

Numerical Simulation of DDTs Distribution in Southern California Bight (SCB)

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I. Introduction

DDTs include DDT (Dichlorodiphenyl/trichloroethane) and breakdown products (such as DDD, DDE and DDMU). DDT use was banned in the U.S. in 1972. From the late 1940s to early 1970s, millions of pounds of DDTs were discharged from industrial sources to the Southern California Bight through Joint Water Pollution Control Plant (JWPCP) outfalls offshore of White Point, near Los Angeles (See Fig.1). In addition, DDTs were also released to the SCB through direct ocean dumping of acid sludge, runoff and storm drain discharge and aerial transport.

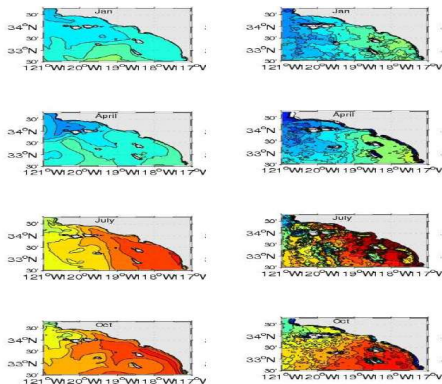


Fig. 2 SST comparison: MODEL (left) and Satellite (right)

3. Numerical Results and Comparison with Observati

Figs. 3-6 shows the seasonal variation in DDTs distribution pattern when the DDTs source is continuously released from the site of the outfall of JWPCP.

Fig. 7 shows the observed distribution of p, p'-DDE at the 2-m depth of water column of SCB. It shows the DDTs are detected in Santa Monica Bay, Long beach and even Santa Barbara Channel, which are also seen in Figs 3-6.

Fig. 8 shows the comparison of vertical distribution of DDTs between model and observation.

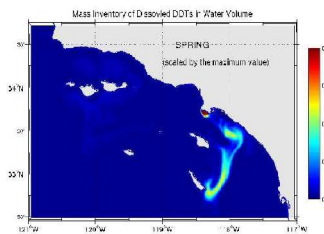


Fig. 3 Mass inventory of dissolved DDTs in water volume in Spring

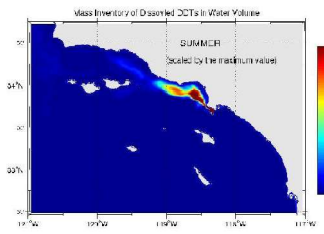


Fig. 4 Mass inventory of dissolved DDTs in water volume in Summer

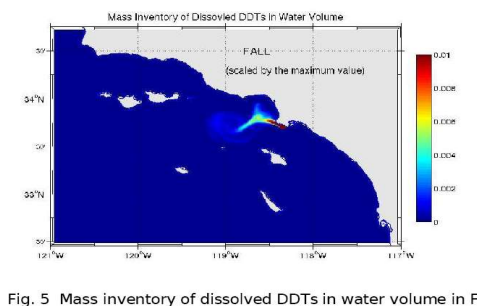


Fig. 5 Mass inventory of dissolved DDTs in water volume in Fall

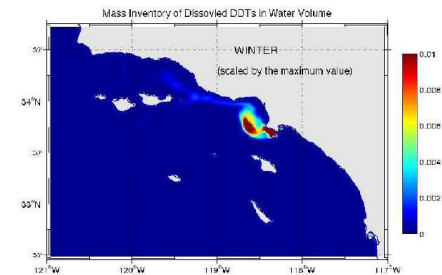


Fig. 6 Mass inventory of dissolved DDTs in water volume in Winter



Fig. 7 Observed DDTs distribution at 2-m depth of water volume (adapted from (Zeng et al.2006))

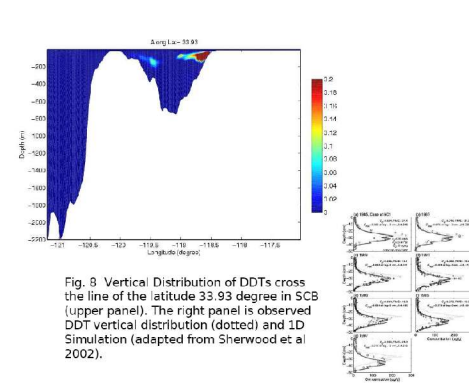


Fig. 8 Vertical Distribution of DDTs cross the line of the latitude 33.93 degree in SCB (upper panel). The right panel is observed DDT vertical distribution (dotted) and 1D Simulation (adapted from Sherwood et al 2002).

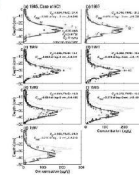


Fig. 9 Correlation between sediment and aqueous concentrations (adapted from Zeng et al, 2006).

4. Discussion

- DDTs are mostly attached to sediments. The relationship of solid-phase DDTs and dissolved phase DDT is shown in the left panel.
- A long-term integration will be done in near future.

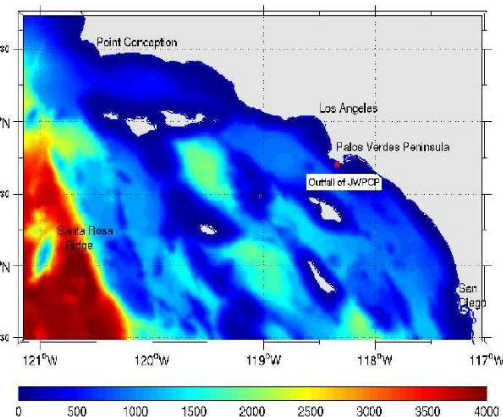


Fig. 1 SCB Bathymetry (unit: meter). The red dot is indicated the location of the outfall of JWPCP.

These discharges resulted in widespread impacts on the natural and human environment (Southern California Coastal Water Research Project SCCWRP, 1992, 1996,1997, 1999). Field surveys have found the sewage discharge has combined with natural sediment to form a deposit over shelf in SCB. Recent field surveys found the dissolved DDTs are clearly widespread (Zeng, et al, 2005).

In this study we used 3-Dimensional numerical model to study the dissolved DDTs distribution. The results presented in this poster is a preliminary results.

2. Numerical Model

Regional Ocean Model System (ROMS) is applied to the study. ROMS solving the rotating primitive equations, is a split-explicit, free-surface oceanic model. The model is forced by MMS reanalyzed wind. Fig.2 shows the model and satellite remote sensing observed SST. DDTs, as a passive tracer, is advected and diffused by the water current.

DDTs is released (its concentration is kept constant) at the site of the outfall of JWPCP.

References:

Zeng, E. D. Tsukada, D. Diehl, J. Peng, K. Schiff, J. Noblet and K. Maruya: 2005: Distribution and Mass Inventory of Tital DDE in the water column Of the Southern California Bight, submitted

SCCWRP (Southern California Coastal Water Research Project), Annual Report 1992-1999 Southern California Coastal Water Reseach Project Authority, Westminister CA.

Sherwood C., D. Drake, P. Wiberg and R. Wheatcroft, 2002: Prediction of the Fate of p,p'-DDE in sediment on the Palos Verdes shelf, California, USA.Cont. Shelf Res, 22, 1025-1058.