DIMES UK5 (JR299) LADCP Data Quality Report

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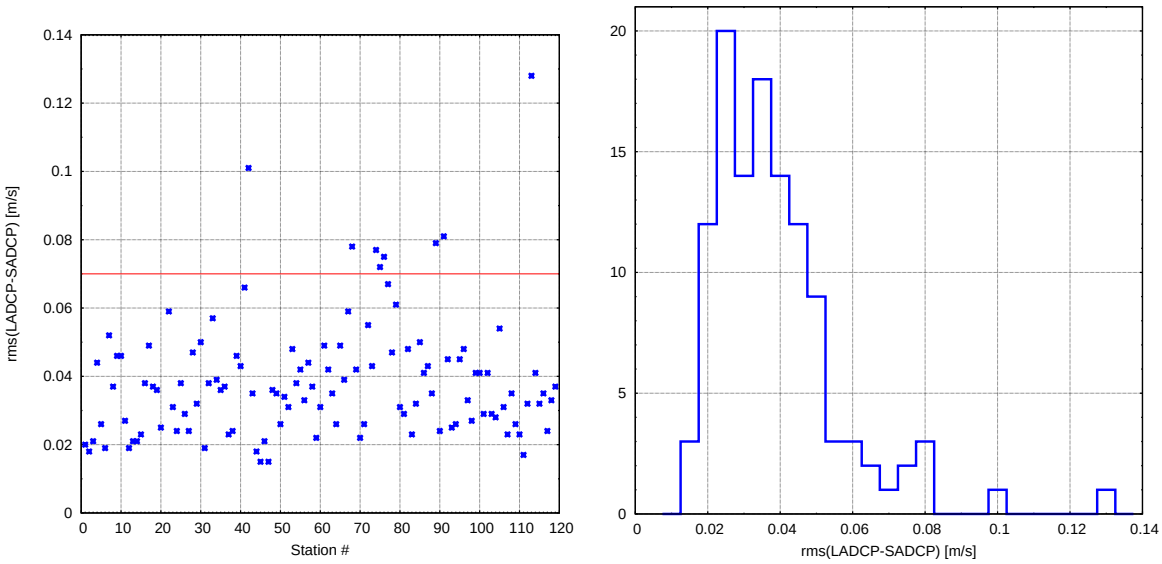

Figure 1: *rms* velocity differences between SADCP and LADCP profiles processed without SADCP data. Left panel: Error vs. station number; red line indicates $7\,\mathrm{cm\cdot s^{-1}}$ limit used to flag suspicious profiles. Right panel: Error histogram.

1 Summary

During DIMES UK5 (JR299), LADCP data were collected on all CTD stations (#1-119). Because of CTD hardware problems the profile at station #21 was aborted. (See JR299 cruise report for details, as well as additional information on data acquisition.) Based on comparisons between LADCP and SADCP velocities in the upper ocean (Figure 1), single-component LADCP velocity errors in this data set are $\approx 3\,\mathrm{cm\cdot s^{-1}}$, implying that the quality of the LADCP data collected during DIMES UK5 is excellent.

2 Quality Control

During the cruise, quality of the JR299 LADCP data was remotely monitored at LDEO. All diagnostic plots created during shipboard processing were inspected and suspicious profiles were flagged. The problems noted during the cruise were mainly minor and included package-wake effects, profiles with missing RDI bottom-track (BT) data, data acquisition glitches resulting in multiple data files, as well as a few profiles potentially affected by weak acoustic backscatter (short range). The shipboard-processed profiles should *not* be used, as they were processed without SADCP data.

After the cruise, the LADCP data were re-processed with the most up-to-date version of the LDEO software (IX_11beta). The quality of each profile is quantified as the *rms* difference between the LADCP solution (processed without the SADCP constraint) and the corresponding SADCP velocities (Figure 1). Profiles with *rms* velocity differences $>7\,\mathrm{cm\cdot s^{-1}}$ were flagged, as were profiles with significant anomalies in the post-cruise processing diagnostic figures.

