3

DSM2 1997 Dye Simulation

Introduction

At noon on April 28, 1997, the USGS released 48 liters of dye from the Mossdale railroad bridge overlooking the San Joaquin River. Eight water quality samplers, located at eight different sites in the South Delta, were used to track the movement of dye. This dye release was simulated using the Delta Simulation Model 2 (DSM2) and the results, comparing computed to observed, are shown in this chapter.

Description

The simulation was conducted using the quality portion of DSM2. The flows and Delta geometry configuration were from the DSM2 1997 hydrodynamics validation, which can be found at *wwwdelmod/docs/dsm2/calval/valid.html*. During the time frame of the study, the Old River at Head barrier was in place. It contained two culverts with a capacity of passing approximately 300 cfs. Forty-eight liters of tracer, over a fifteen-minute period, were released into the San Joaquin River at the DSM2 grid location corresponding to the Mossdale site. The dye concentration was observed at the eight locations shown in Figure 3-1 and compared to model results reported at the same sites.

Discussion of Results

Figures 3-2 through 3-9 show the concentration plots. From these graphs, travel time, dispersion, and concentrations were analyzed for each observation site. General comments comparing the model's results to observed data are shown in Figure 3-1.

There was a strong match between the travel time of the simulated tracer and the observed data. The timing of the peaks between observed and computed were within a couple of hours. (This is excluding the Old River at CC Ferry site, which did not have accurate observed data.)

This study was particularly helpful in showing how well DSM2 models dispersion in various areas of the Delta. The quality portion of DSM2 is calibrated using salinity. Since there are several continuous sources of salinity, it is impossible to determine the

local dispersion effects. Examining the plots shows that in some areas of the Delta, such as the Stockton site, the model had greater dispersion. At other sites, like Turner Cut or San Joaquin River at Mandeville, model dispersion was less.

Differences in concentrations between the model and observed data are a result of differences in channel velocities, flow splits and/or dispersion. Additionally, the USGS considers concentrations below 0.04 ug/l to be background concentrations.

Conclusions

This study demonstrated how well DSM2 modeled a conservative tracer. In general, the model did very well in simulating the travel time of the dye. Areas for strongest improvement are in the modeling of dispersion.

