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EVALUATION OF COMPUTER-PRODUCED LAKE ERIE STORM SURGE FORECASTS  
FROM SEPTEMBER 1, 1974 THROUGH APRIL 30, 1975

William S. Richardson

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by

William S. Richardson

INTRODUCTION

This Office Note describes my evaluation of the computer-produced Lake Erie storm surge forecasts (FZUS1) which were transmitted from NMC from September 1, 1974 through April 30, 1975.

I have verified storm surge cases where the observed set-up (magnitude of difference in storm surge between Buffalo and Toledo) was 6 feet or greater. I have also verified those cases where the set-up was forecast to be 6 feet or greater during the 01-12 hour forecast period.

STORM SURGE CASES

Figures 1 through 15 contain graphs of the observed, specified, and forecast storm surges for 15 cases which satisfied the 6-foot criteria. The "specified" surges (hindcasts) were computed with the observed sea-level pressures as predictors, while the sea-level pressure forecasts from the PE model were used to compute the storm surges forecasts. In all figures except figure 3, the top set of graphs shows the observed and specified surges; the remaining graphs are observed and forecast surges.

The initial time of the PE sea-level pressure data used in each forecast is indicated above the forecast curve. The surge forecasts for Buffalo are hourly forecasts valid 1 to 48 hours after the time of the initial data. The surge forecasts for Toledo are made bi-hourly and are valid 2 to 48 hours after the time of initial data. The dates shown on the storm surge graphs are placed at the 1200 EST (1700 GMT) position for each day.

The specified storm surge is in good agreement with the observed surge in most cases. However, the rapid fluctuation in the lake level at Buffalo on November 14 (figure 2) is underspecified. I am investigating this case further, and will report my findings. The Buffalo equation specified the surge on January 12 (figure 6) to be much lower than the observed surge. The negative surge at Toledo on January 11 (figure 6) is specified much lower than the observed surge. On March 14 (figure 9) and March 24 (figure 10), the negative surges at Buffalo are specified much lower than the observed surges. As pointed out in my 1973-74 evaluation (Richardson, 1974), the error in the specification of low water at Buffalo is probably because most of the developmental data consisted of positive surges at Buffalo. Hopefully this problem will be corrected when we rederive the forecast equations on a larger sample of data.

While the storm surge forecasts are in reasonable agreement with the observed surges, there are five cases where the set-up was forecast to be 6 feet or greater, and the observed set-up was less than 6 feet. These five cases are

November 20, 1974 (figure 4), and March 4 (figure 10), March 28 (figure 11), April 9 (figure 13), and April 28, 1975 (figure 15). The negative surges at Buffalo were forecast much lower than the observed surges on March 27 (figure 11), April 9 (figure 13), and April 28 (figure 15). The storm surge forecast for Toledo on April 10 (figure 13) was too high. Since the specified surges are in reasonable agreement with the observed surges for these four dates, the errors in the storm surge forecasts are due to the PE sea-level pressure forecasts.

#### CONCLUSIONS

Even with these forecast errors, I feel the storm surge forecasts provide meaningful guidance to the forecaster.

#### REFERENCES

Richardson, William S., "Evaluation of computer-produced Lake Erie storm surge forecasts from September 1, 1973 through April 30, 1974", TDL Office Note 74-10, July 1974, 9 pp.

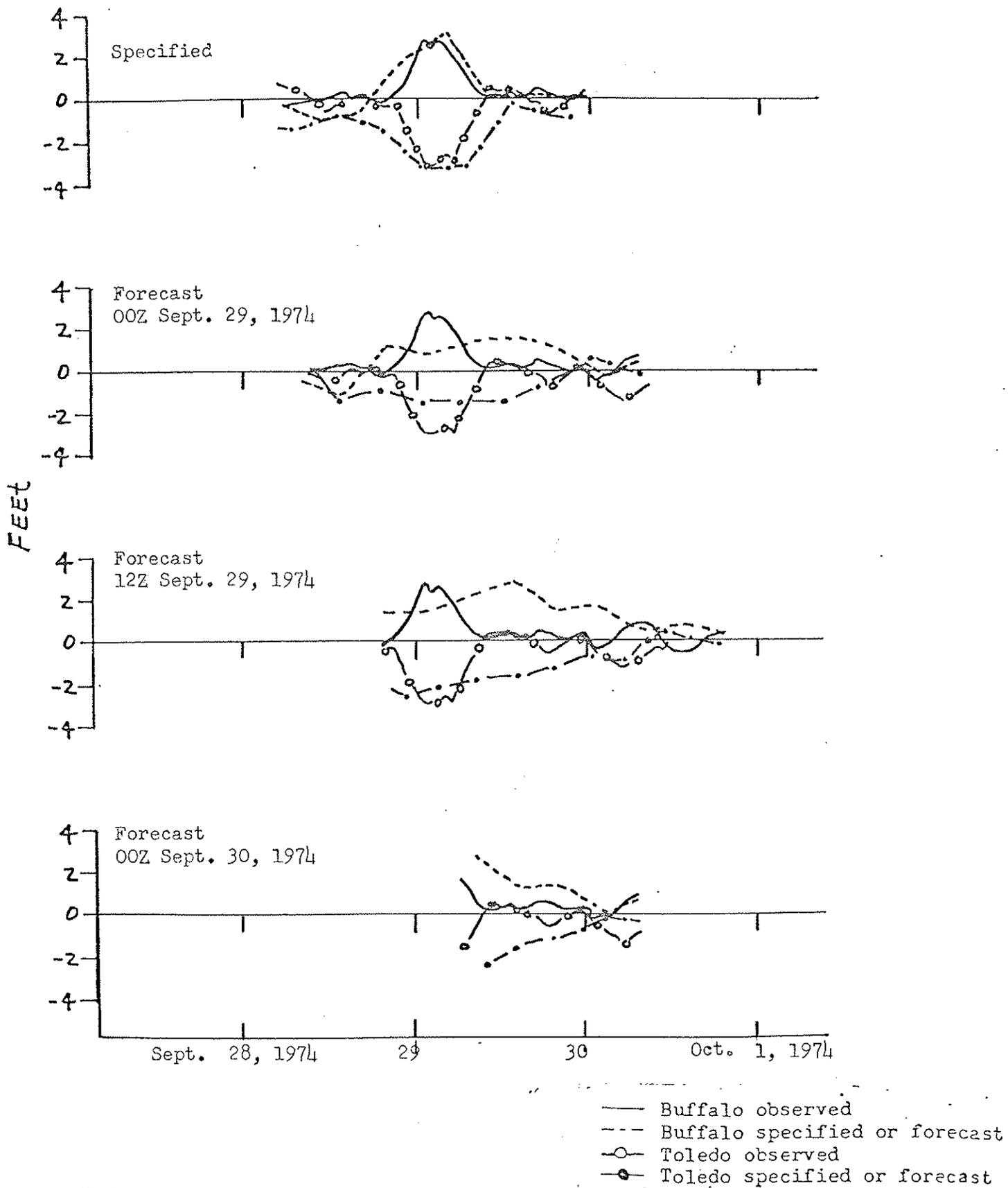


Figure 1. Observed storm surge, specified storm surge, and forecast storm surge at Buffalo and Toledo for September 29, 1974.