All profiles flagged during and after the cruise were carefully inspected, and some were re-processed with different parameters. The following notes detail the findings and choices made for final processing:

006 insufficient RDI BT data; post-processed BT used for final processing (`p.btrk_mode = 2;`)

007–009 no upward-looking ADCP installed; profiles okay

023 upcast u wake (Figure 2); *rms* LADCP-SADCP difference $<7\,\mathrm{cm\cdot s^{-1}}$; profile okay

031 insufficient RDI BT data; post-processed BT used for final processing

033 upcast u wake; *rms* LADCP-SADCP difference $<7\,\mathrm{cm\cdot s^{-1}}$; profile okay

037, 038, 041 upcast v wake; *rms* LADCP-SADCP differences $<7\,\mathrm{cm\cdot s^{-1}}$; profiles okay

042 *rms* LADCP-SADCP difference $>10\,\mathrm{cm\cdot s^{-1}}$; nothing obviously amiss in this deep ($\approx$3500 m) profile, i.e. large velocity differences likely due to profile depth

050, 054 no RDI BT; post-processed BT used for final processing

058 upcast u wake; *rms* LADCP-SADCP difference $<7\,\mathrm{cm\cdot s^{-1}}$; profile okay

060 insufficient RDI BT data; post-processed BT used for final processing

063 upcast wake; insufficient RDI BT data; post-processed BT used for final processing; profile okay

065 insufficient RDI BT data; post-processed BT used for final processing

068 upcast v wake; LADCP-SADCP difference $>7\,\mathrm{cm\cdot s^{-1}}$; deep profile (>3000 m) with strong near-surface flow; profile okay

073 upcast wake; *rms* LADCP-SADCP difference $<7\,\mathrm{cm\cdot s^{-1}}$; profile okay

074–076 LADCP-SADCP differences $>7\,\mathrm{cm\cdot s^{-1}}$; deep profiles with strong near-surface flows; final profiles okay

078 uplooker data truncated shortly before cast end; profile okay

081 uplooker data in two files, main file ends shortly before cast end, profile not noticeably affected; insufficient RDI BT data, post-processed BT used for final processing; profile okay

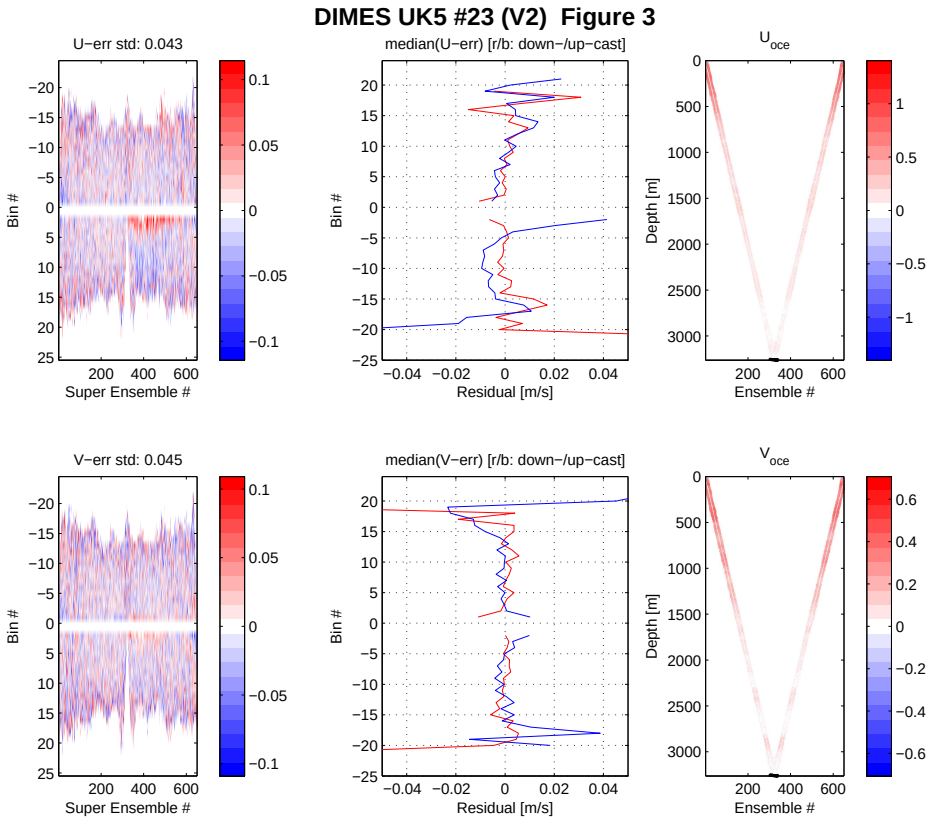

Figure 2: Inversion residuals and ocean velocity (ProcFig. 3) at station #023. Note the upcast package-wake effects apparent in the upcast inversion residuals of the zonal velocity component (left and center panels of the upper row).

