

# Compare Tidal Predictions

Preliminar results from comparing tidal predictions generated as a result of analysis of a common data set by different analysis software



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## TASK B - OVERVIEW



International  
Hydrographic  
Organization

- Survey completed, presentation available online
- **Analysis of common data sets:**
  - Increased the number of common data sets
  - Provided a framework for reporting results
  - Everyone was challenged to analyse some or all sets
  - **Comparing results** (on-going)
- Guideline for analysis – no progress to report



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# PRELIMINAR COMPARISON OF RESULTS



International  
Hydrographic  
Organization

- Results from Germany, Spain, New Zealand, Argentina, Norway
- Compared number of constituents, and some main ones
- Compared some statistics and tidal planes
- Some general considerations of the different predictions

|             | Buenos Aires | Altimetry (ARG) | Lyttelton | Yokosuka | Awashima | Egersund | Oslo | Vardoe | Barcelona | Poole Harbour | Boston | Panama City | Seattle | Brest | Callao | Hamburg | Cuxhaven | Ilha Fiscal | Port Nolloth | Corral | Punta Arenas | Coruna | Saint Malo |
|-------------|--------------|-----------------|-----------|----------|----------|----------|------|--------|-----------|---------------|--------|-------------|---------|-------|--------|---------|----------|-------------|--------------|--------|--------------|--------|------------|
| Germany     | x            | x               | x         | x        | x        | x        | x    | x      | x         | x             | x      | x           | x       |       | x      |         |          | x           | x            | x      | x            |        |            |
| Spain       |              |                 |           | x        | x        | x        | x    | x      | x         | x             | x      | x           | x       | x     | x      | x       | x        | x           | x            | x      |              | x      | x          |
| New Zealand | x            |                 | x         |          |          |          | x    | x      | x         | x             | x      | x           | x       | x     | x      | x       |          | x           | x            |        |              |        |            |
| Argentina   | x            | x               | x         | x        | x        | x        | x    | x      | x         | x             | x      | x           | x       | x     | x      | x       | x        | x           | x            | x      | x            |        |            |
| Norway      |              |                 | x         | x        | x        | x        | x    | x      | x         |               | x      | x           | x       | x     | x      | x       | x        |             | x            | x      |              | x      |            |

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# EXAMPLE: BARCELONA

International  
Hydrographic  
Organization

| Barcelona<br>Spain | Number of constituents |             |
|--------------------|------------------------|-------------|
|                    | Resolvable             | Significant |
| Germany            | 105                    | 29          |
| Spain              | 241                    | 62          |
| New Zealand        | 68                     | 20          |
| Argentina          |                        | 10          |
| Norway             | 68                     | 50          |

| Barcelona<br>Spain | SA        |       | M2        |       | S2        |       |
|--------------------|-----------|-------|-----------|-------|-----------|-------|
|                    | Amplitude | Phase | Amplitude | Phase | Amplitude | Phase |
| Germany            | 0,071     | 25,9  | 0,046     | 213,5 | 0,016     | 231,1 |
| Spain              | 0,065     | 265,5 | 0,046     | 213,4 | 0,016     | 230,5 |
| New Zealand        | -         | -     | 0,045     | 241,2 | 0,016     | 258,9 |
| Argentina          | 0,063     | 180,7 | 0,045     | 213,7 | 0,016     | 231,1 |
| Norway             | 0,065     | 259,3 | 0,046     | 213,9 | 0,016     | 231,0 |

| Barcelona<br>Spain | Observed - predicted [m] |            |            |
|--------------------|--------------------------|------------|------------|
|                    | Std.dev.                 | Min. diff. | Max. diff. |
| Germany            | 0,390                    | -0,380     | 0,670      |
| Spain              | 0,095                    | -0,272     | 0,355      |
| New Zealand        |                          |            |            |
| Argentina          | 0,086                    | -0,316     | 0,463      |
| Norway             | 0,097                    | -0,378     | 0,552      |

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# EXAMPLE: LYTTTELTON AND BUENOS AIRES