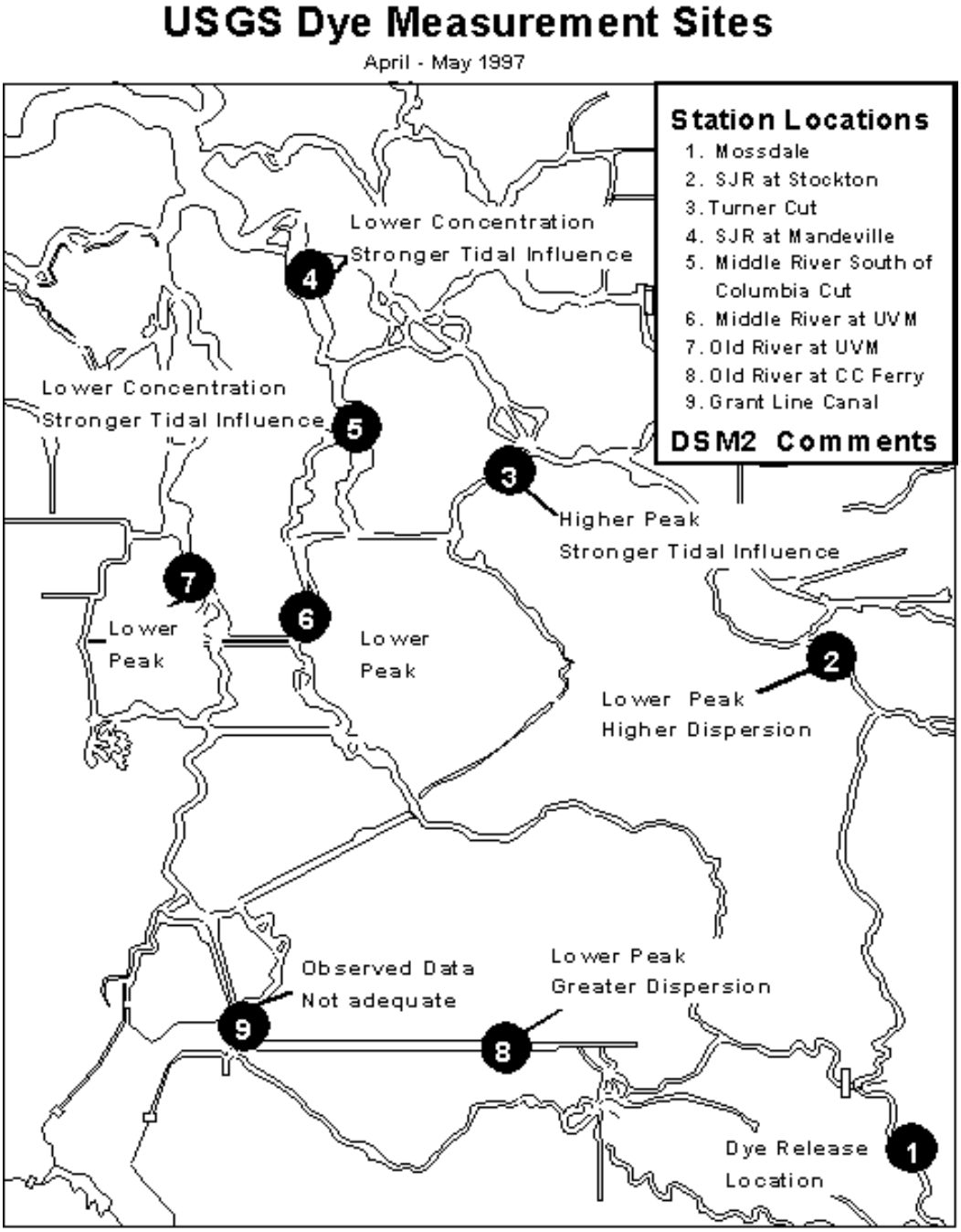
USGS Dye Measurement Sites
April - May 1997
Station Locations
1. Mossdale
2. SJR at Stockton
3. Turner Cut
4. SJR at Mandeville
5. Middle River South of Columbia Cut
6. Middle River at UVM
7. Old River at UVM
8. Old River at CC Ferry
9. Grant Line Canal
DSM2 Comments
Lower Concentration
Stronger Tidal Influence
Lower Concentration
Stronger Tidal Influence
Higher Peak
Stronger Tidal Influence
Lower
Peak
Lower
Peak
Lower Peak
Higher Dispersion
Observed Data
Not adequate
Lower Peak
Greater Dispersion
Dye Release
Location
1
2
3
4
5
6
7
8
9

Figure 3-1

Figure 3-2

San Joaquin River at Stockton (DSM2 Channel 15)

