

Worsley's Solar Declination Value

I have been examining the solar declination values that Worsley used. While the solar declination value is not directly given, we can derive the value he used. The solar declination is used to compute the Polar Distance, which is given. Further, since he gives the trigonometric value of the polar distance, we have a second check or look at the data. The trigonometric value and the stated Polar distance angle have a direct one-to-one relationship.

$$\text{Log (cosecant)} = \text{Log}(1/\sin(90+\text{declination}))$$

It is clear that Worsley is adjusting his declination as a function of the time. For each of Worsley's observations, I repeat Worsley's stated time directly from his log book. Next, we adjust that to modern values, where our noon is 12-00 and his noon is 24-00. I then used Frank Reed's Online Nautical Almanac to get the solar declination for the modern time and stated date, for the whole hours around Worsley's time. We can see the declination fits nicely into the time slot, within a reasonable margin of error.

24April1916

Worsley's Stated Time	24.40.01	
Adjust to Modern Values	12-40-01	
Online Nautical Almanac	12-00	N12° 50'.7
	13-00	N12° 51'.6
Worsley's Implied Declination		N12° 51'.5

26April1916

Worsley's Stated Time	2.26.6	
Adjust to Modern Values	14-26-06	
Online Nautical Almanac	14-00	N13°31'.5
	15-00	N13°32'.3
Worsley's Implied Declination		N13°31'.9

29April 1916

Worsley's Stated Time	25.1.47	
Adjust to Modern Values	13-01-47	
Online Nautical Almanac	13-00	N14°27'.7
	14-00	N14°28'.5
Worsley's Implied Declination		N14°27'.8

4May1916

Worsley's Stated Time	25.22.29	
Adjust to Modern Values	13-22-29	
Online Nautical Almanac	13-00	N15°57'.8
	14-00	N15°58'.6
Worsley's Implied Declination		N15°58'.0

7May1916, 1st Observation

Worsley's Stated Time	25.24.51	
-----------------------	----------	--

Adjust to Modern Values	13-24-51	
Online Nautical Almanac	13-00	N16°48'.8
	14-00	N16°49'.5
Worsley's Implied Declination		N16°48'.9

7May1916, 2nd Observation, WHICH IS APPARENTLY OUT OF CHRONOLOGICAL ORDER!

Worsley's Stated Time	23.19.38	
Adjust to Modern Values	11-19-38	
Online Nautical Almanac	11-00	N16°47'.4
	12-00	N16°48'.1
Worsley's Implied Declination		N16°47'.3

7May1916, 3rd Observation

Worsley's Stated Time	5.26.47	
Adjust to Modern Values	17-26-47	
Online Nautical Almanac	17-00	N16°51'.5
	18-00	N16°52'.2
Worsley's Implied Declination		N16°52'.0