International  
Hydrographic  
Organization

| Lyttelton<br>New Zealand | Number of constituents |             |
|--------------------------|------------------------|-------------|
|                          | Resolvable             | Significant |
| Germany                  | 89                     | 12          |
| Spain                    |                        |             |
| New Zealand              | 60                     | 20          |
| Argentina                |                        | 31          |
| Norway                   | 59                     | 35          |

| Lyttelton<br>New Zealand | SA        |       | M2        |       | S2        |       |
|--------------------------|-----------|-------|-----------|-------|-----------|-------|
|                          | Amplitude | Phase | Amplitude | Phase | Amplitude | Phase |
| Germany                  | -         | -     | 0,830     | 125,9 | 0,058     | 149,9 |
| Spain                    |           |       |           |       |           |       |
| New Zealand              | -         | -     | 0,861     | 125,0 | 0,057     | 149,6 |
| Argentina                | 0,057     | 14,3  | 0,861     | 125,2 | 0,057     | 149,7 |
| Norway                   |           |       | 0,860     | 137,9 | 0,057     | 150,3 |

| Buenos Aires<br>Argentina | Number of constituents |             |
|---------------------------|------------------------|-------------|
|                           | Resolvable             | Significant |
| Germany                   | 97                     | 21          |
| Spain                     |                        |             |
| New Zealand               | 68                     | 16          |
| Argentina                 |                        | 99          |
| Norway                    |                        |             |

| Buenos Aires<br>Argentina | SA        |       | M2        |       | S2        |       |
|---------------------------|-----------|-------|-----------|-------|-----------|-------|
|                           | Amplitude | Phase | Amplitude | Phase | Amplitude | Phase |
| Germany                   | 0,098     | 63,6  | 0,282     | 206,4 | 0,043     | 314,6 |
| Spain                     |           |       |           |       |           |       |
| New Zealand               | -         | -     | 0,270     | 119,1 | 0,039     | 2,1   |
| Argentina                 | 0,064     | 336,3 | 0,259     | 294,7 | 0,047     | 41,6  |
| Norway                    |           |       |           |       |           |       |

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# EXAMPLE: HAMBURG AND OSLO

International  
Hydrographic  
Organization

| Hamburg<br>Germany | Number of constituents |             |
|--------------------|------------------------|-------------|
|                    | Resolvable             | Significant |
| Germany            |                        |             |
| Spain              | 241                    | 152         |
| New Zealand        | 68                     | 26          |
| Argentina          |                        | 142         |
| Norway             | 68                     | 49          |

| Hamburg<br>Germany | SA        |       | M2        |       | S2        |       |
|--------------------|-----------|-------|-----------|-------|-----------|-------|
|                    | Amplitude | Phase | Amplitude | Phase | Amplitude | Phase |
| Germany            | 0,060     | 338,3 | 1,582     | 85,5  | 0,367     | 163,6 |
| Spain              |           |       |           |       |           |       |
| New Zealand        | -         | -     | 1,615     | 110,8 | 0,370     | 190,3 |
| Argentina          | 0,064     | 261,8 | 1,585     | 85,2  | 0,367     | 163,2 |
| Norway             | 0,067     | 339,0 | 1,583     | 85,8  | 0,366     | 163,9 |

| Oslo<br>Norway | Number of constituents |             |
|----------------|------------------------|-------------|
|                | Resolvable             | Significant |
| Germany        | 97                     | 32          |
| Spain          | 232                    | 61          |
| New Zealand    | 68                     | 14          |
| Argentina      |                        | 38          |
| Norway         | 68                     | 31          |

| Oslo<br>Norway | SA        |       | M2        |       | S2        |       |
|----------------|-----------|-------|-----------|-------|-----------|-------|
|                | Amplitude | Phase | Amplitude | Phase | Amplitude | Phase |
| Germany        | 0,092     | 319,5 | 0,152     | 125,8 | 0,035     | 70,1  |
| Spain          | 0,097     | 320,3 | 0,146     | 125,2 | 0,035     | 71,5  |
| New Zealand    | 0,103     | 295,9 | 0,145     | 100,9 | 0,035     | 284,3 |
| Argentina      | 0,075     | 252,6 | 0,142     | 126,5 | 0,033     | 73,8  |
| Norway         | 0,097     | 320,7 | 0,146     | 125,9 | 0,035     | 72,0  |