082 uplooker data end shortly before cast end, profile not noticeably affected; insufficient RDI BT data, post-processed BT used for final processing; profile okay

089 multiple uplooker data files, dual-head processing with main UL file causes *rms* LADCP-SADCP difference $>10\,\mathrm{cm\cdot s^{-1}}$, whereas the DL-only based profile has a difference of $\approx 8\,\mathrm{cm\cdot s^{-1}}$; final profile processed with downlooker data alone; deep profile with strong near-surface flow; profile okay

090 insufficient RDI BT data; post-processed BT used for final processing

091 insufficient RDI BT data; post-processed BT used for final processing; upcast v wake; deep profile with strong near-surface flow; profile okay

112 insufficient RDI BT data; post-processed BT used for final processing

113 shallow station; $10\,\mathrm{cm\cdot s^{-1}}$ difference in v component between SADCP and RDI BT data in region of overlap (200–400 m), even greater bias for post-processed BT, final profile, processed with

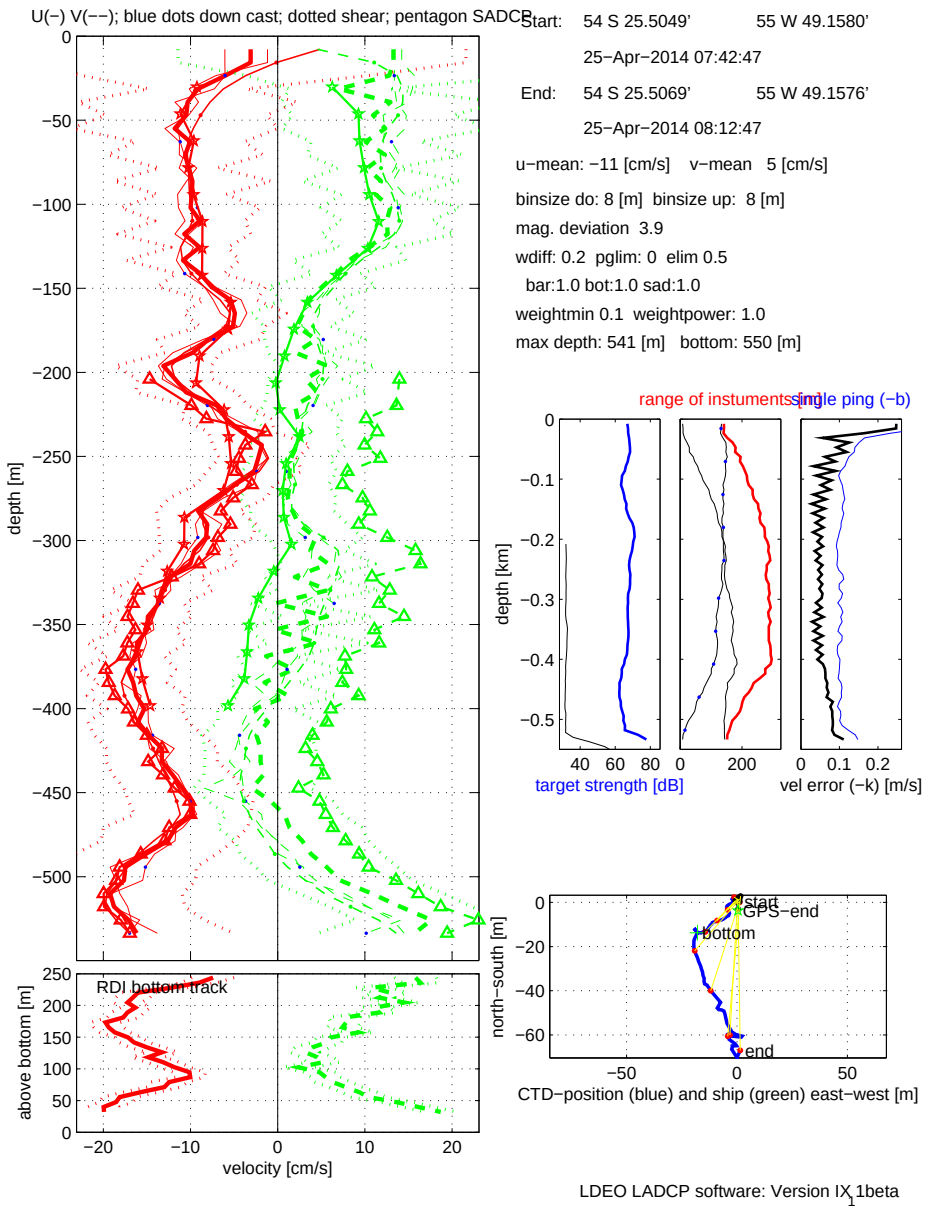

Figure 3: Summary figure (ProcFig. 1) at station #113. Note the $10\,\mathrm{cm\cdot s^{-1}}$ inconsistency between the BT- and SADCP-derived meridional velocity component.

RDI BT, agrees with SADCP (rather than with BT); profile shear okay, but bias uncertainty of $\approx 10\,\mathrm{cm\cdot s^{-1}}$ in v component remains.