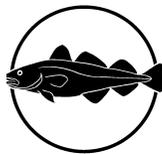


# The Faroese Fisheries Laboratory

Fiskirannsóknarstovan



## Shallow-water ADCP calibrations 1998 - 99

by

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Technical Report No.: 99-04

Tórshavn

October 1999

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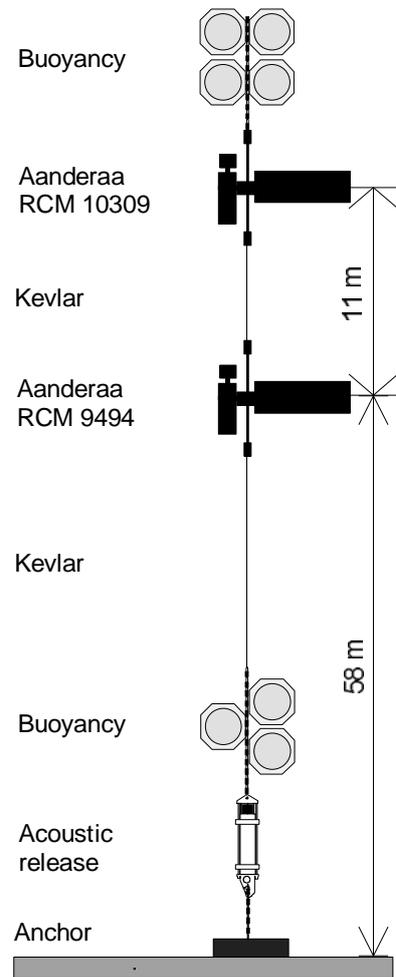
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In the shallow-water ADCP deployments 1994-98, the ADCP's were surrounded by large steel frames, which affect the ADCP compass so much, that the measurements of heading were heavily biased. For the deployments in 1998 the steel frames were replaced by aluminium frames, which should not affect the ADCP compass. The aim of this document is thus to check whether the ADCP compass is affected by the aluminium frame.

As for the previous years, it was planned to deploy a special calibration rig at the two sites NWSA and NWSA for a few hours, but only prior to recovery of the ADCP's. Unfortunately the calibration at NWSA was cancelled because of bad weather conditions.

The calibration rig includes two Aanderaa RCM7 current meters with serial numbers 9494 and 10309 which are 58 and 69 meters above bottom respectively (Fig. 1). Table 1 lists locations and measuring periods for the calibration rig deployment at NWSA as well as the associated ADCP deployment. The two Aanderaa current meters were set to 5 minute intervals while the ADCP logged at 20 minute intervals.

To evaluate the compass heading bias, ADCP current directions from bin 5 and bin 6 (centred at 56 and 66 m above bottom) were compared to the compass readings from RCM 9494 and RCM 10309 respectively for each reading during the calibration period. The result is discussed below.



**Figure 1.** Calibration rig. Vertical distances not to scale.

**Table 1.** Positions, bottom depths, measuring period and intervals for the 1998 - 99 NWSA ADCP and the associated Aanderaa calibration deployment.

| Instrum.        | Latitude     | Longitude    | Bott. depth | Measuring period                | Interval |
|-----------------|--------------|--------------|-------------|---------------------------------|----------|
| ADCP            | 61° 00.137'N | 05° 50.612'W | 295 m       | 98/11/06 08:40 - 99/06/12 17:00 | 20 min.  |
| Calibration rig | 61° 01.500'N | 05° 54.000'W | 293 m       | 99/06/12 11:30 - 99/06/12 18:45 | 05 min.  |

### NWSA current direction calibration

For NWSA the instrument heading, pitch and roll measured by the ADCP exhibited no sudden jumps. The mean heading was 176°, with a minimum at 173° and maximum at 177°, while the absolute values of pitch and roll both were less than 2°.

Table 2 lists the result of the calibration experiment, which indicates that the ADCP and Aanderaa current directions are the same.