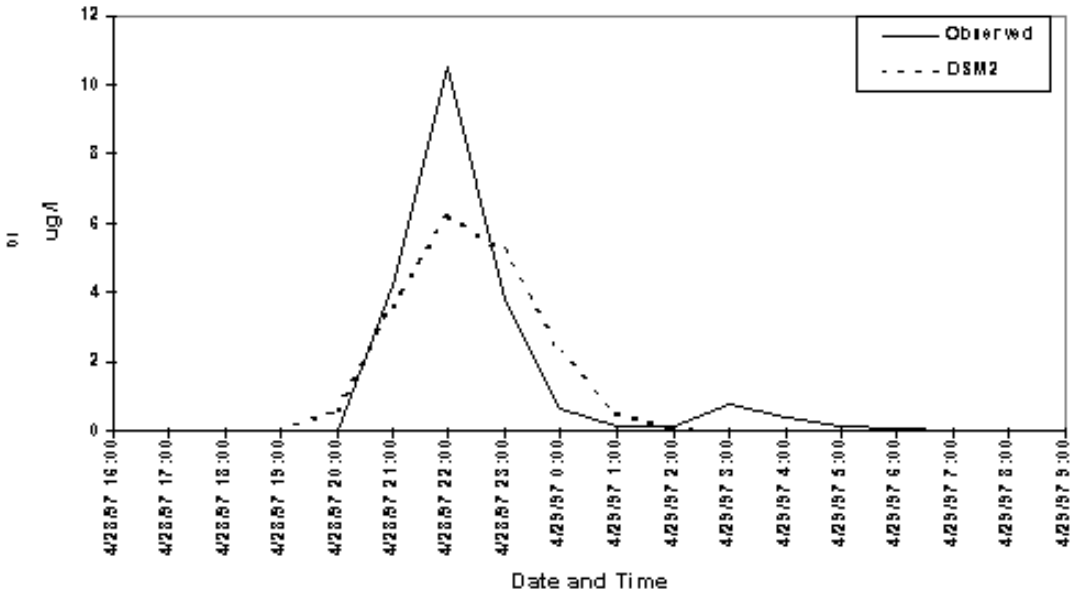

Figure 3-3

Turner Cut (DSM2 Channel 172)

