

Animator for QUAL Output

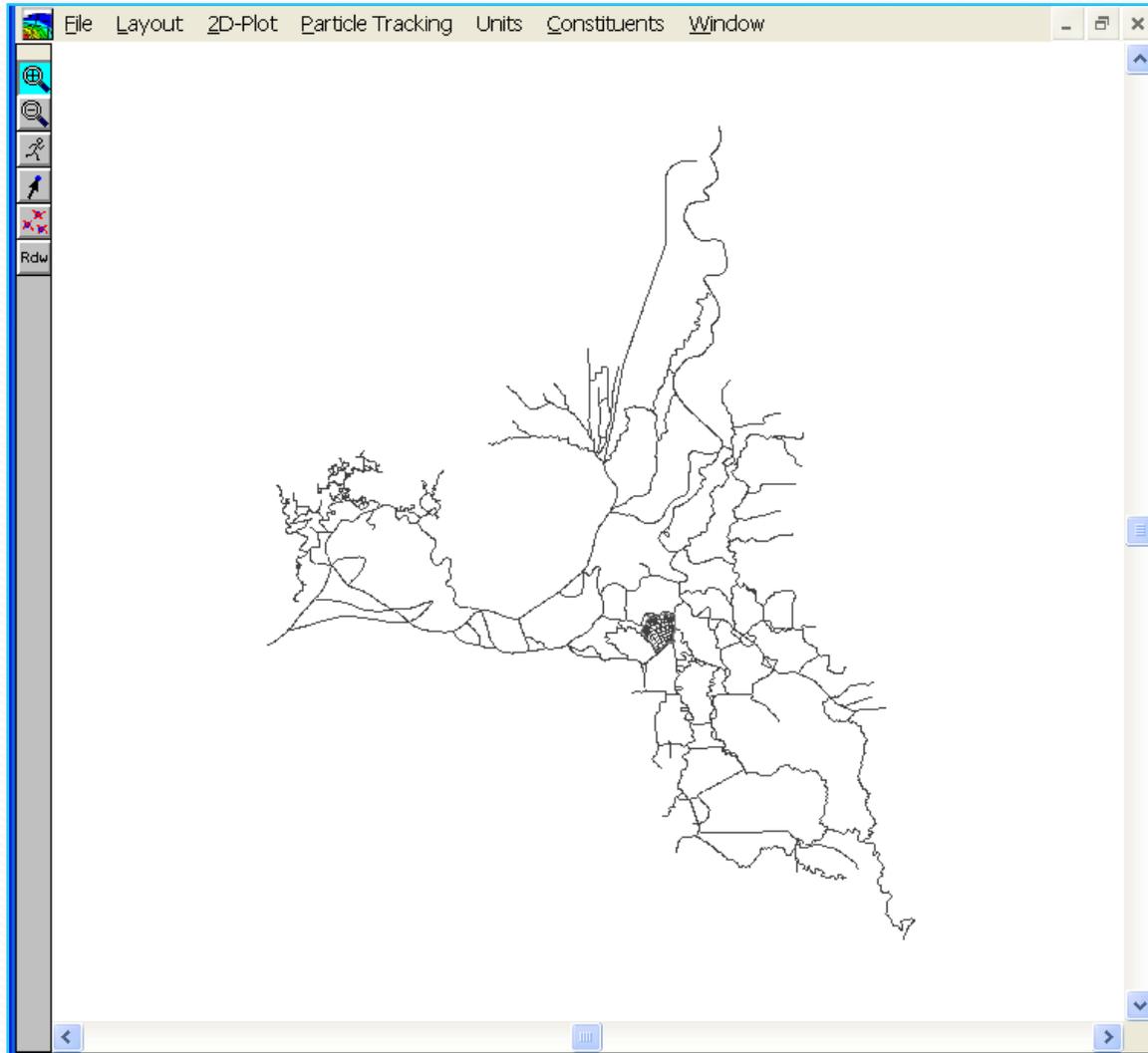
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Background

- In WY2010, RMA developed an animator for 15-min turbidity data in our 2-D grid of the Delta
- In WY2012, the technology was implemented online for animating turbidity on Bay-Delta Live for 34North in a reduced grid
- December 2013, adapted a 1-D grid to closely match DSM2 grid for general QUAL output
 - Grid is 2-D in area around Franks Tract, 1-D elsewhere
- Two applications shown here:
 - Planning modeling salinity
 - Historical turbidity