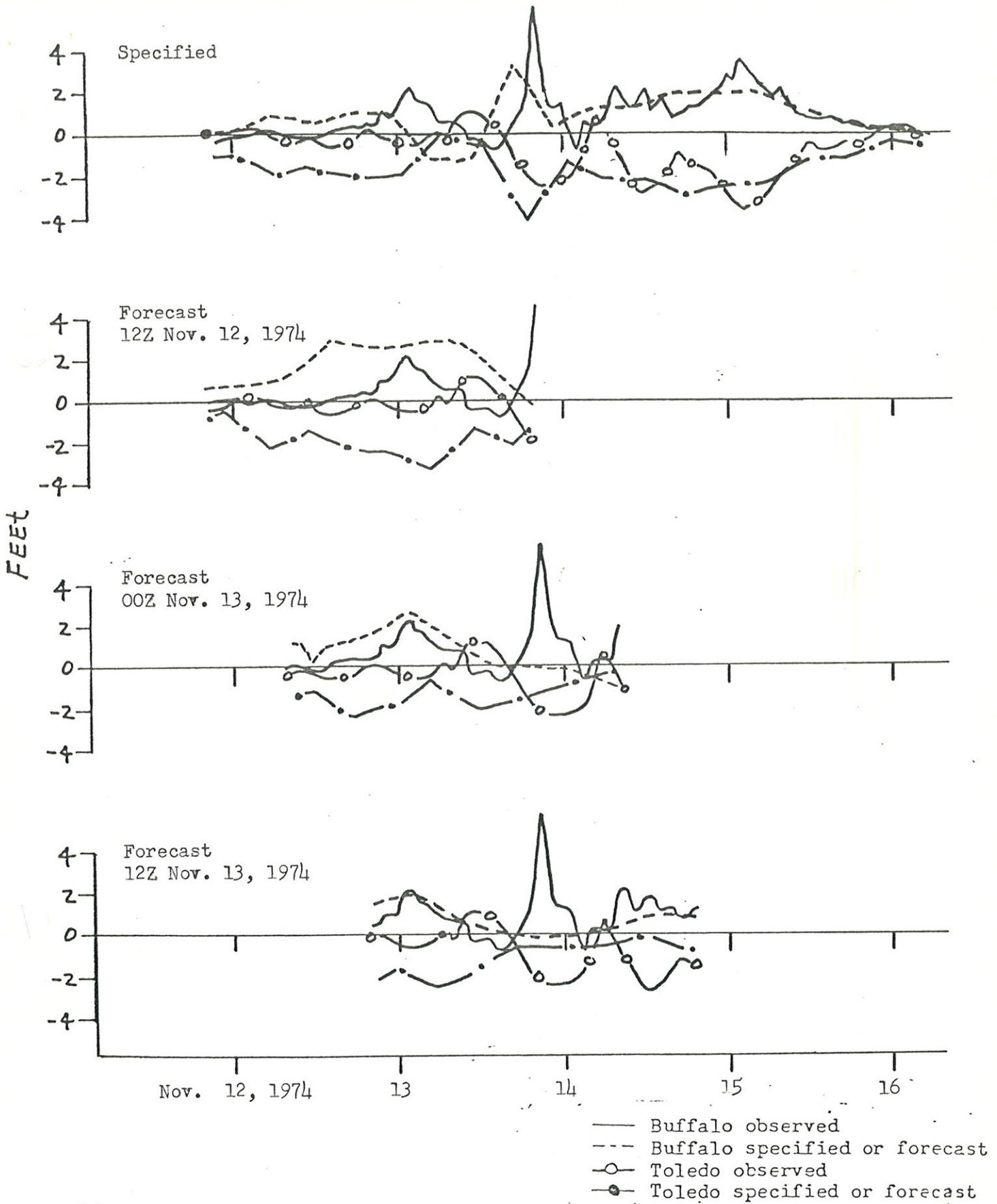


Figure 2. Observed storm surge, specified storm surge, and forecast storm surge at Buffalo and Toledo for November 14, 1974.

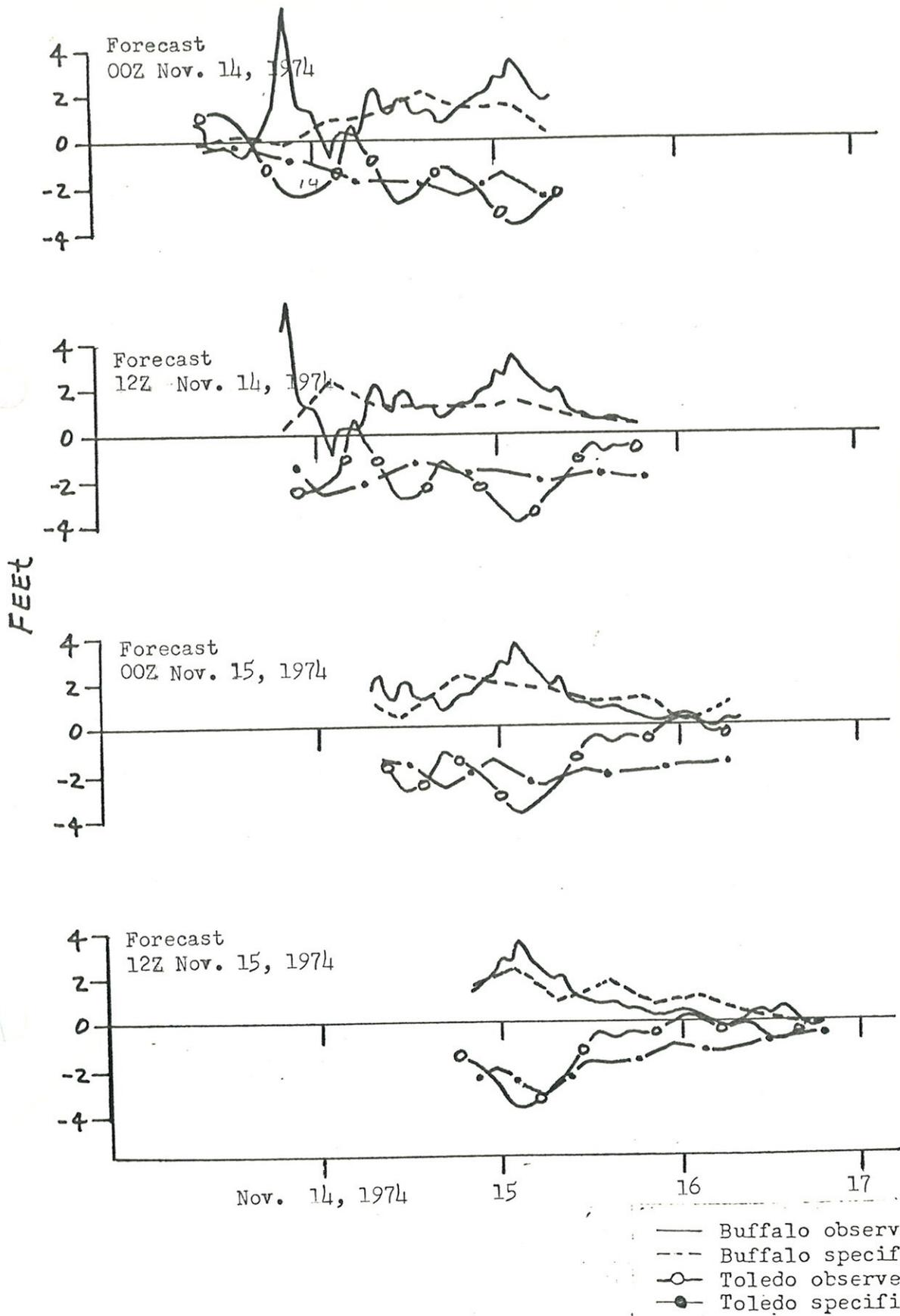
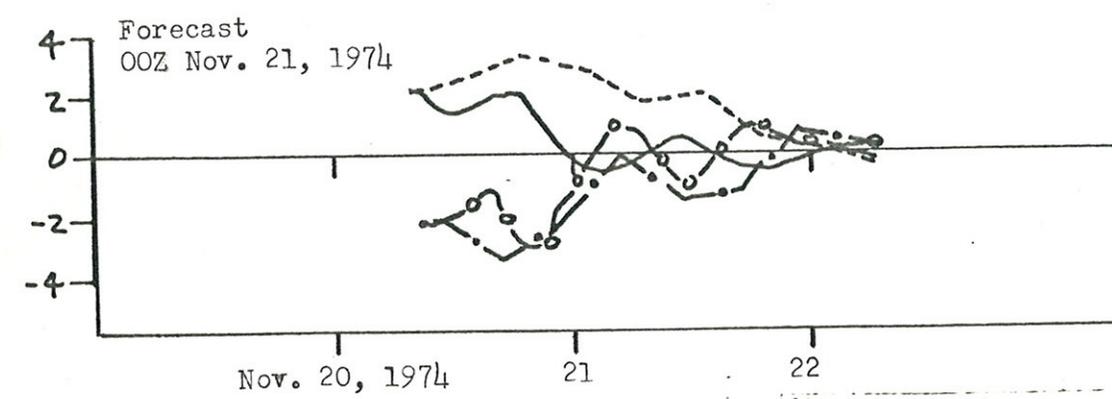
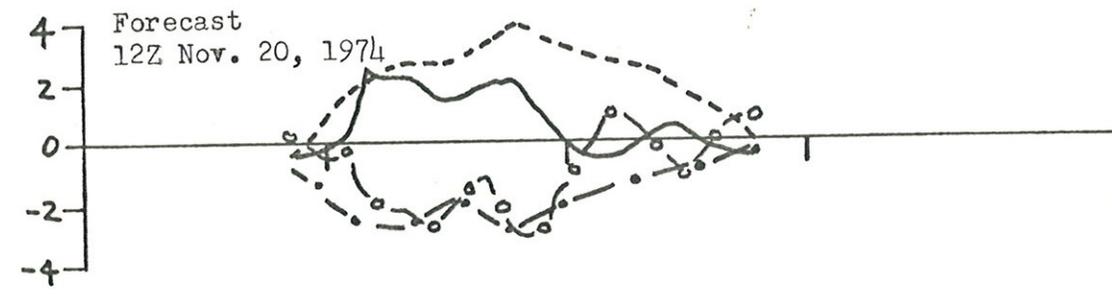
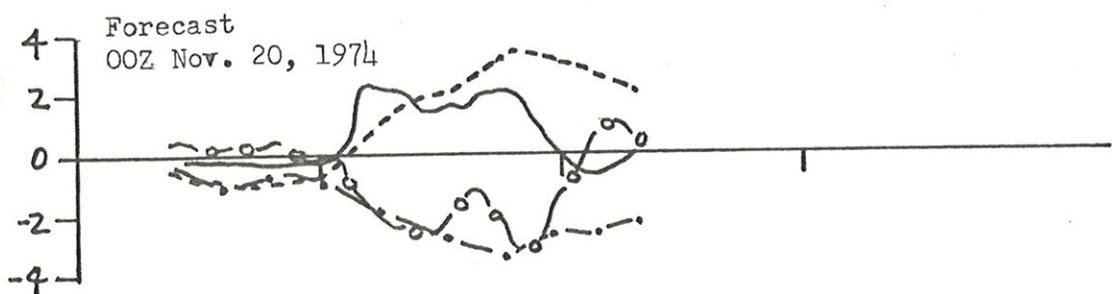
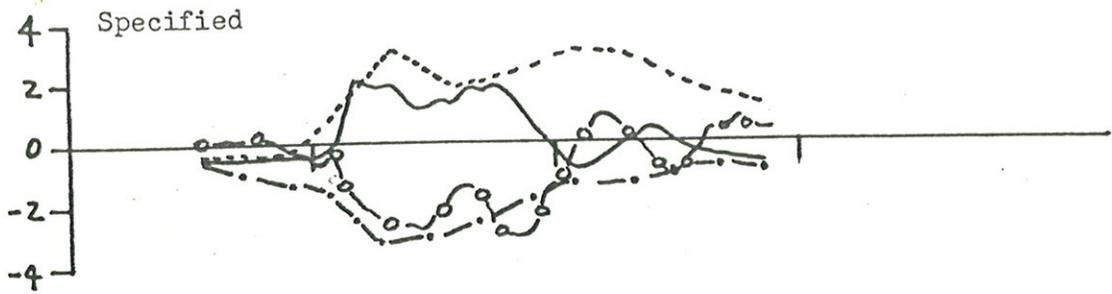


