**(2.5) Worksheet Solution: Distance and bearing along a trajectory**

Problem:

Find the **distance** () and **direction** () this buoy has traveled over the last day.

Take the radius of the earth, , to be . Assume the Earth is flat between the position the buoy was at yesterday and today. What is the distance and direction between these two points?

Worked Example Solution:

*This example will use data from when Buoy ID: 300234060834110 travelled from () to () from Oct. 27-28, 2016. Remember, the negative sign in front of longitude means West of the prime meridian. A negative sign in front of latitude would mean South of the equator.*

We can use the following rule of isosceles triangular geometry to calculate



* *This means the buoy drifted North as it drifted from location A to B.*

We can use the same rule to calculate for the triangle containing :



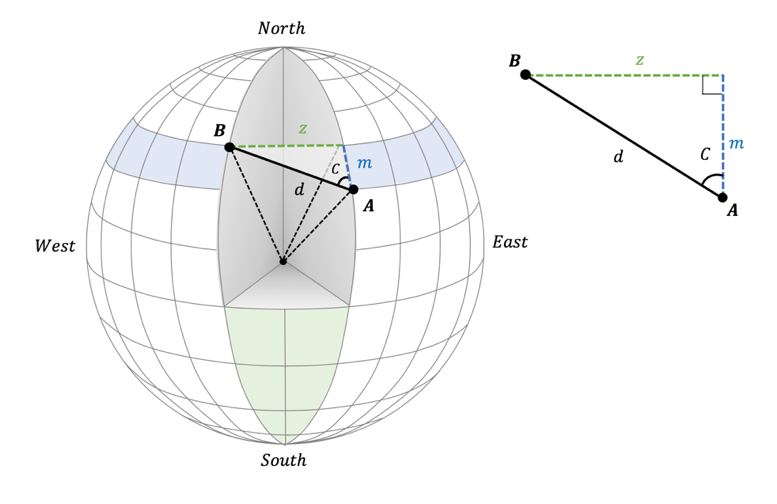
Here, we will need to calculate using right triangle geometry:



Thus, the zonal component becomes:

* *The negative sign in front of the distance means the object drifted to the West.*

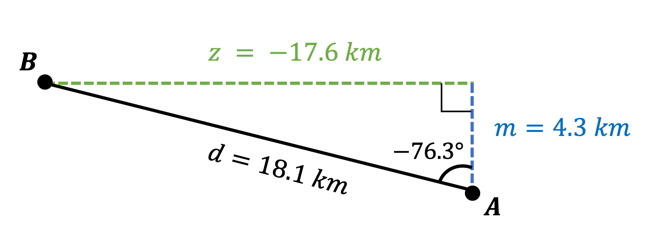
The total distance traveled, can be calculated from the zonal and meridional components of the buoy drift using Pythagorean’s Theorem.



Using rules for a right triangle, we can calculate C:

* *The negative sign means the object drifted at an angle West of North.*

The total trajectory between points A and B can be visualized as the following:



Below is a depiction of the actual location from Google Earth:





* If students would like to compare their calculation to the actual great circle distance traveled along the surface of the Earth, the following online calculator can be used: <http://www.onlineconversion.com/map_greatcircle_distance.htm>

This calculator uses geographic coordinates to find the distance along a section of circle with radius *r* between the points. The spherical trigonometry used is university level math.

* In this case, the actual distance traveled was: