1 Introduction

Over the past 12 years, the Delta Modeling Section of the California Department of Water Resources' Bay-Delta Office has been developing and enhancing the Delta Simulation Model Version 2 (DSM2), the tools used to support DSM2 modeling, and other Delta flow and water quality estimation tools. The following are brief summaries of work that was conducted during the past year. The names of contributing authors are in parentheses.

Chapter 2 – Using Dye-Injection Study to Revise DSM2-SJR Geometry

Work related to the San Joaquin River Dissolved Oxygen Total Maximum Daily Load Technical Work Group revealed that simulated travel times in the DSM2 San Joaquin River extension were significantly greater than observed travel times. To improve the DSM2-SJR, the irregular cross sections and channel roughness between Bear Creek and Vernalis were modified to more accurately represent the local bathymetry and to simulate travel times approximating the observed dye study travel times. After the revisions, DSM2-SJR accuracy was verified in simulating flow, water levels, and salinity.
(Jim Wilde)

Chapter 3 – Jones Tract 2004 Levee Break DSM2 Simulation

Following the June 3, 2004, Jones Tract Levee Break, the Department used DSM2 to forecast both hydrodynamic and water quality impacts at various Delta locations in response to the flooding. From June through November 2004, the Municipal Water Quality Investigations (MWQI) Program of the Department's Office of Water Quality collected water quality field data in Upper and Lower Jones Tracts. The DSM2 historical simulation was updated for 2004, and the DSM2-QUAL algorithm, which is used to simulate increases in organic carbon concentrations due to the flooding of peat soil-based islands, was applied to Jones Tract. This chapter discusses the methodology used to simulate the Jones Tract Levee Break and compares the modeled hydrodynamic, electrical conductivity, and dissolved organic carbon results to MWQI field data.
(*Mierzwa and Suits*)

Chapter 4 – Sensitivity of DSM2 Temperature Simulations to Time Step Size

The San Joaquin River Dissolved Oxygen Total Maximum Daily Load Technical Working Group is using DSM2-QUAL to characterize the transformation and fate of algae and other oxygen-demanding materials in the San Joaquin River between their sources in the watershed and the Stockton Deep Water Ship Channel. The DSM2-QUAL modules for simulating dissolved oxygen and temperature, in addition to the DSM2-SJR extension discussed in Chapter 2, were used to assess the impact of San Joaquin River water on the Deep Water Ship Channel. The Technical Working Group raised questions regarding the range of time steps that can be used in the simulations. In response, a series of DSM2 temperature simulations were conducted downstream of Vernalis to determine the sensitivity of the results to different time steps. This chapter presents the results of these studies.
(*Hari Rajbhandari*)

Chapter 5 – Estimation of Electrical Conductivity at Martinez for Sea Level Rise Conditions

CALSIM and DSM2 are being used to investigate some potential impacts to water supply and quality in the Delta due to long-term climate change and sea level rise. In order to study these sorts of long-term phenomena, it is necessary to develop appropriate water level and salinity ocean boundary conditions for DSM2. DSM2's downstream boundary at Martinez is not located at the ocean. Therefore, it is necessary to come up with a way to account for the possible increase in the amount of salinity (represented as electrical conductivity in DSM2) that enters the Delta due to increases in sea level. Two different methods are presented for estimating electrical conductivity for sea level rise-based DSM2 simulations.
(*Jamie Anderson and Aaron Miller*)

Chapter 6 – Fingerprinting: Clarifications and Recent Applications

Over the past few years, DSM2 has increasingly been used to determine the sources of water or constituents at specified locations in the Delta, a procedure known as fingerprinting. Knowing the source of water at a given location can be important when making assumptions about constituents that cannot be directly simulated or for better understanding hydrodynamic mixing-based processes in the Delta. This chapter expands previous descriptions of DSM2 fingerprinting methodologies and reviews a few recent practical fingerprinting applications.
(*Jamie Anderson and Jim Wilde*)