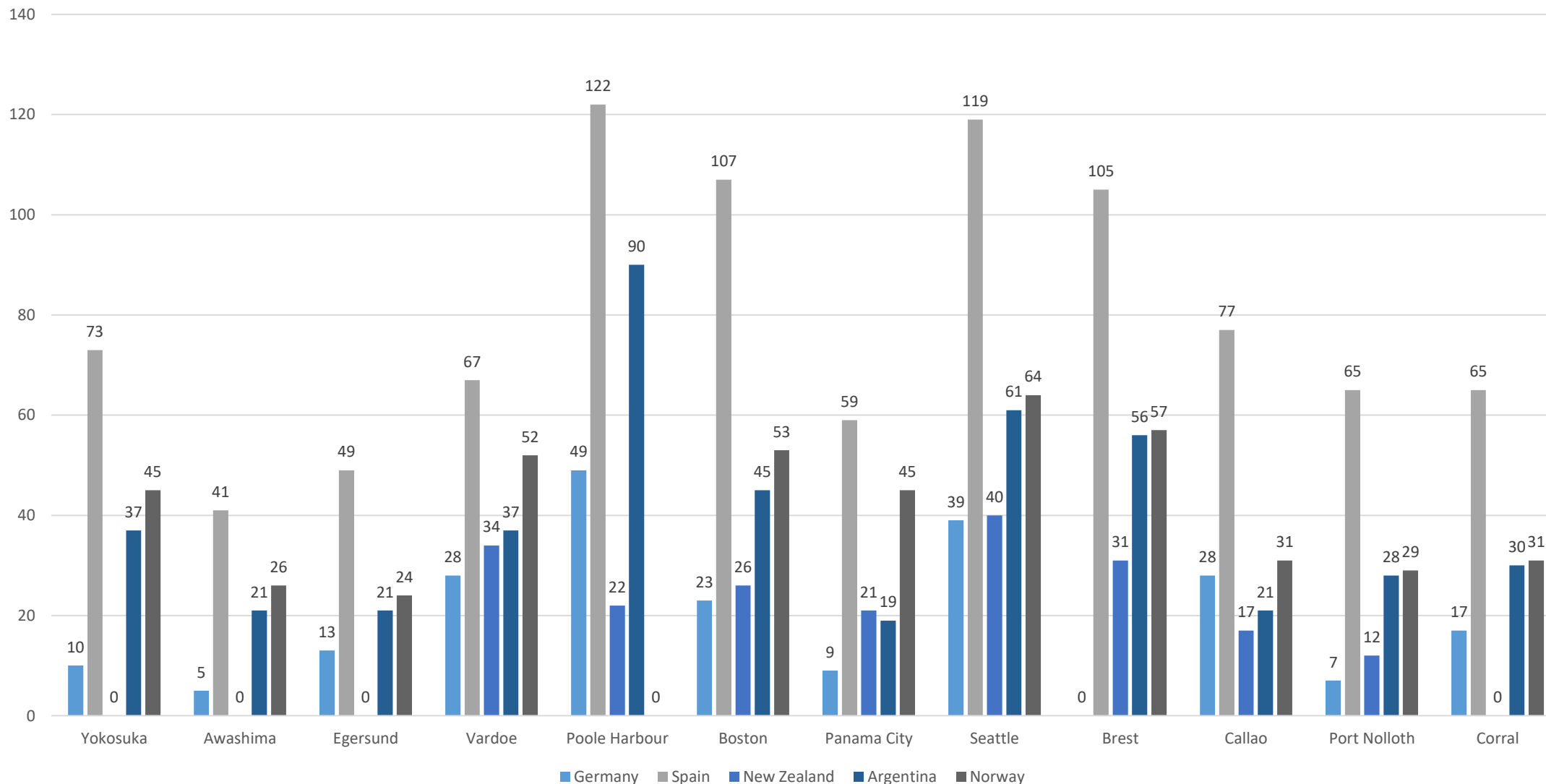


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# NUMBER OF SIGNIFICANT CONSTITUENTS VARIES



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# **FIRST IMPRESSIONS**



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- Main constituents are very similar 😊
- Number of constituents used and found significant varies
- Methods and type of constituents differs
- HAT/LAT and predictions will therefore differ





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# **CHALLENGING WORK**



International  
Hydrographic  
Organization

- Detailed analysis and reports have been provided for an impressive number of series – thank you!
  - Handling different formats, time zones, missing meta data, ...
  - Time consuming to analyse and make all the impressive reports
- Comparing different reports and results
  - How to «compare tidal predictions»
  - The variation in constituents
  - Comparing output of predictions or tide tables



