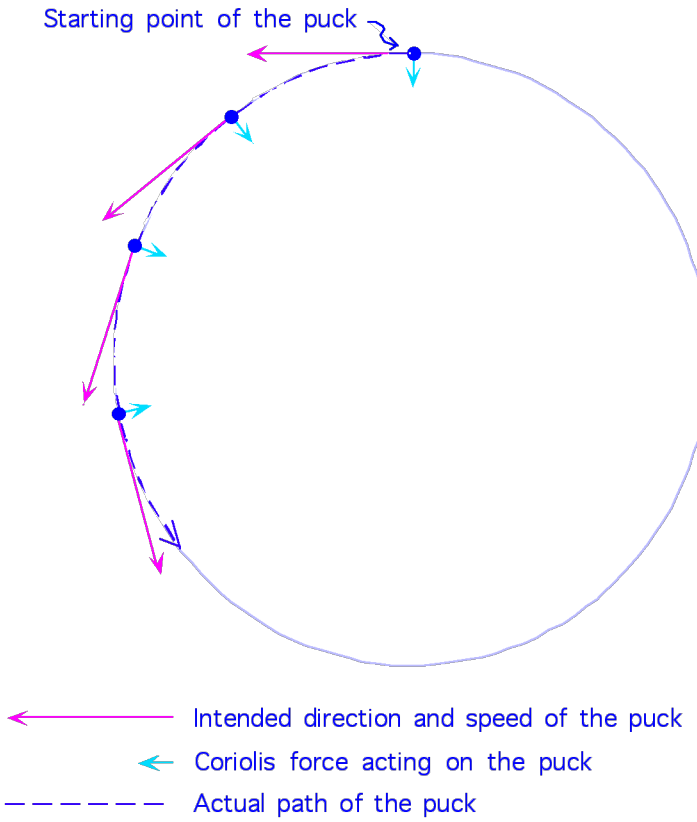
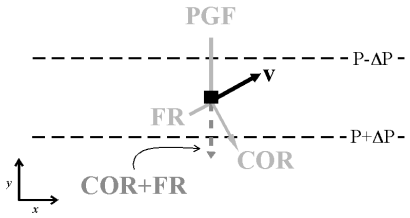
AOS 100/101
Spring 2017
Homework #6
Solutions

1)

The sheet of ice is flat which means the only reason the puck moves is because it has been given a push. Since the ice is frictionless, the puck will always have the same speed as it does just after the push is given to it. The only force that is acting on the puck after the push is the Coriolis force (COR). Since this experiment is occurring in the Southern Hemisphere, the Coriolis force will pull the puck to the left *at right angles* for as long as the puck is moving. The result of this constant pull to the left is that the puck will, over time, complete a circular path known as the *inertia circle*. The drawing below may help demonstrate.



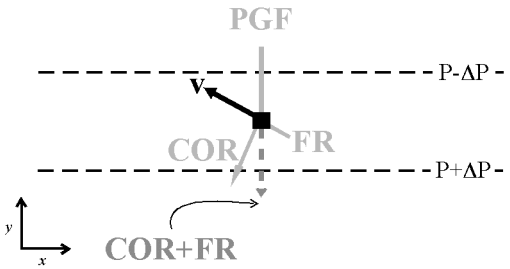
2) This problem requires that you consider the three way force balance of the wind at the surface. In this case the balance is between the PGF and the SUM of the COR and FR forces as indicated in the drawing (applicable to the Northern Hemisphere) below;



If you imagine yourself with the wind at your back, it is clear that the lower pressure will be to your LEFT in this case. However, since the balanced wind in the presence of friction forces the wind to be directed across isobars from high to low pressure, the low pressure will not be directly to your left.

3)

This problem requires that you consider the appropriate force balances (for the SH) at the surface and at 1 KM. At the surface, there will be a three way force balance between PGF, COR, and FR as shown below



At 1 KM there will be no friction and so the balance will be geostrophic and the resulting wind at 1 KM is parallel to the isobars at that level so it will be headed due west. Comparing the surface wind diagram (headed to the NW) with the 1 KM wind (headed due West) you notice that the wind direction changes direction in a counterclockwise fashion from the surface to the 1 KM. Hence, the wind BACKS with increasing height on this day at Santiago, Chile.

4)

Geostrophic flow is the result of a balance between the pressure gradient force (PGF) and the Coriolis force (COR). If the winds well above the surface of the Earth are nearly in geostrophic balance, then a considerable Coriolis force must be acting on the Earth. The Coriolis force is a result of the rotation of the Earth on its axis. Thus, the fact that the winds above the surface are nearly geostrophic is proof that the Earth rotates on its axis.