**3.3 Worksheet Solution**: **Estimating Error**

Below are forecasted location solutions using an excel worksheet. They may be slightly different from the values students have calculated by hand.

|  |  |
| --- | --- |
| Day of Forecast | (Latitude, Longitude) |
| 350 | Forecast D: ()  Reported D: () |
| 352 | Forecast D: ()  Reported D: () |
| 354 | Forecast D: ()  Reported D: () |
| 356 | Forecast D: ()  Reported D: () |
| 358 | Forecast D: ()  Reported D: () |
| 360 | Forecast D: ()  Reported D: () |
| 362 | Forecast D: ()  Reported D: () |
| 364 | Forecast D: ()  Reported D: () |
| 1 | Forecast D: ()  Reported D: () |

*Model error calculation:*

The meridional and zonal distances traveled by a buoy from location B to D are given by:

And the total distance is given by:

Combining, we can simplify to:

The error is given by the difference in the forecasted and reported distances traveled from B to D:

where:

and “DF” and “DR” indicate the forecasted and reported buoy locations, respectively.



Example for Forecast Day 350:

B: ()

Reported D: ()

Forecast D: ()

The forecasted distance would be given by:

The reported distance would be given by:

The error for this forecast is thus given by:

|  |  |  |
| --- | --- | --- |
| Day of Forecast | (Latitude, Longitude) | Error |
| 350 | Forecast D: ()  Reported D: () |  |
| 352 | Forecast D: ()  Reported D: () |  |
| 354 | Forecast D: ()  Reported D: () |  |
| 356 | Forecast D: ()  Reported D: () |  |
| 358 | Forecast D: ()  Reported D: () |  |
| 360 | Forecast D: ()  Reported D: () |  |
| 362 | Forecast D: ()  Reported D: () |  |
| 364 | Forecast D: ()  Reported D: () |  |
| 1 | Forecast D: ()  Reported D: () |  |

The students have calculated the deviation of their forecast from reality (an observation). You can think of this as an error for the particular forecast time. It is more instructive to think of model error in such a way that the model error characterizes the spread in error of the forecast model.

The excel spreadsheet provides tools to investigate the distribution of dF – dR. We will use this to explore the concept of model error.