Figure 3. Observed storm surge, specified storm surge, and forecast storm surge at Buffalo and Toledo for November 15, 1974.

FEET



- Buffalo observed
- - - Buffalo specified or forecast
- Toledo observed
- Toledo specified or forecast

Figure 4. Observed storm surge, specified storm surge, and forecast storm surge at Buffalo and Toledo for November 20, 1974.

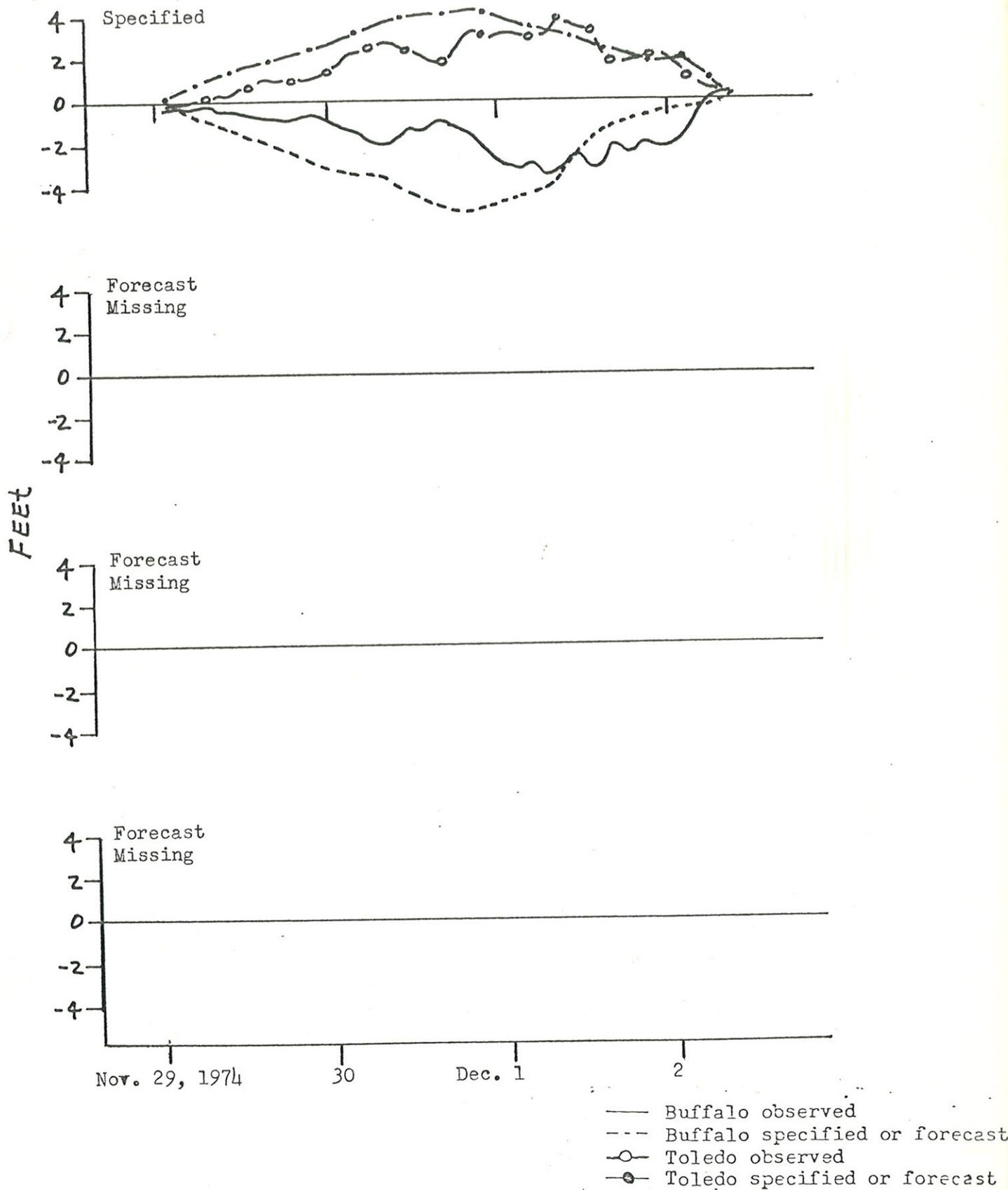


Figure 5. Observed storm surge, specified storm surge, and forecast storm surge at Buffalo and Toledo for December 1, 1974.