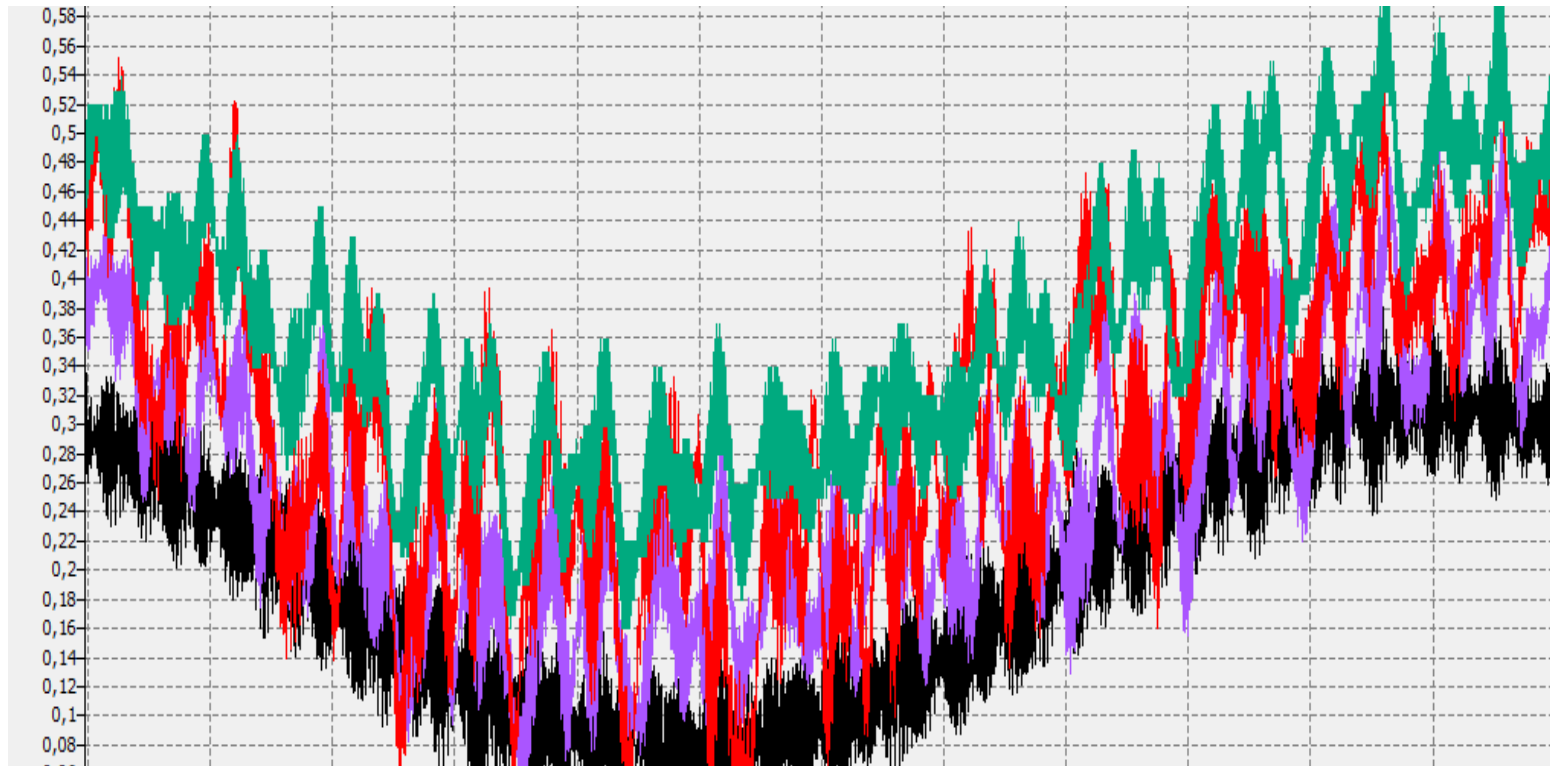
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# COMPARING PREDICTIONS FOR NORWAY



International  
Hydrographic  
Organization

- Large differences, mainly due to long-periodical constituents
- Variation in short-periodical constituents for Vardø



Predictions for Egersund by:





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## **FURTHER WORK COULD BE**