**Table 2.** Comparison of current direction measured by the NWSA ADCP and the two Aanderaa current meters during the calibration experiment in June 1999. For the Aanderaa current meters, the speed and direction shown are the averages of the two instruments (direction corrected for magnetic deviation by adding  $-11^\circ$ ), while shear is the difference in direction between them. The direction shown for the ADCP is the direction of the vectorially averaged current vectors of bin 5 and bin 6. Observations where speed was less than 10 cm/s are not included.

| Time (GMT)         | Measured by Aanderaa current meters |           |       | Measured by ADCP<br>Direction | Aanderaa - ADCP<br>Direction |
|--------------------|-------------------------------------|-----------|-------|-------------------------------|------------------------------|
|                    | Speed (cm/s)                        | Direction | Shear |                               |                              |
| 12 June 1999 11:40 | 42.5                                | 219°      | 14°   | 220°                          | -1°                          |
| 12 June 1999 12:00 | 46.5                                | 223°      | 12°   | 220°                          | 3°                           |
| 12 June 1999 12:20 | 49.1                                | 226°      | 12°   | 230°                          | -4°                          |
| 12 June 1999 12:40 | 49.6                                | 230°      | 13°   | 228°                          | 2°                           |
| 12 June 1999 13:00 | 48.1                                | 232°      | 11°   | 232°                          | -1°                          |
| 12 June 1999 13:20 | 42.6                                | 230°      | 12°   | 233°                          | -3°                          |
| 12 June 1999 13:40 | 41.1                                | 230°      | 12°   | 238°                          | -8°                          |
| 12 June 1999 14:00 | 40.3                                | 238°      | 9°    | 244°                          | -7°                          |
| 12 June 1999 14:20 | 40.5                                | 245°      | 10°   | 244°                          | 1°                           |
| 12 June 1999 14:40 | 36.6                                | 246°      | 11°   | 242°                          | 4°                           |
| 12 June 1999 15:00 | 27.7                                | 247°      | 12°   | 238°                          | 9°                           |
| 12 June 1999 15:20 | 25.8                                | 241°      | 11°   | 243°                          | -3°                          |
| 12 June 1999 15:40 | 19.9                                | 245°      | 7°    | 235°                          | 10°                          |
| 12 June 1999 16:00 | 13.9                                | 247°      | 8°    | 243°                          | 4°                           |

Average for the NWSA calibration period:

$0.4^\circ \pm 1.4^\circ$

### Residual velocities

A further check of the compass may be had by comparing the directions of the residual velocities for different deployments at sites NWSA and NWNA. Table 3 and 4 list the residual velocities at four specified depths for all deployments at respectively NWNA and NWSA.

**Table 3.** Comparison of Residual velocities at NWNA.

| Deployment | Measuring period        | Direction at specified depth |      |      |      |
|------------|-------------------------|------------------------------|------|------|------|
|            |                         | 100m                         | 150m | 200m | 250m |
| NWNA9601   | 1996/01/24 - 1996/05/26 | 107°                         | 108° | 108° | 104° |
| NWNA9606   | 1996/06/16 - 1997/05/22 | 109°                         | 109° | 109° | 108° |
| NWNA9706   | 1997/06/14 - 1998/06/09 | 110°                         | 110° | 111° | 107° |
| NWNA9807   | 1998/07/07 - 1999/07/02 | 104°                         | 104° | 104° | 99°  |

**Table 4.** Comparison of Residual velocities at NWSA.

| Deployment | Measuring period        | Direction at specified depth |      |      |      |
|------------|-------------------------|------------------------------|------|------|------|
|            |                         | 100m                         | 150m | 200m | 250m |
| NWSA9511   | 1995/11/10 - 1996/05/27 | 183°                         | 187° | 189° | 178° |
| NWSA9606   | 1996/06/14 - 1997/05/23 | 204°                         | 202° | 201° | 196° |
| NWSA9811   | 1998/11/06 - 1999/06/12 | 200°                         | 204° | 207° | 202° |

For NWNA, the residual velocity direction is somewhat low for NWNA9807 compared to the other deployments. This may perhaps indicate a compass error, but only of the order of  $5^\circ$ .

For NWSA the residual velocity direction is more variable, and the values for NWSA9811 are not inconsistent with the other deployments.

Based on these results we conclude that the aluminium frame does not affect the ADCP compass appreciably. The data for the deployments at NWSA and NWSA is therefore corrected for magnetic variation only by adding a constant deviation in the same procedure as all other deployments and as described in the deployment header file.

*Tórshavn 27. Oktober 1999*