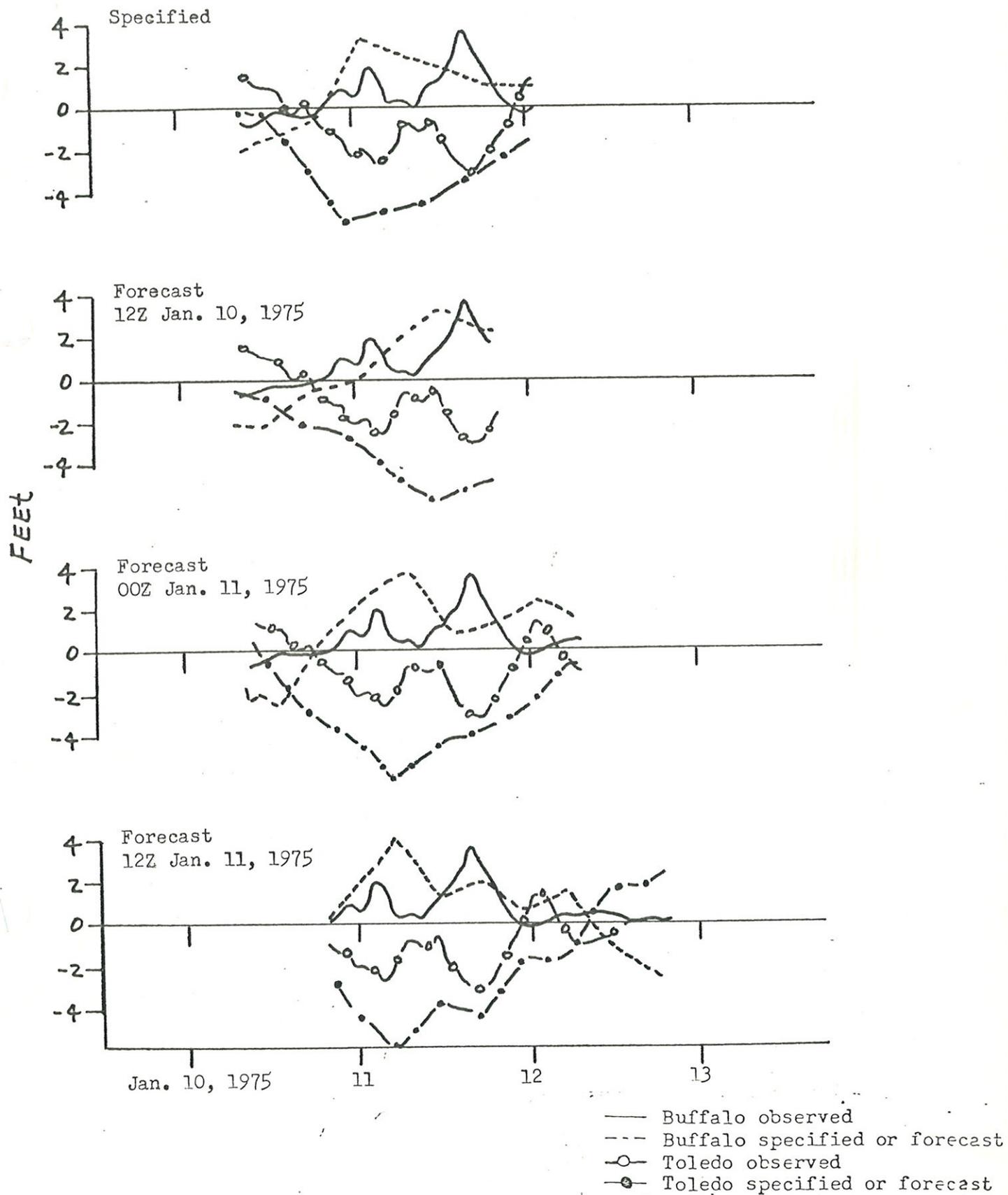


Figure 6. Observed storm surge, specified storm surge, and forecast storm surge at Buffalo and Toledo for January 12, 1975.

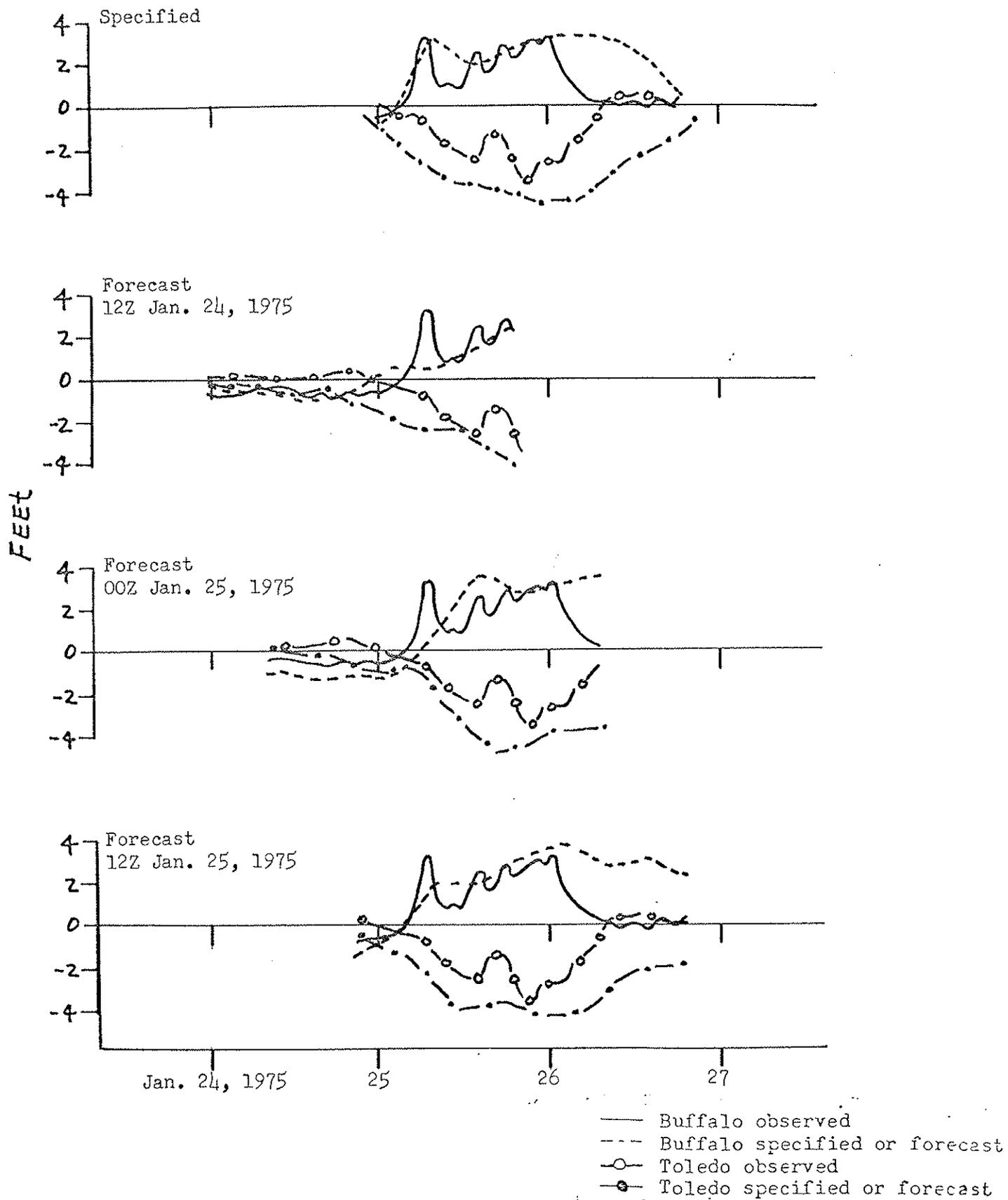


Figure 7. Observed storm surge, specified storm surge, and forecast storm surge at Buffalo and Toledo for January 25, 1975.

