A New Historical Meteorological Database Over The Mediterranean Sea

M. Carmen Alvarez-Castro*, David Gallego, Pedro Ribera, Cristina Peña-Ortiz and Paulina Ordoñez

Universidad Pablo de Olavide (Sevilla) *contact: mcalvcas@upo.es

INTRODUCTION:

In order to obtain more information about past climates, new paleoclimatic techniques and sources are needed to evaluate the present climatic change. Ship's logbooks have proved to be one of the most effective sources in our endeavours to reconstruct the maritime climate back. Several thousands Royal Navy Logbooks, surviving the rigours of life at sea, have come to the present day. Most are found in the UK repositories such as The National Archives (Figure 1) at Kew (TNA).

Figure 1: The National Archives (TNA)

The principal objective is to analyse the scientific potential of logbook (Figure 2) climatic data and produce a database of daily weather observations for the Mediterranean Sea between 1673 and 1850. The new database significantly improves our knowledge of the circulation variability in the Mediterranean during 1673-1850 and the possibility of comparing past wind variability with instrumental records. So, logbooks weather information has been digitized into a database to identify weather patterns and extremes.

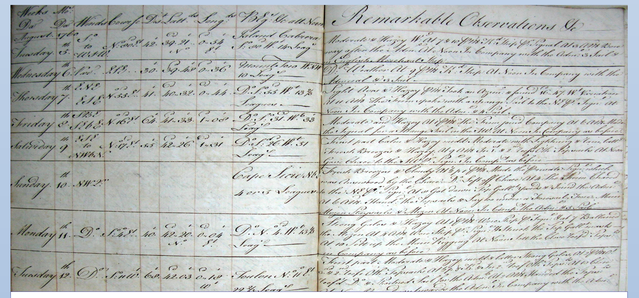
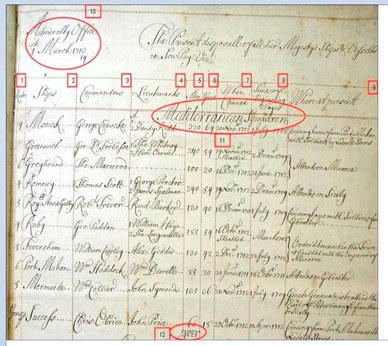


Figure 2: Logbook of Royal Navy

METHODOLOGY:

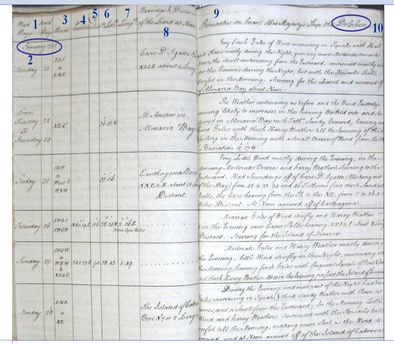
To build the database it has been necessary to localize at TNA which vessels were sailing the Mediterranean Sea between 1673 and 1850. We consulted documents at TNA where Royal Navy officers keep a record of vessels' location. These records are catalogued at TNA as ADM 8 (Figure 3) and are classified annually. The ADM 8 documents indicate, in a monthly basis, the number of ships in the area and the main information for these ships.

Once the monthly list of vessels sailing the Mediterranean was known, we selected at least one or two ships per month, and we searched the Captain's logbooks of the selected ships. The documents that contain these logbooks are catalogued at TNA as ADM 51 (Figure 4) , and their reference at TNA can be found in the ADM 51 glossary. The needed documents were ordered to TNA and it was possible to take pictures of each one of these logbooks. The next step is to digitize the daily logbooks, making use of the extensive set of pictures, to construct the database from 1673 to 1850.



(1) Rate
(2) Ships
(3) Comanders
(4) Lieutenants
(5) Men
(6) Guns
(7) When Cleaned
(8) Time of beginning Wages
(9) Where at present
(10) Date
(11) Mediterranean Squadron
(12) Total of Men

Figure 3: Example of document ADM 8 (Lists) from TNA



(1) Days
(2) Month & Year
(3) Wind Direction
(4) Course
(5) Miles of distance Sailed
(6) Latitude
(7) Longitude
(8) Bearing at noon
(9) Weather and other information
(10) Name of the Ship

Figure 4: Example of document ADM 51 (Captain's logbooks) from TNA

All meteorologically relevant data at noon were extracted from each logbook's page. In the left page of the logbooks the data that can be found are date, location of the ship, latitude, longitude (in case it was registered by the officer) and wind direction (Figure 4). In the right page of the logbooks meteorological data and other relevant data of navigation were recorded.

For our purposes, the main contents of the database are wind direction and wind force information. To translate the original force information to Beaufort's Scale the CLIWOC MULTILINGUAL METEOROLOGICAL DICTIONARY(1) has been used. This dictionary was built to translate the early observers ancient vocabulary of the early observers into expressions directly comparable with the present-day Beaufort Scale. (1) CLIWOC Multilingual Meteorological Dictionary, HISKLIM 5 (KNMI publ 205) 49 pp, KNMI, De Bilt, 2003.

Example in figure 4: January, 25th 1754 their position was about 10 leagues of distance NNE1/2E to Carthagena Bore. The latitude was 37º 06' N, wind direction was South by West, W and WNW. The weather was "Very little wind mostly during the Evening, in the morning moderate breezes and hazy weather steering to the E" and wind force was BF 2 and BF 4.

RESULTS:

Data digitized for this database (Figure 5) includes information about 82 ships from 313 documents from TNA with logbooks covering the period 1673-1850. We have 21,000 images of these logbooks for the complete period. Today, the database already includes around 31,233 records and we continue working to transcribe the remaining data. The period 1735-1800 has been fully transcribed and is ready for analysis. It is still necessary to digitize data between1800-1850 and to complete the first period (1673-1735).

Some problems have been found in database. Gaps and data from ship's position. Gaps (1,62%) could be fixed by a search at TNA again. Data from ship's position sometimes need a correction (Figure 6). These corrections are possible classified in three groups:

1) If the logbook contains data with Landmark (reference point), we will search the position (latitude-longitude) of this Landmark.

2) If the logbook contains data with Landmark+Bearing (reference point with direction and distance to that point) we will calculate the position

3) If the logbook contains data with Landmark+Latitude+Longitude we will have a complete data and no need any correction.

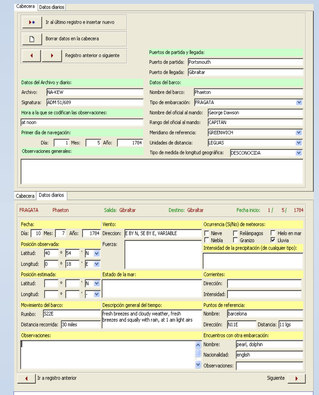


Figure 5: Example of database

Total	16803
Data with landmark	9757 (58%)
Data with landmark+Bearing	4662 (27,8%)
Complete data	1003 (6%)

Figure 6: Correction of ship's position (1735-1780)

With this database it will be possible:

- To provide a better understanding of the nature of climatic change over the Mediterranean for the 1673-1850 (period without instrumental data)

- To prepare future analysis of extreme weather events.

- To improve the current Sea Level Pressure reconstructions over the Mediterranean.

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