International  
Hydrographic  
Organization

- Analysis from more countries
  - Reports from USA are on their way
- Better way of comparing
  - Define scope or parameters to compare
  - Enter key input to common document/report?
  - Should be easy to include more results
- «Native» country could compare predictions for their series
  - Local knowledge
  - Compare to best available set/prediction
  - Validate or evaluate the predictions against other observations
- Similar approach for tidal streams/current
  - Need someone familiar with this to lead the work

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# BACKGROUND TABLES

International  
Hydrographic  
Organization

## Overview of available reports

|                     |           | Germany | Spain | New Zealand | Argentina | Norway |
|---------------------|-----------|---------|-------|-------------|-----------|--------|
| Common data sets    | # results | 18      | 18    | 14          | 21        | 17     |
| Buenos Aires        | 3         | 1       | 0     | 1           | 1         | 0      |
| Altimetry Argentina | 2         | 1       | 0     | 0           | 1         | 0      |
| Lyttelton           | 4         | 1       | 0     | 1           | 1         | 1      |
| Yokosuka            | 4         | 1       | 1     | 0           | 1         | 1      |
| Awashima            | 4         | 1       | 1     | 0           | 1         | 1      |
| Egersund            | 4         | 1       | 1     | 0           | 1         | 1      |
| Oslo                | 5         | 1       | 1     | 1           | 1         | 1      |
| Vardoe              | 5         | 1       | 1     | 1           | 1         | 1      |
| Barcelona           | 5         | 1       | 1     | 1           | 1         | 1      |
| Poole Harbour       | 4         | 1       | 1     | 1           | 1         | 0      |
| Boston              | 5         | 1       | 1     | 1           | 1         | 1      |
| Panama City         | 5         | 1       | 1     | 1           | 1         | 1      |
| Seattle             | 5         | 1       | 1     | 1           | 1         | 1      |
| Brest               | 4         | 0       | 1     | 1           | 1         | 1      |
| Callao              | 5         | 1       | 1     | 1           | 1         | 1      |
| Hamburg             | 4         | 0       | 1     | 1           | 1         | 1      |
| Cuxhaven            | 3         | 0       | 1     | 0           | 1         | 1      |
| Ilha Fiscal         | 4         | 1       | 1     | 1           | 1         | 0      |
| Port Nolloth        | 5         | 1       | 1     | 1           | 1         | 1      |
| Corral              | 4         | 1       | 1     | 0           | 1         | 1      |
| Punta Arenas        | 2         | 1       | 0     | 0           | 1         | 0      |
| Coruna              | 2         | 0       | 1     | 0           | 0         | 1      |
| Saint Malo          | 1         | 0       | 1     | 0           | 0         | 0      |

## Number of significant constituents

|                 | Germany | Spain | New Zealand | Argentina | Norway |
|-----------------|---------|-------|-------------|-----------|--------|
| Buenos Aires    | 21      |       | 16          | 99        |        |
| Altimetry (ARG) | 5       |       |             | 18        |        |
| Lyttelton       | 12      |       | 20          | 31        | 35     |
| Yokosuka        | 10      | 73    |             | 37        | 45     |
| Awashima        | 5       | 41    |             | 21        | 26     |
| Egersund        | 13      | 49    |             | 21        | 24     |
| Oslo            | 32      | 61    | 14          | 38        | 31     |
| Vardoe          | 28      | 67    | 34          | 37        | 52     |
| Barcelona       | 29      | 62    | 20          | 10        | 50     |
| Poole Harbour   | 49      | 122   | 22          | 90        |        |
| Boston          | 23      | 107   | 26          | 45        | 53     |
| Panama City     | 9       | 59    | 21          | 19        | 45     |
| Seattle         | 39      | 119   | 40          | 61        | 64     |
| Brest           |         | 105   | 31          | 56        | 57     |
| Callao          | 28      | 77    | 17          | 21        | 31     |
| Hamburg         |         | 152   | 26          | 142       | 49     |
| Cuxhaven        |         | 134   |             | 96        | 52     |
| Ilha Fiscal     | 33      | 61    | 26          |           |        |
| Port Nolloth    | 7       | 65    | 12          | 28        | 29     |
| Corral          | 17      | 65    |             | 30        | 31     |
| Punta Arenas    | 26      |       |             | 55        |        |
| Coruna          |         | 88    |             |           | 56     |
| Saint Malo      |         | 88    |             |           |        |