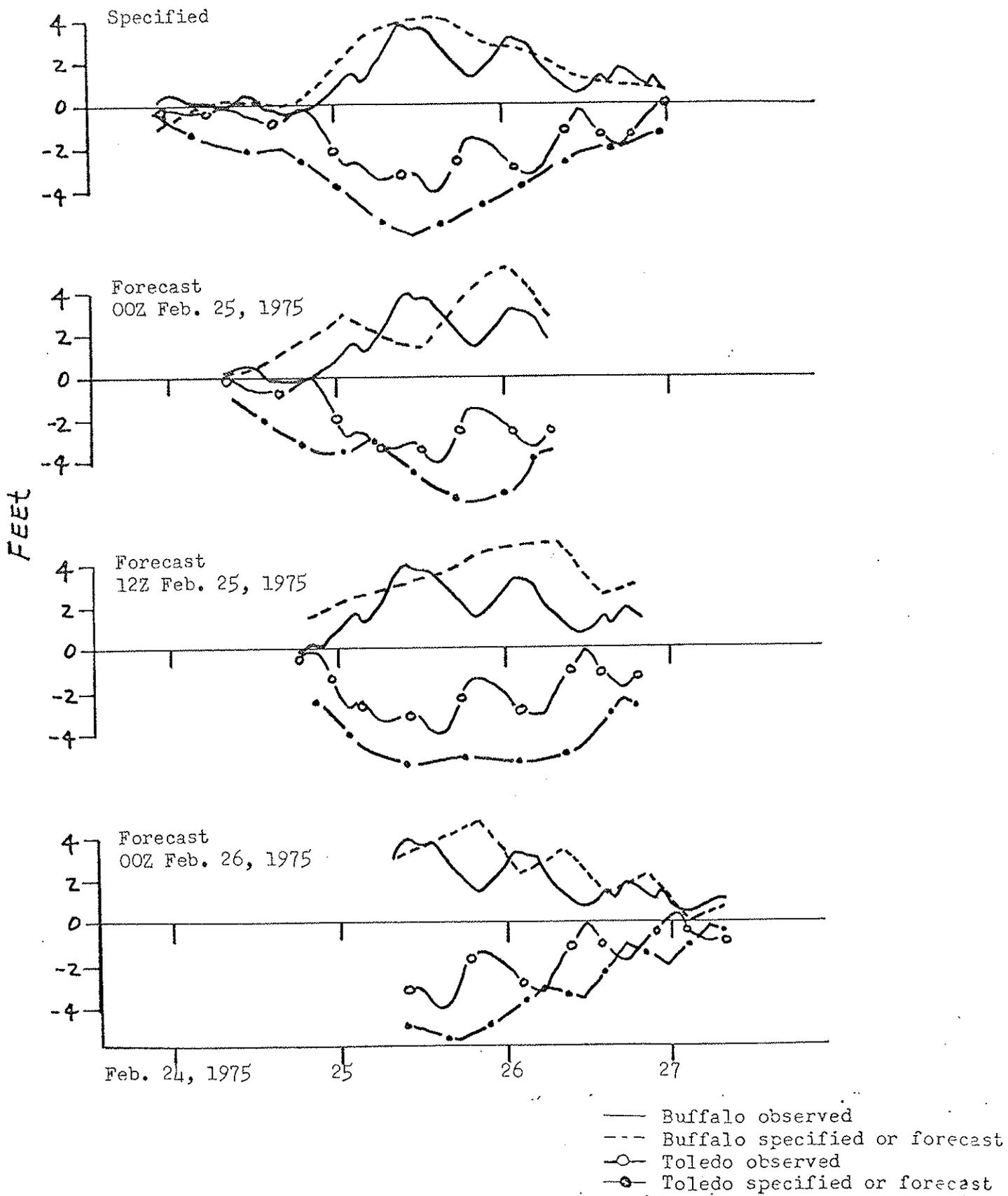


Figure 8. Observed storm surge, specified storm surge, and forecast storm surge at Buffalo and Toledo for February 25, 1975.

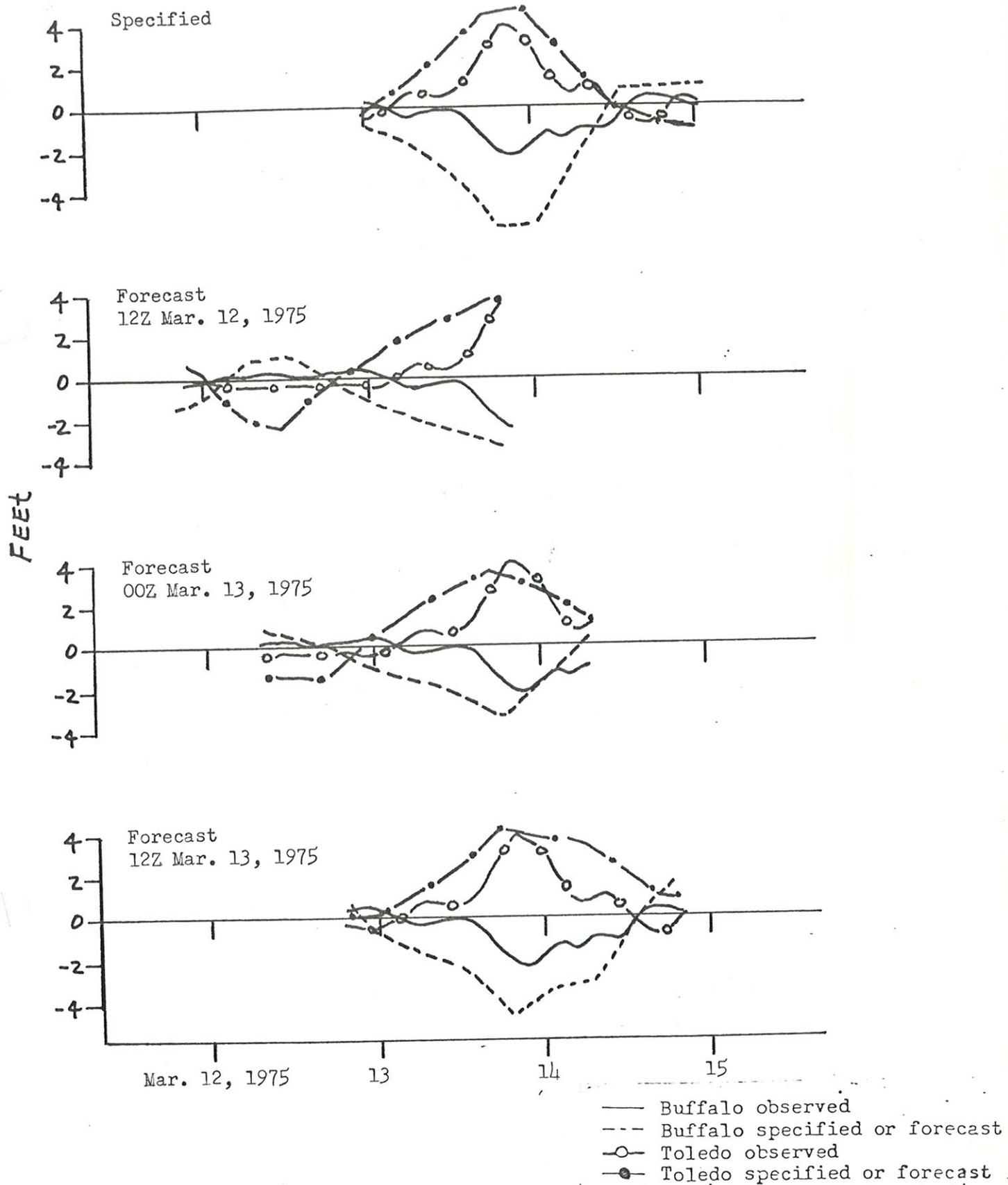


Figure 9. Observed storm surge, specified storm surge, and forecast storm surge at Buffalo and Toledo for March 14, 1975.

