

LOGBOOK DATA: CONSISTENCY & VERIFICATION

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CLIWOC



Fleet Activities – N Case Independent Samples

Where fleets are gathered, it is possible to assemble n independent samples for statistical comparison. One such case is Admiral Edward Boscowan's North Atlantic crossing (England – Halifax) in 1755. We are fortunate that many of the fleet logbooks have survived. A study was undertaken of eight of them. The wind force data were standardised to modern-day Beaufort scale equivalents using the CLIWOC multi-lingual dictionary. The correlation matrix (below) shows and encouraging degree of agreement, with all except two of the correlations being significant at either the 0.01 or 0.05 level.

With regard to the wind directions (all measured on a 32-point compass), the mean difference between all possible pairs was just 2.8 points; a point is 11.25 degrees, giving 32 degrees.

Dutch Fleet Data

The methods of wind force and direction estimation were similar across all sea-faring nations, and it is important to examine the variation in data from different sources.

A fleet of Dutch vessels sailing from the Netherlands to the Indian Ocean provided a valuable n-sample case. The correlations of the homogenised wind force series are shown (below (upper matrix)). The results are similar to those for English data; the majority of wind force correlations were significant at the 0.01 level, while the mean wind direction variation was 2.3 points, or 25 degrees – consistent with the English results.

Logbook	Beaufort	Green	Beaufort	Palm	Beaufort	Green	VM
Beaufort	1.00						
Green	0.92	1.00					
Beaufort	0.93	0.95	1.00				
Palm	0.93	0.95	0.95	1.00			
Beaufort	0.93	0.95	0.95	0.95	1.00		
Green	0.92	0.95	0.95	0.95	0.95	1.00	
VM	0.93	0.95	0.95	0.95	0.95	0.95	1.00
Strong	0.93	0.95	0.95	0.95	0.95	0.95	0.95

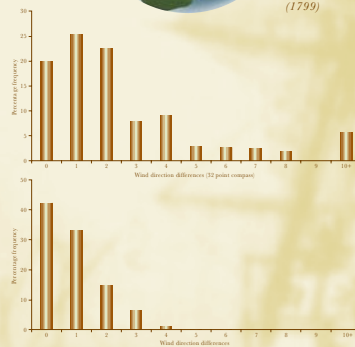
Beaufort	Green	Beaufort	Dutch	English	Netherlands	Netherlands	Summit	Barby
Beaufort	1.00							
Green	0.92	1.00						
Dutch	0.93	0.95	1.00					
English	0.93	0.95	0.95	1.00				
Netherlands	0.93	0.95	0.95	0.95	1.00			
Netherlands	0.93	0.95	0.95	0.95	0.95	1.00		
Summit	0.93	0.95	0.95	0.95	0.95	0.95	1.00	
Barby	0.93	0.95	0.95	0.95	0.95	0.95	0.95	1.00

Logbook Data: How Much Is There?

It is estimated that in France, the Netherlands, Spain and the UK there are over 120,000 logbooks for the period 1750 to 1850, covering all the world's oceans (although the Pacific Ocean is least well-represented). At an approximate estimate each logbook contains 250 days of daily data (and much sub-daily data); this equates to 30 million days of oceanic weather data. This impressive quantity of data is, however, only of scientific value if it can be verified as reliable. Part of the CLIWOC brief was to undertake an examination of this very question.



Dual voyage of HMS Diana & HMS Calypso (1799)



CLIWOC – Climatological Data Base for the World's Oceans: 1750 – 1850. This project was funded under the EU Framework V programme

Dual Voyages - Pairwise Independent Samples

The large number of logbooks that have survived ensures that there are situations in which we can compare the records of ships in company. For a number of such 'dual voyages' nearly 500 pairs of observations were accumulated over eight trans-oceanic voyages. Using the conversion to Beaufort forces from the CLIWOC multi-lingual dictionary, the various homogenised series could be statistically analysed. Attention focuses on the two principal recorded elements of wind force and wind direction. The results are presented in adjacent table (below), and can be summarised thus:

- All correlations between wind force series are significant at 0.01 level
- Differences between the wind force means of the two-sample series are all less than 1 Beaufort 'unit', and significant at the 0.01 level in only 3 cases.
- Bar charts of the frequency of differences between the wind force and wind direction series are shown in two diagrams (left), and indicate:
 - 3.75% of paired wind force readings differ by one Beaufort unit or less
 - 4.45% of paired wind direction readings (using 32-point compass) differ by one point or less

Large vessel	Small vessel	Date	Year	Region	Wind speed correlation	n	sig	Wind direction diff. (0-32)	Wind direction diff. (0-90)	
Victoria	Sphinx	Apr - Jun	1795	N & S Atlantic	0.76	60	< 0.01	0.26	0.15	2.75
Japan	Sea	Jan - Feb	1800	Indian Ocean	0.77	98	< 0.01	0.40	0.22	3.00
Diana	Calypso	Apr - Nov	1799	N Atlantic	0.75	31	< 0.01	0.12	0.04	1.00
L'Amiral	Barbante	Jul - Nov	1800	Indian Ocean	0.84	91	< 0.01	0.01	0.00	0.00
Green	Anglo	Feb - Mar	1815	Indian Ocean	0.73	75	< 0.01	0.17	0.09	1.00
Wladis	Com	Apr - May	1815	N & S Atlantic	0.72	48	< 0.01	0.16	0.01	0.00
Wladis	Com	Apr - May	1800	N Atlantic	0.67	40	< 0.01	0.04	0.07	1.00
Sphinx	Comet	Apr - May	1800	N & S Atlantic	0.63	41	< 0.01	0.04	0.01	1.00
Sea Breeze	Venus	Jul - Sep	1794	N & S Atlantic	0.67	102	< 0.01	0.20	0.01	0.00



Dutch East Indian c.1700