Comparison of Discharge Measurements by New RiverRay ADCP and Rio Grande ADCP in Mississippi River

Summary: RiverRay ADCP is a new generation, intelligent river discharge measurement system recently developed by Teledyne RD Instruments, USA. Discharge measurements were conducted on the Mississippi River using a new RiverRay ADCP and a Rio Grande ADCP. Results indicate that the relative difference between the two ADCPs' measured mean discharges was less than 0.1%. Both of the RiverRay ADCP and Rio Grande ADCP performed excellent.

The comparison tests of a RiverRay ADCP with a 600 kHz Rio Grande ADCP on the Mississippi River at Baton Rouge were conducted on October 15 and 16, 2009. Figure 1 shows the mounting pole for the RiverRay or Rio Grande ADCP on the survey boat. Figure 2 shows the RiverRay ADCP mounted on the end of the mounting pole. Figure 3 shows a GPS antenna on the top end of the mounting pole.

Figure 1: Mounting pole for the RiverRay or Rio Grande ADCP on the survey boat

Figure 2: RiverRay ADCP mounted on the low end of the mounting pole

Figure 3: GPS antenna on the top end of the mounting pole

A total of 11 transects each were made using the RiverRay and Rio Grande ADCPs, respectively, on October 15. A total of 8 transects were made using the RiverRay ADCP and 12 transects using the Rio Grande ADCP on October 16. Figure 4 and Figure 5 show the discharge data from the October 15 tests and October 16 tests respectively.

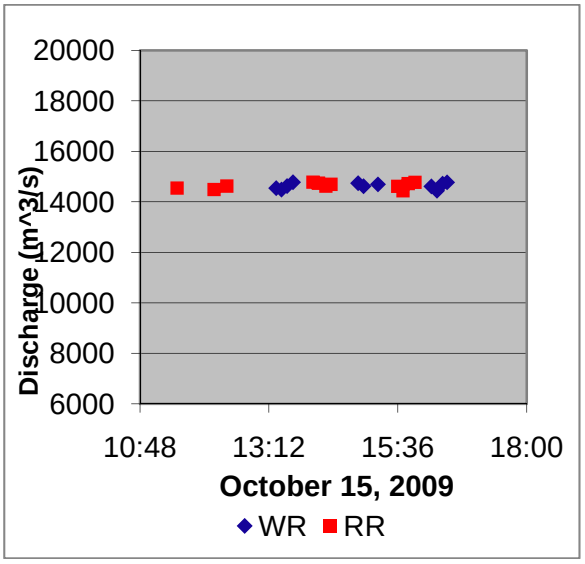

Figure 4: Discharge data from the October 15 tests

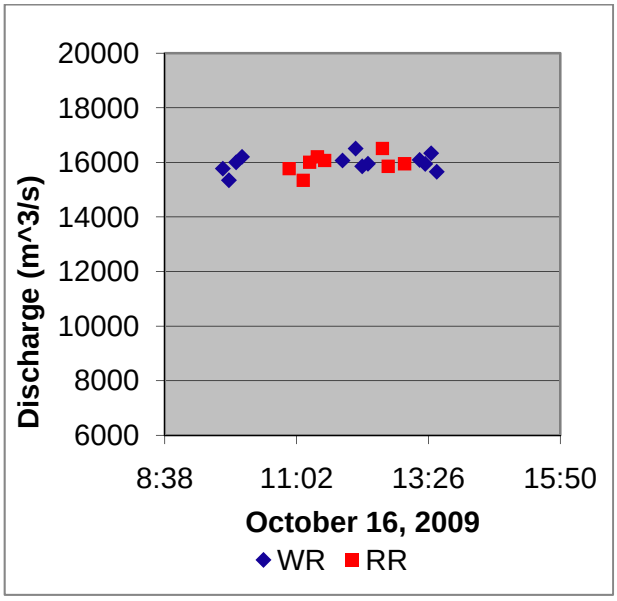

Figure 5: Discharge data from the October 16 tests

Average velocity for all transects approached 1.2 m/s and maximum depth exceeded 40 m. Tables 1 and 2 summarize the statistics of the discharge data for the Oct. 15 and 16 tests respectively, where CV is the coefficient of variation (mean/standard deviation) and RMR is the relative maximum residual (largest individual departure from the mean).

Table 1: Statistics of the discharge data for the Oct. 15 tests

	Mean	CV	RMR
RiverRay	14654.6	1.3%	-2.24%
Rio Grande	14639.3	0.8%	-1.36%

Table 2: Statistics of the discharge data for the Oct. 16 tests

	Mean	CV	RMR
RiverRay	15982.5	1.4%	-2.1%
Rio Grande	15976.1	1.9%	-3.96%

The relative difference between the RiverRay and Rio Grande ADCP measured mean discharges are only 0.10% and 0.04% for the Oct. 15 and Oct. 16 tests respectively.

Figure 6 and 7 show the typical velocity contour plots from the RiverRay and Rio Grande ADCP measurements respectively.

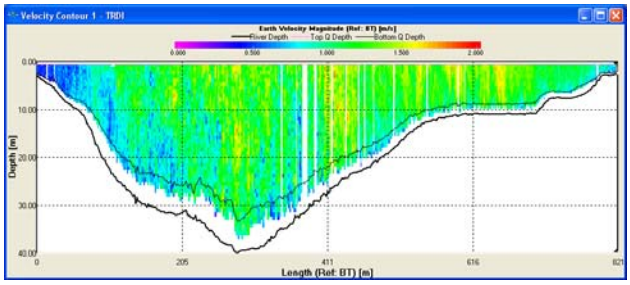

Figure 6: Typical velocity contour plot from the RiverRay ADCP measurements (ensemble data output, Δt=0.53 -- 0.88s)

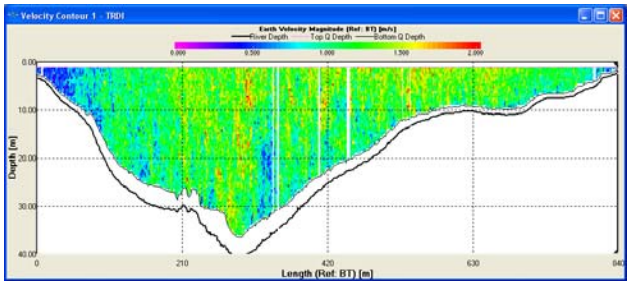

Figure 7: Typical velocity contour plot from the Rio Grande ADCP measurements (single ping data output, Δt=0.57-- 0.62s)

The test results indicate that RiverRay measured discharges agree well with the Rio Grande measured discharges. Both of the RiverRay ADCP and Rio Grande ADCP performed excellent.

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