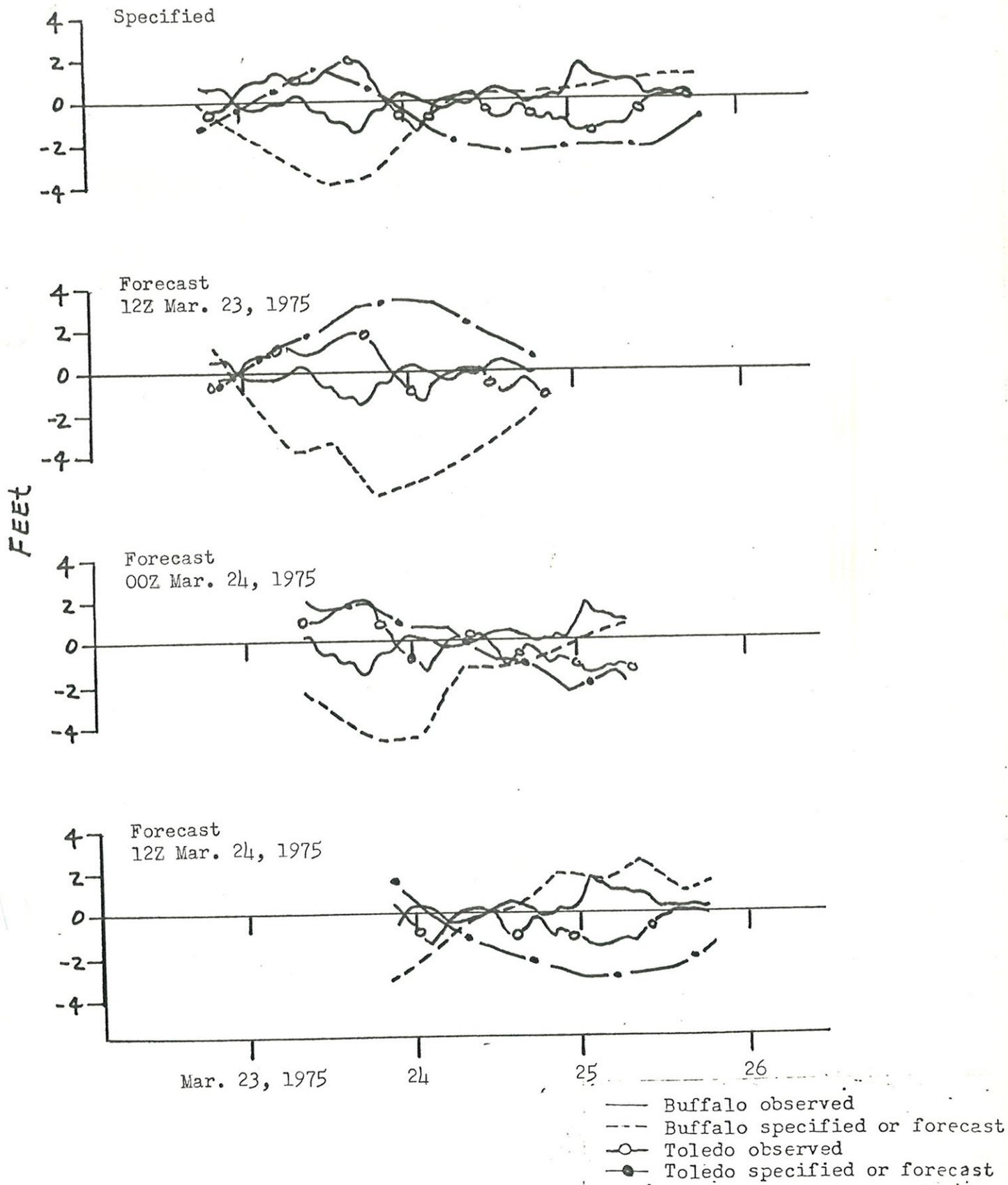


Figure 10. Observed storm surge, specified storm surge, and forecast storm surge at Buffalo and Toledo for March 24, 1975.

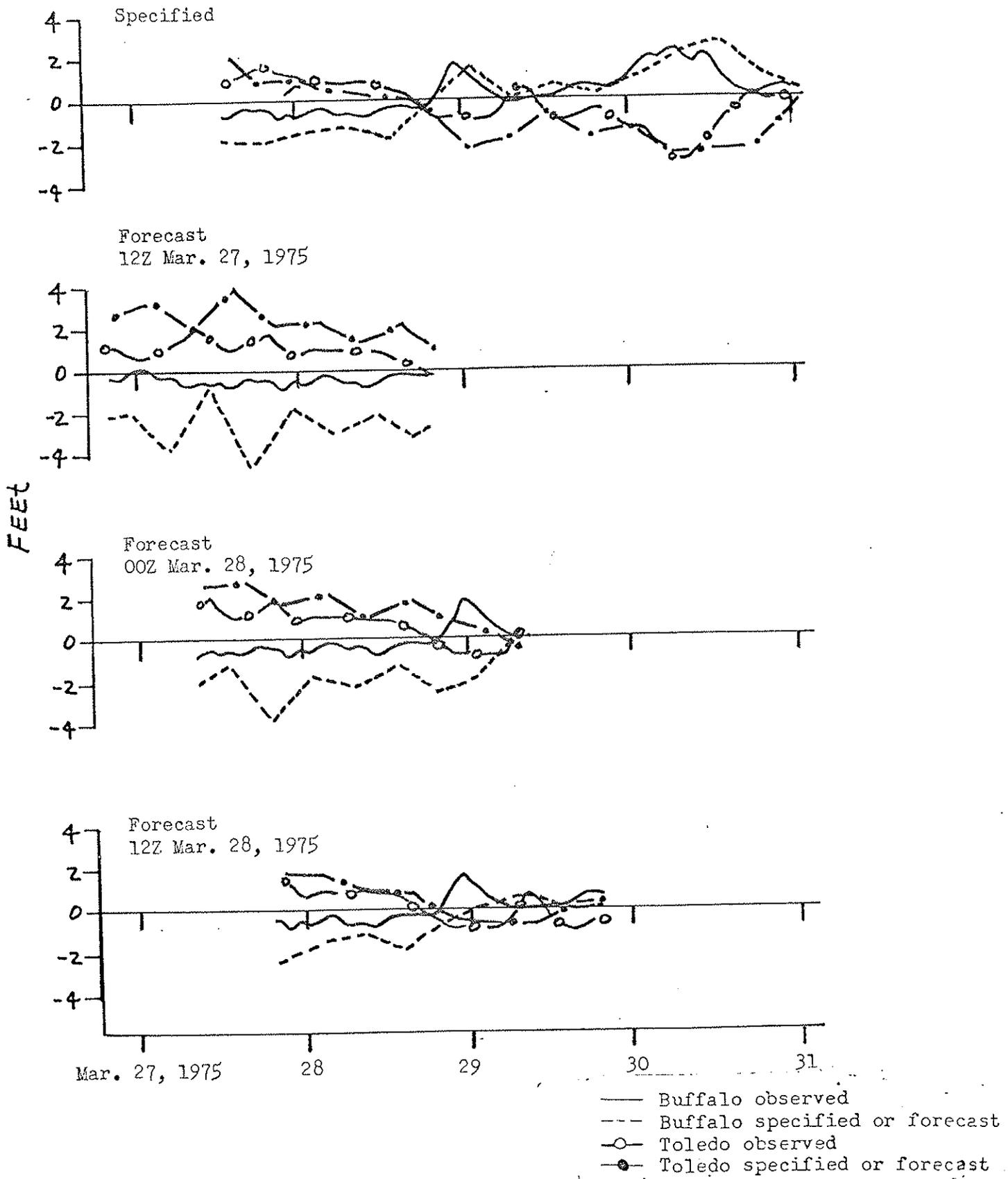


Figure 11. Observed storm surge, specified storm surge, and forecast storm surge at Buffalo and Toledo for March 28, 1975.