Existing 1-D RMA Grid Modified



Concept

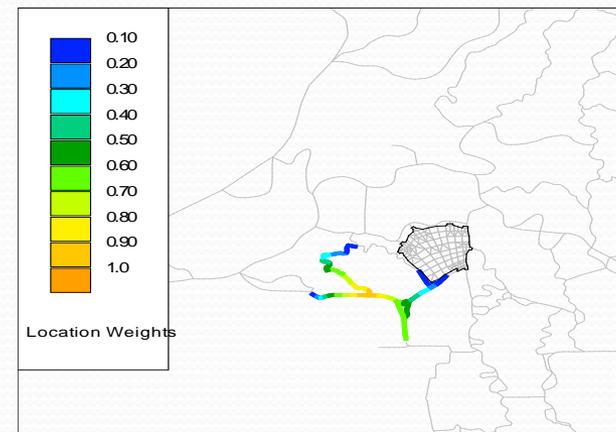
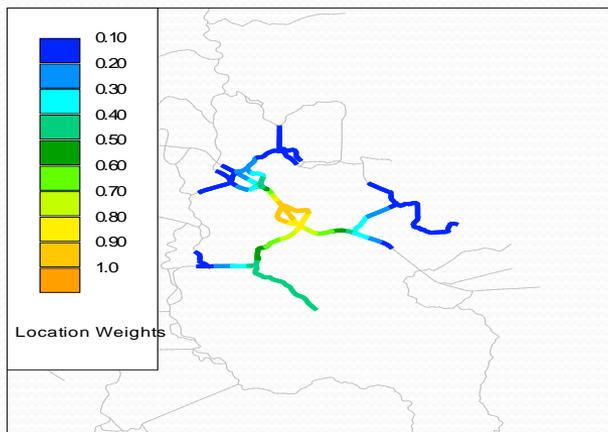
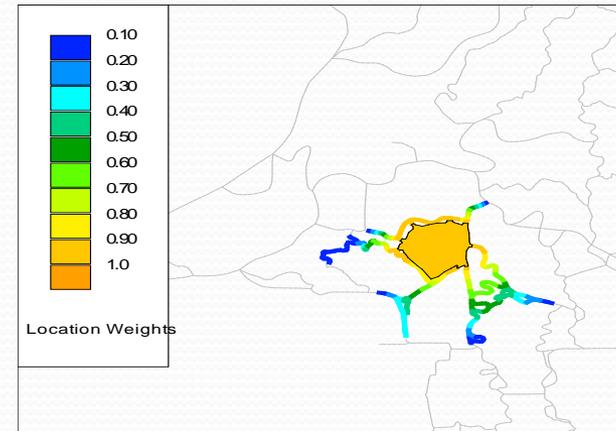
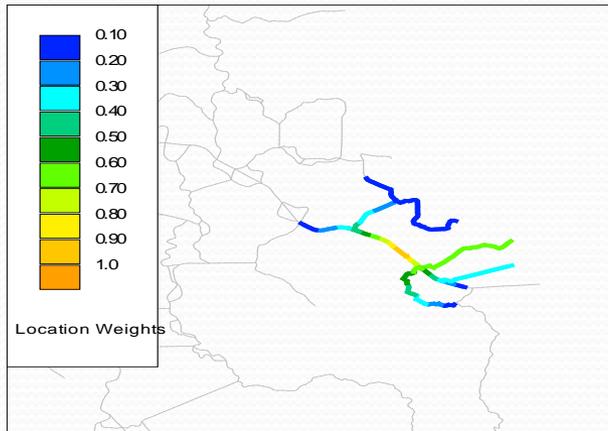
- Interpolate point time series data in a finite element grid
 - Spatial interpolation is performed by linear superposition of point values multiplied by spatial weighting functions
 - Time series are output from a DSM₂ QUAL model run in user-defined locations
 - Number of locations chosen defines the spatial resolution