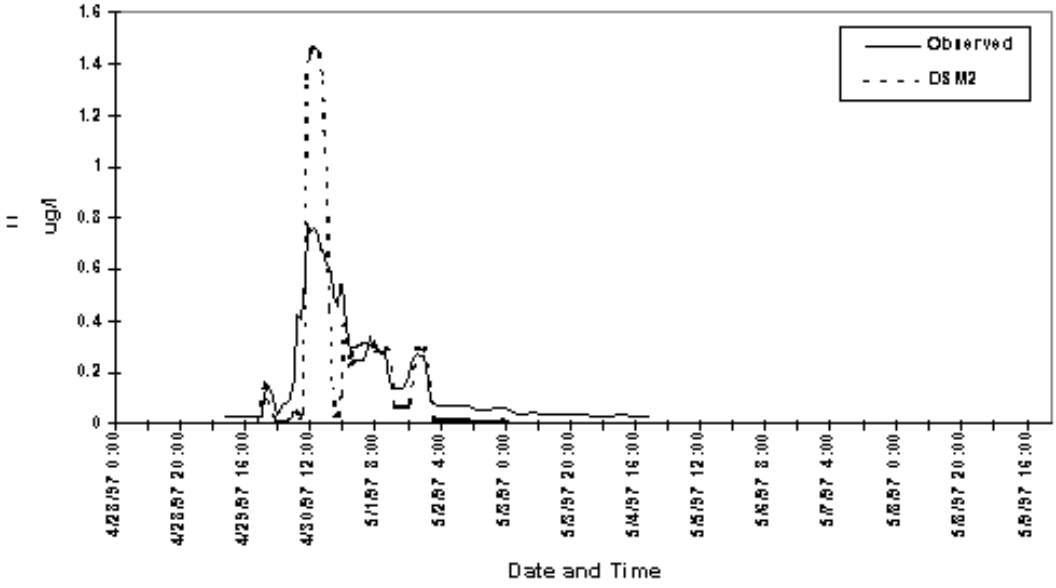

Figure 3-4

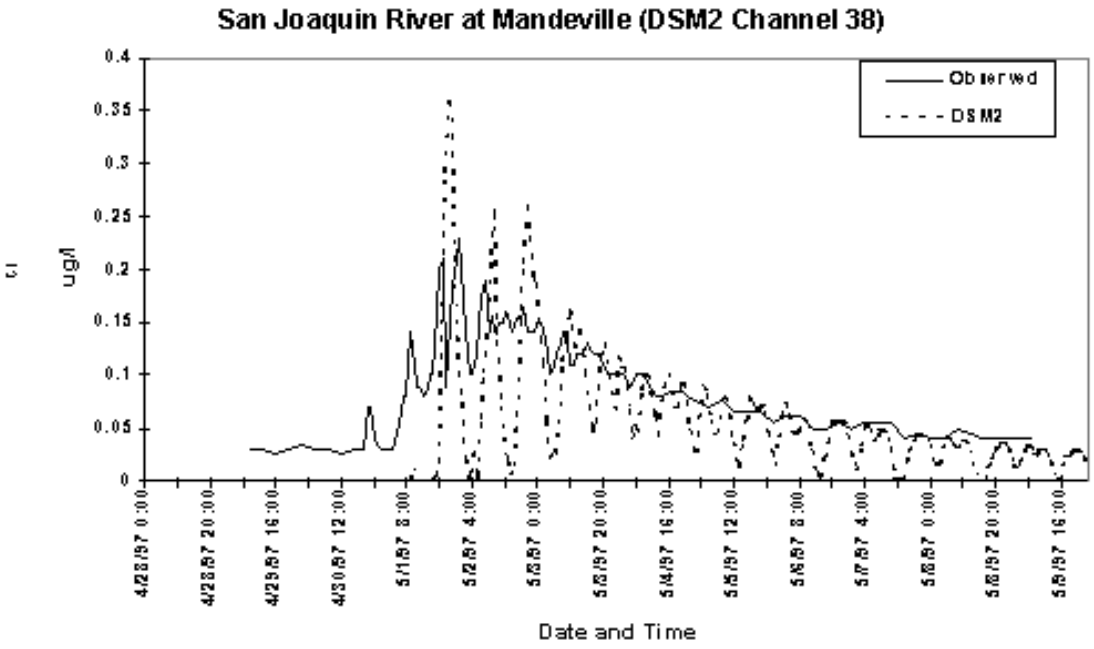
San Joaquin River at Mandeville (DSM2 Channel 38)
Observed
DSM2
ug/l
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
4/28/97 0:00
4/28/97 20:00
4/29/97 16:00
4/30/97 12:00
5/1/97 8:00
5/2/97 4:00
5/3/97 0:00
5/3/97 20:00
5/4/97 16:00
5/5/97 12:00
5/6/97 8:00
5/7/97 4:00
5/8/97 0:00
5/8/97 20:00
5/9/97 16:00
Date and Time

Figure 3-5

Middle River South of Columbia Cut (DSM2 Channel 159)

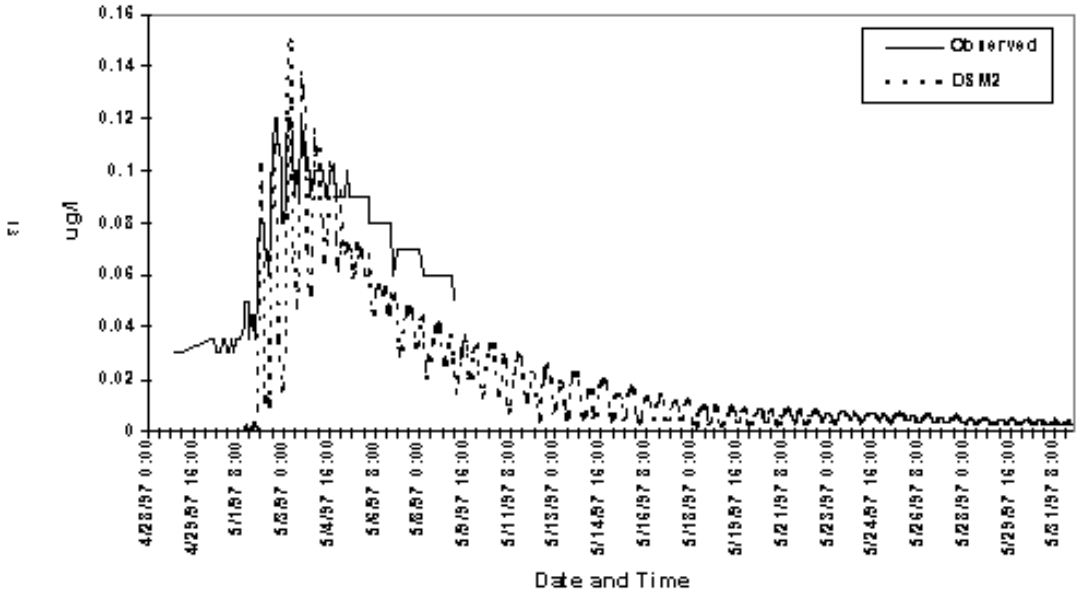

Figure 3-6

Middle River at UVM (DSM2 Channel 144)