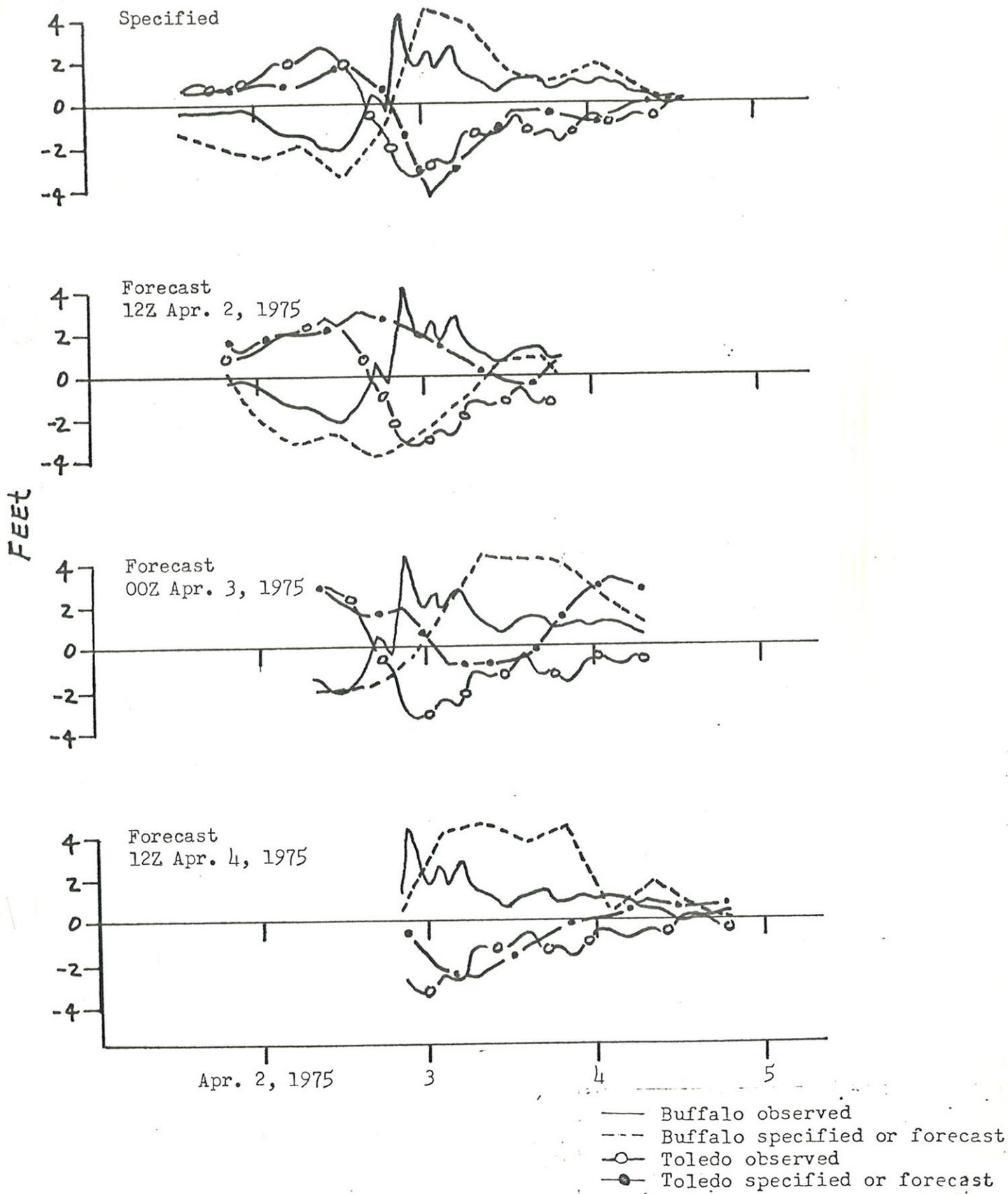


Figure 12. Observed storm surge, specified storm surge, and forecast storm surge at Buffalo and Toledo for April 3, 1975.

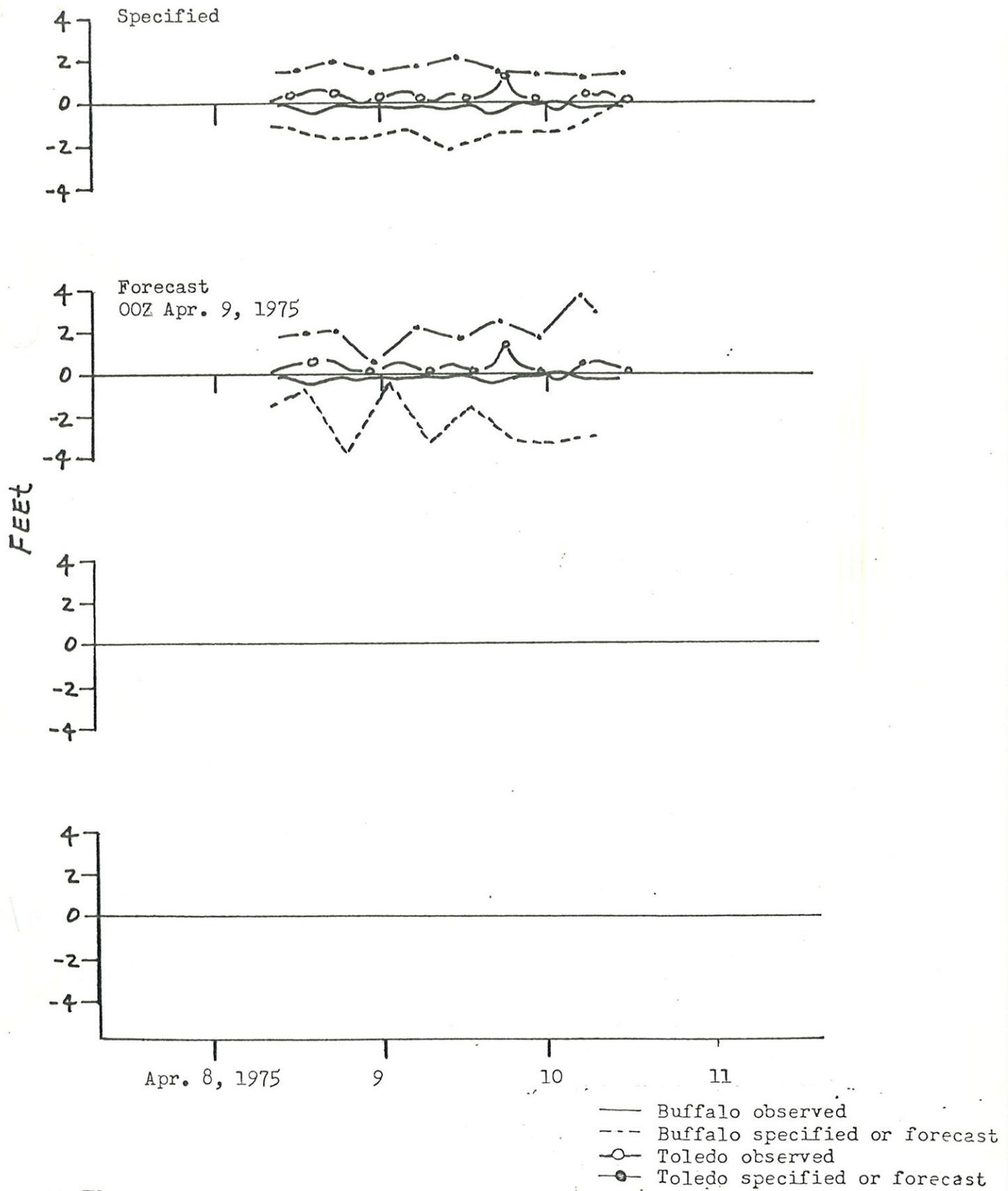


Figure 13. Observed storm surge, specified storm surge, and forecast storm surge at Buffalo and Toledo for April 9, 1975.

