

3 Comparison with WES Mississippi River and Illinois Waterway Data

Field Data Description

Velocity and water-level data were collected by WES on the Mississippi River and Illinois Waterway during 1995 and 1996 (Pratt and Fagerburg, draft). The most difficult aspect of comparing NAVEFF with the WES data was that many of the field data collection sites were near the ends of islands. NAVEFF, being a one-dimensional model, is not applicable to areas where the cross-sectional area and width is changing rapidly. The Pool 26 data on the Mississippi River were collected near island ends and were not used in the comparison. The cross-section at the velocity or water level probe location was used in NAVEFF to make the comparison. A second difficulty was that vessel speed, which is the most sensitive parameter, was determined from passage times at cross-sections that were several miles apart rather than speed at the measurement section. The data used in the comparison is shown in Table 3. Return velocity and drawdown data were filtered using a Fast Fourier Transform (FFT) to eliminate short period effects not caused by the tow. The 11 sec moving average used in the ISWS data and the FFT used with the WES data result in very similar smoothing of the data. Tows not meeting the NAVEFF limitations given in the Introduction are not shown in Table 3.

Results

Mississippi River at Pool 8. Main channel ranges 1 and 3 were used in the analysis. A scatterplot of observed versus computed drawdown is shown in Figure 18. MRE and MTE for drawdown are 0.43 and 0.31, respectively. One of the shortcomings of the difference measures MTE and MRE is that one or two data points having a small observed value and a large computed value will significantly affect the value of MRE and MTE, particularly when the sample size is small. As an example, removal of the one Pool 8 data point labeled as an outlier in Table 3 resulted in MRE and MTE for drawdown of 0.19 and 0.06, respectively. Outlier is defined herein as observed/computed < 0.5 or greater than 2.0. Removal of outliers was done only for the WES UMRS data not to make the WES data look better but to show the significance of outliers on the chosen error measures MRE and MTE.

Illinois Waterway at Lagrange. Scatterplots of observed versus computed return velocity and drawdown are shown in Figures 19 and 20, respectively. Using all data points, MRE and MTE for return velocity are 0.36 and 0.25, respectively. Without the two points on Lagrange return velocity labeled as outliers in Table 3, MRE and MTE for return velocity are 0.26 and 0.13, respectively. Using all data points, MRE and MTE for drawdown are 0.33 and 0.11, respectively. Without the three points on Lagrange drawdown labeled as outliers in Table 3, MRE and MTE for drawdown are 0.20 and -0.04, respectively.

Error Measures for All WES UMRS Data. Since there was no return velocity analysis on Pool 8, the Lagrange return velocity error analysis represents all WES UMRS data. Using all data points, MRE and MTE for drawdown are 0.35 and 0.15, respectively. Omitting the three outliers and combining all drawdown data resulted in a MRE of 0.22 and a MTE of 0.01.