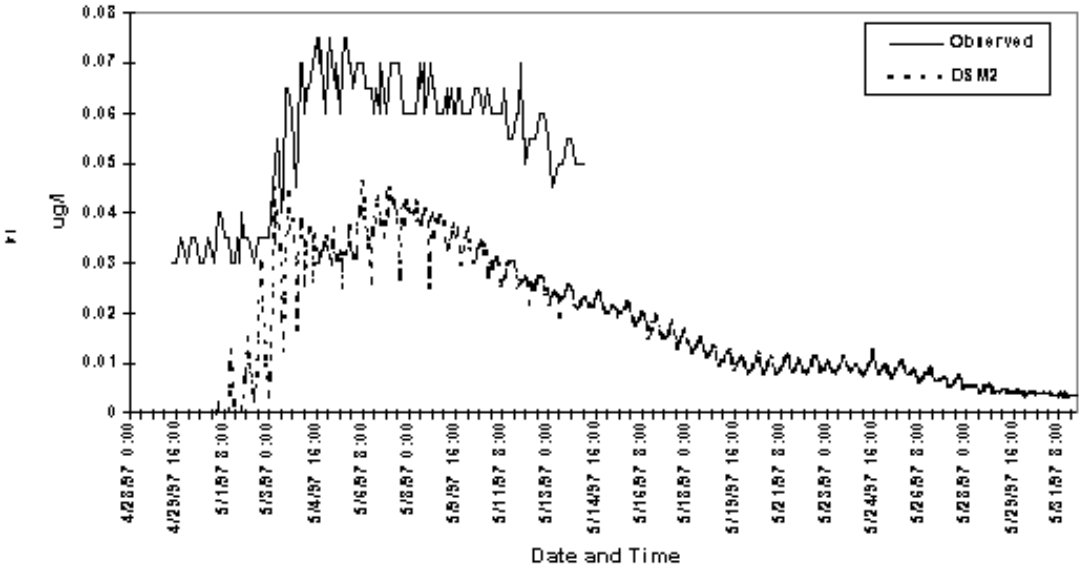

Figure 3-7

Old River at UVM (DSM2 Channel 106)