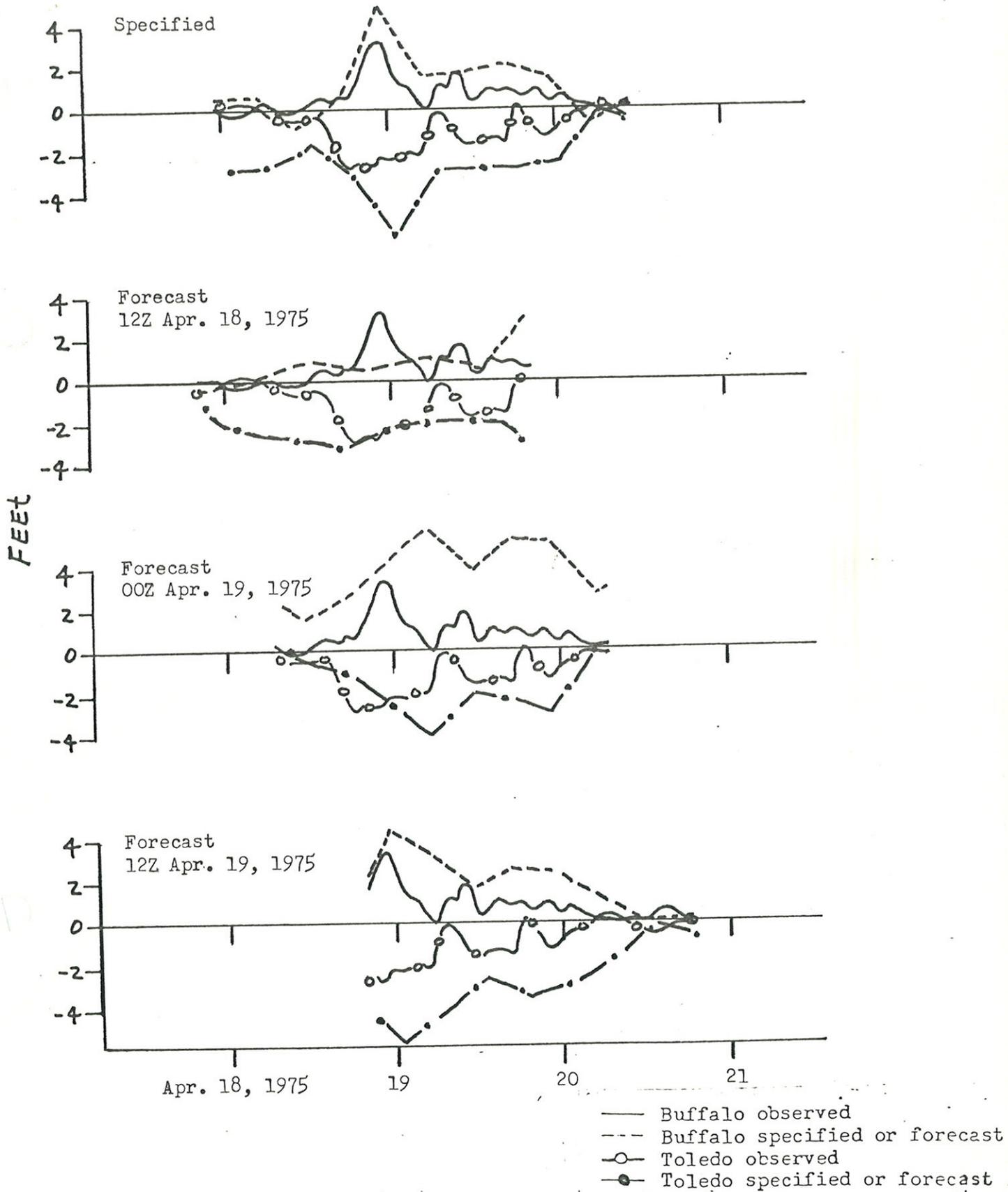


Figure 14. Observed storm surge, specified storm surge, and forecast storm surge at Buffalo and Toledo for April 19, 1975.

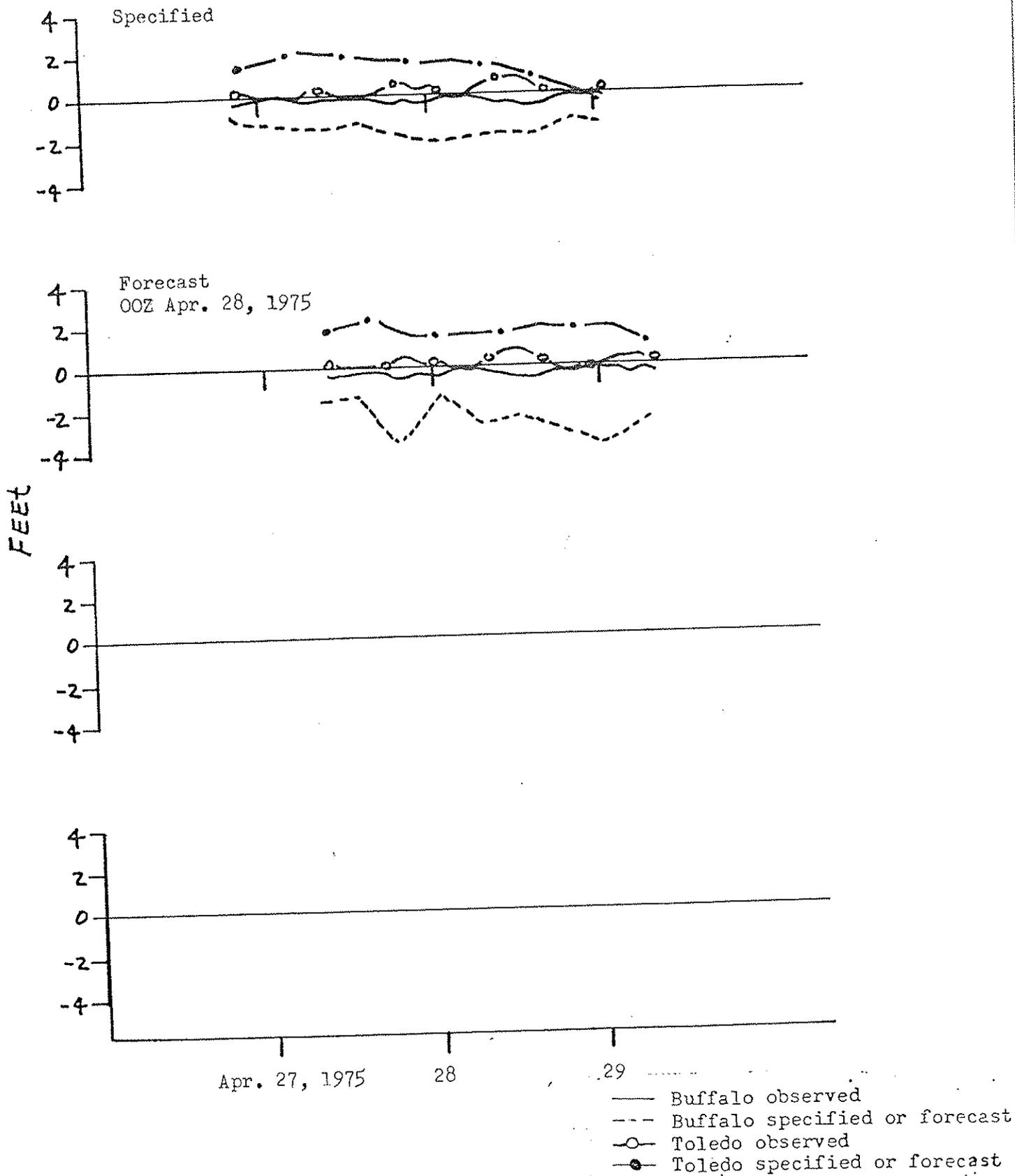


Figure 15. Observed storm surge, specified storm surge, and forecast storm surge at Buffalo and Toledo for April 28, 1975.