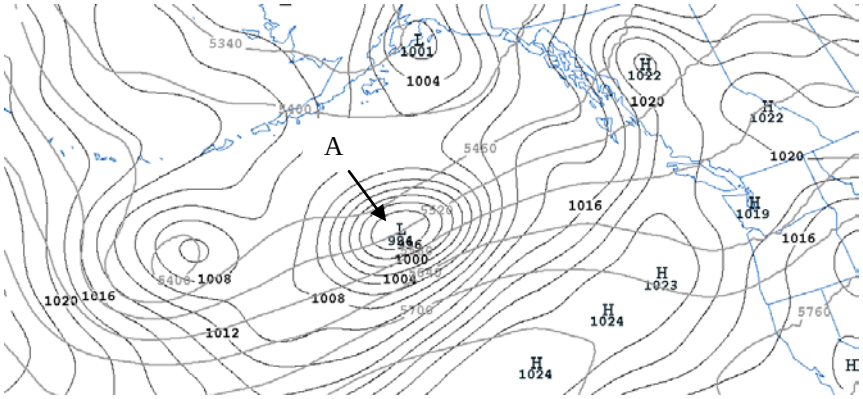


(a)

(b)

6.) Consider the plot of 500-mb height and sea level pressure below for a Pacific Ocean cyclone, "A". Based on this information, do you expect this cyclone to weaken or strengthen with time? _____ (weaken or strengthen).

Briefly justify your answer below.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