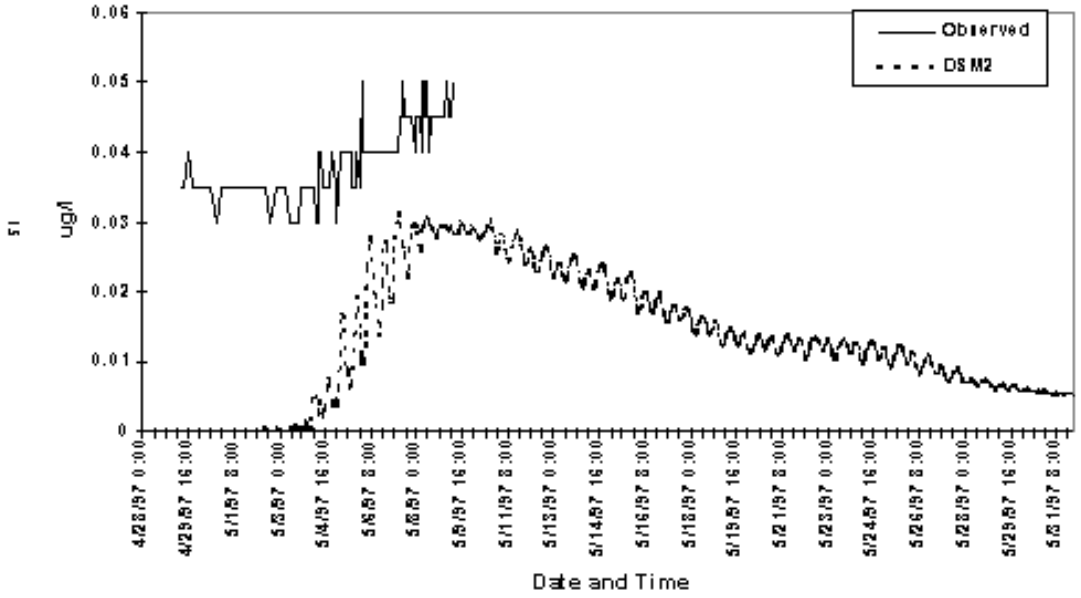

Figure 3-8

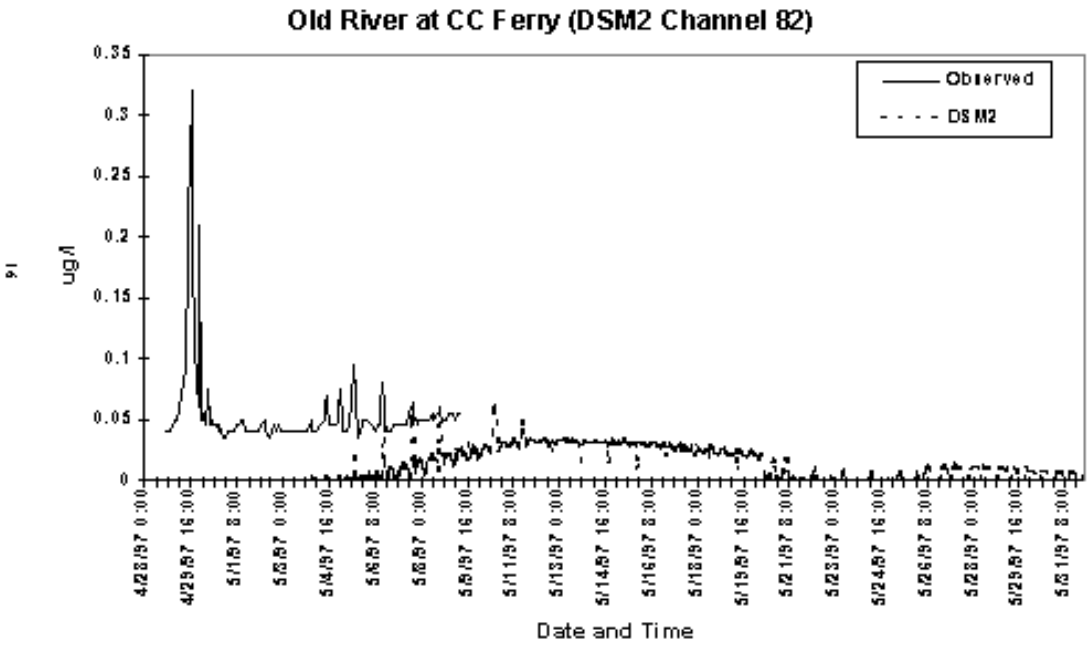
Old River at CC Ferry (DSM2 Channel 82)
Observed
DSM2
ug/l
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
4/28/97 0:00
4/29/97 16:00
5/1/97 8:00
5/3/97 0:00
5/4/97 16:00
5/6/97 8:00
5/8/97 0:00
5/9/97 16:00
5/11/97 8:00
5/13/97 0:00
5/14/97 16:00
5/16/97 8:00
5/18/97 0:00
5/19/97 16:00
5/21/97 8:00
5/23/97 0:00
5/24/97 16:00
5/26/97 8:00
5/28/97 0:00
5/29/97 16:00
6/1/97 8:00
Date and Time

Figure 3-9

Grant Line Canal (DSM2 Channel 207)