The Coriolis Force and Wind

WHAT YOU SHOULD LEARN IN THIS EXERCISE:

- Become familiar with the Coriolis force

Part A: Getting Started

A1. Launch the application:

→ Go to the Hands-On Meteorology web page

→ Open the program "Coriolis"

Part B: Investigate the Coriolis Force

B1. (a) Set the options to:

Initial Radial Speed	= 3.0 m/s
Rotation (rpm)	= 2.50
Frame of Reference	= Above Disc

(b) Click the Start button

(c) What direction is the disk rotating? (circle one) clockwise counterclockwise

(d) Click the Release button when the ball is near the bottom of the disc. After the dots are drawn across the disc click Stop.

(e) The red path follows the ball as seen by an observer in the current frame of reference (above the disc.) The black path is the shadow the ball would leave on the disk as it rolled. What direction did the black dots curve as they were drawn? (circle one)

to the right to the left

B2. (a) Change the Frame of Reference = On Disc. Click Start, Release, and Stop.

(b) Do the real path (red) and apparent path (black) of the dots differ? If so, how?

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B3. (a) Set the options to:

Initial Radial Speed	= 3.0 m/s
Rotation (rpm)	= -2.50
Frame of Reference	= Above Disc

(b) Click the Start button.

(c) What direction is the disk rotating? (circle one) clockwise counterclockwise

(d) Click the Release button when the ball is near the bottom of the disc. After the dots are drawn across the disc click Stop.

(e) The red path follows the ball as seen by an observer in the current frame of reference (above the disc.) The black path is the shadow the ball would leave on the disk as it rolled. What direction did the black dots curve as they were drawn? (circle one)

to the right to the left

B4. (a) Change the Frame of Reference = On Disc. Click Start, Release, and Stop.

(b) Do the real path (red) and apparent path (black) of the dots differ? If so, how?

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Part C: Coriolis Force on Earth

C1. Look at the globe in the front of the classroom and try to draw similarities between the Earth rotation and the disc rotating. Remember the sun rises in the east and sets in the west!

(a) If you are looking down on the earth from above the north pole, which way would the earth rotate? (circle one) clockwise counterclockwise

(b) If you are viewing the path of an object from above the North Pole, the path is straight. Which way does the object's shadow curve?

to the right to the left

(c) Which way is the wind deflected by the Coriolis force in the Northern Hemisphere?

to the right to the left

C2. Using the same reasoning you used in C1, which way is the wind deflected by the Coriolis force in the *Southern* Hemisphere?

to the right to the left

Extended Exercise #3:

Due at the beginning of Hands-On class October 17/18

WHAT YOU NEED TO TURN IN:

Please organize the following materials in the order they are listed, staple, and turn in.

- Cover page with your name, the date, title of exercise: "Forces and Wind" and your section number and instructor
- The answers to questions 1 – 4 below (Part D)

Note: Your answers should be typed. This will provide you with a backup copy of your assignment and prevent any misinterpretation by the TA grading the assignment.

PART D: QUESTIONS FOR THOUGHT

Complete the following:

1. Answer these questions about force balance.

   (a) What forces are in balance when geostrophic balance is achieved?
   (b) Can we use the geostrophic wind to approximate the real wind in the upper atmosphere most of the time? Why or why not?
   (c) Can we use the geostrophic wind to approximate the real wind near the surface most of the time? Why or why not?
   (d) Could geostrophic balance be achieved if the earth stopped rotating? Why or why not?
   (e) What forces are in balance when hydrostatic balance is achieved? Does the atmosphere approximate hydrostatic balance most of the time?

2. Answer the following questions from this map of sea level pressure: Sea Level Pressure Map

   (a) Using the map, rank the following cities in order from strongest winds to weakest or no winds.
   Atlanta, Georgia
   Minneapolis, Minnesota
   Santa Fe, New Mexico
   (b) Explain *why* isobar spacing is related to wind speed.
   (c) If you determined that there was a wind in Atlanta, Georgia, what direction would the wind be blowing from?
   (d) If you determined that there was a wind in Minneapolis, Minnesota, what direction would the wind be blowing from?
   (e) If you determined that there was a wind in Santa Fe, New Mexico, what direction would the wind be blowing from?
   (f) (i) If you were in Denver, CO, would the station pressure be greater than, equal to, or less than the pressure given on this map. Why?
   (ii) How about Death Valley, CA? Why?