
Methodology for Flow and Salinity Estimates in the Sacramento-San Joaquin Delta and Suisun Marsh

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Chapter 10: DSM2 Calibration

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10 DSM2 Calibration

10.1 Introduction

The Delta Modeling Section has been working with IEP (Interagency Ecological Program) with the goal of calibrating DSM2-Hydro and DSM2-Qual. Several agencies are contributing to this process. These include DWR (Delta Modeling Section, ESO, and O&M), USGS, USBR, Contra Costa Water District, Metropolitan Water District, and Stanford University. The first DSM2 calibration was performed in 1997 by Delta Modeling Section staff. This calibrated version has been used since fall 1997. Since then a significant amount of geometry and flow data have become available. It became evident that a new round of calibration would be justifiable. The DSM2 IEP-Project Work Team (PWT) was formed in late 1998. The group laid out the tasks needed for a successful calibration. The results for first iteration of DSM2-HYDRO became available in summer of 1999. At this point calibration is still in process. IEP-PWT hopes to have HYDRO and QUAL calibrated by the middle of summer 2000. The following is a brief discussion of the various aspects of this calibration process.

10.2 Calibration

IEP-PWT decided early on to make the DSM2 calibration an open process. The group laid down the strategy for having the results of all of the calibration runs available on the IEP Internet web-site. The staff from DWR's ESO developed a set of routines to make this process fully automated. The reader is referred to the following web-site for detailed information regarding the calibration, including the model results for all the iteration cycles done up to date:

<http://www.iep.water.ca.gov/dsm2pwt/>

At this Web site, a person can click on a map showing locations in the Delta where field and model data are available. A plot includes the results of the latest iteration, the results from the particular iteration cycle which the team believes had the best fit, along with the field data. The team looked for incremental improvements in matching the field data.

10.2.1 HYDRO

Four different time periods were selected for calibration of DSM2-HYDRO:

1. May 1988,
2. April 1997,
3. April 1998, and
4. September 1998.

This decision was based on the availability of the flow and stage data throughout the Delta.

Two sets of plots were generated: 1) instantaneous and 2) tidal-average. This enabled the team to check the tidal amplitudes, phase, mean flows, and the flow splits. In order to easily quantify how well the model matches the field data, some error indexes were defined and their values were computed and shown on all the plots. For specific definition of these error indexes see:

http://www.iep.water.ca.gov/dsm2pwt/calibrate/error_index.GIF

Any calibration effort requires manipulation of some model parameters. These are usually parameters which are not directly measurable in the field. For HYDRO the calibration parameter was chosen to be the Manning's n coefficient, which describes the friction characteristics of the channels. In HYDRO every channel may be assigned a unique Manning's n coefficient. To reduce the number of degrees of freedom, the Delta was divided into a series of about fifty groups of channels, with all the channels in a group having a single value of Manning's n coefficient. For a map showing the geographical location of these groups see:

http://www.iep.water.ca.gov/dsm2pwt/calibrate/chnl_groupsI.html

An idea that was suggested and later implemented was to change the network grid representing the Delta. The majority of the changes in the grid corresponds to the Western Delta, and mainly affected the way some of the large bodies of water are simulated. In the old grid, these open water areas were simulated as a reservoir, which basically acts like a tank. The disadvantage of the reservoir assumption is that any water parcels that enter are completely mixed in a single-time step. In the new grid, some of these open water areas are being simulated as a series of connecting wide channels. The new model grid map (as shown in Figure 10-1) is available as a 'zipped' version and can be downloaded from the IEP Web site at:

<http://www.iep.water.ca.gov/dsm2pwt/calibrate/>

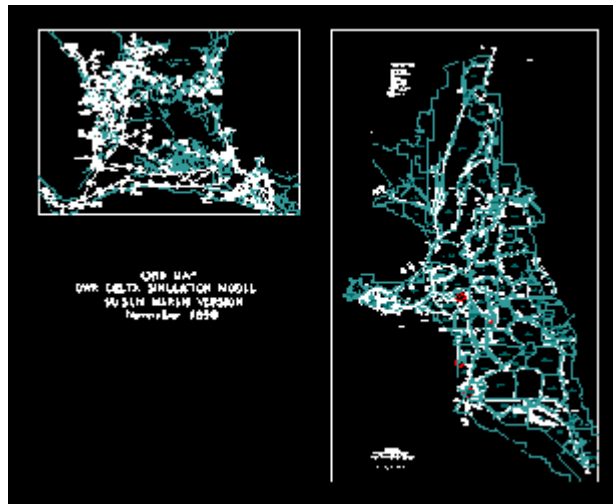


Figure 10-1: New DSM2 Grid (as of November 1999).

As of June 2000, there have been 49 calibration iteration cycles. The IEP-PWT members routinely attend conference calls to discuss the results of the latest runs and decide on the direction of any changes to the calibration parameters. The magnitudes of the incremental improvements in the model results are becoming smaller as expected. Overall, the results of the latest run show major improvements in the model predictions compared to the previous calibrated version.

10.2.2 QUAL

The calibration of DSM2-QUAL has begun. The staff from the Delta Modeling Section is setting up the model runs and the interface needed to show the results. Unlike HYDRO, QUAL will need more than a few days to warm up. In fact it usually takes two to six months to wash out the impact of the initial water quality assumption. IEP-PWT decided to calibrate QUAL for the three consecutive years from 1992 to 1994. The most interesting periods for QUAL calibration are when noticeable salinity intrusion from the ocean occur. 1992-1994 is considered a dry period and contains three to four times where salinity rises and falls.

The calibration parameter for QUAL is the dispersion factor. The dispersion factor accounts for the process of mixing salinity between two neighboring parcels of water. Two runs have already been completed using dispersion factors of 0.25 and 1.0 (constant for the whole Delta). The following web-site contains a clickable map allowing the user to plot model results and the field data:

<http://wwwdelmod.water.ca.gov/studies/calibration/>

Once the process of calibration is under way, results from the QUAL runs may dictate the need for further calibration of HYDRO. QUAL is sensitive to small changes in flow especially during dry periods (low net Delta outflow). At this point, it is expected that the process of calibration for both models can take a few more months. By fall 2000, it is expected that the Delta Modeling Section will switch to using the new calibrated version of DSM2.