Methodology

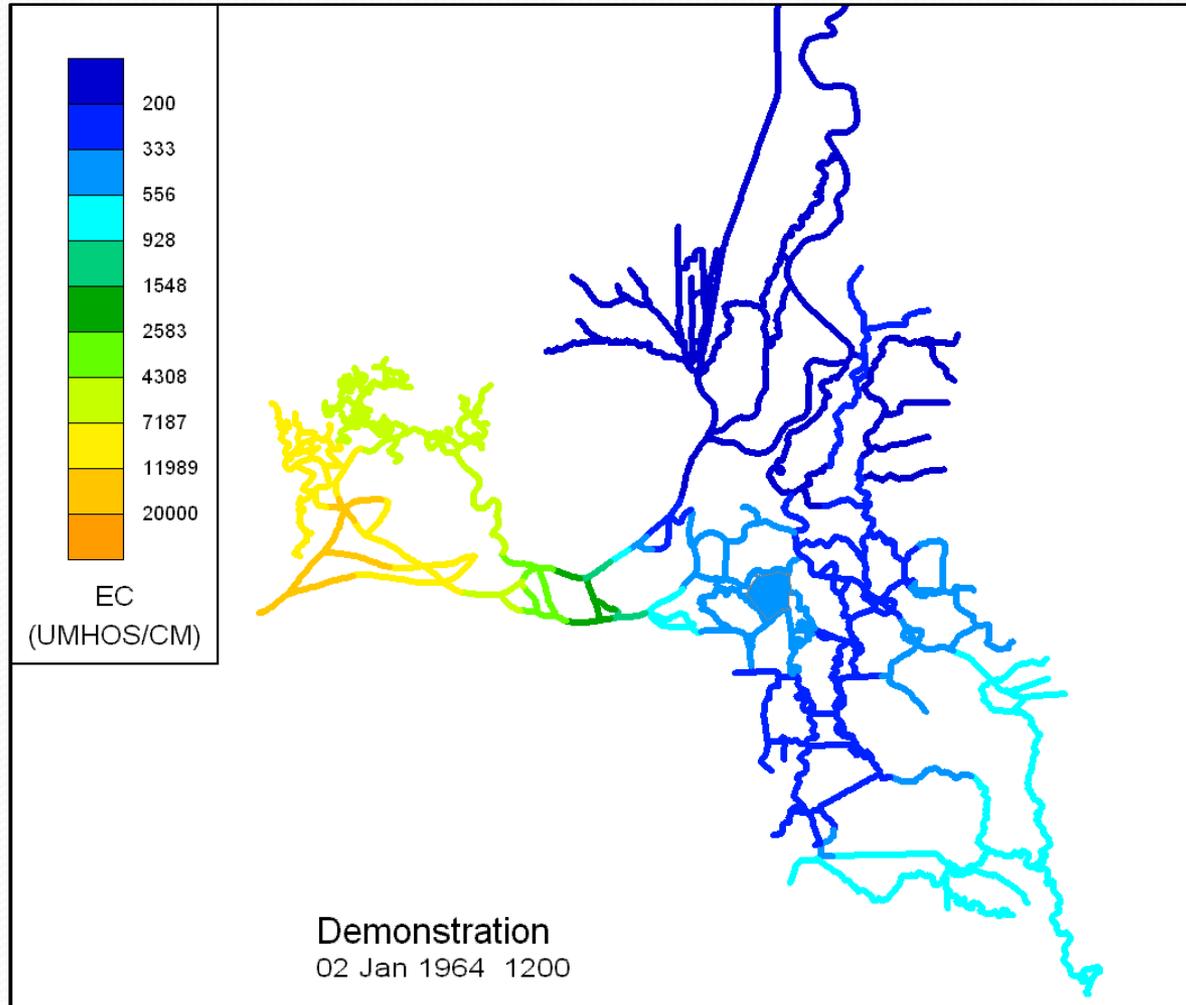
- Defined a sequence of weight functions φ_i , $i=1, \dots, m$ where m is the number of time series locations selected, is constructed such that:
 - $0 \leq \varphi_i(x,y) \leq 1$ for all locations (x,y) in the grid
 - $\varphi_i(x,y)=1$ at time series locations i , and these locations correspond to a node in the grid
 - $\varphi_i(x,y)=0$ at time series locations different from i
 - $\sum_{i=1}^m \varphi_i(x,y) = 1$ at any grid location (x,y) .
- Weight functions produced by solving Laplace equations w/Neumann BCs in 1-D or 2-D
- $E(x,y)$ is the animation value, where $E_i(x,y)$, $i = 1, \dots, m$, is the value observed at the time series location i associated with weighting function φ_i :

$$E(x, y) = \sum_{i=1}^m E_i(x, y) \times \varphi_i(x, y)$$

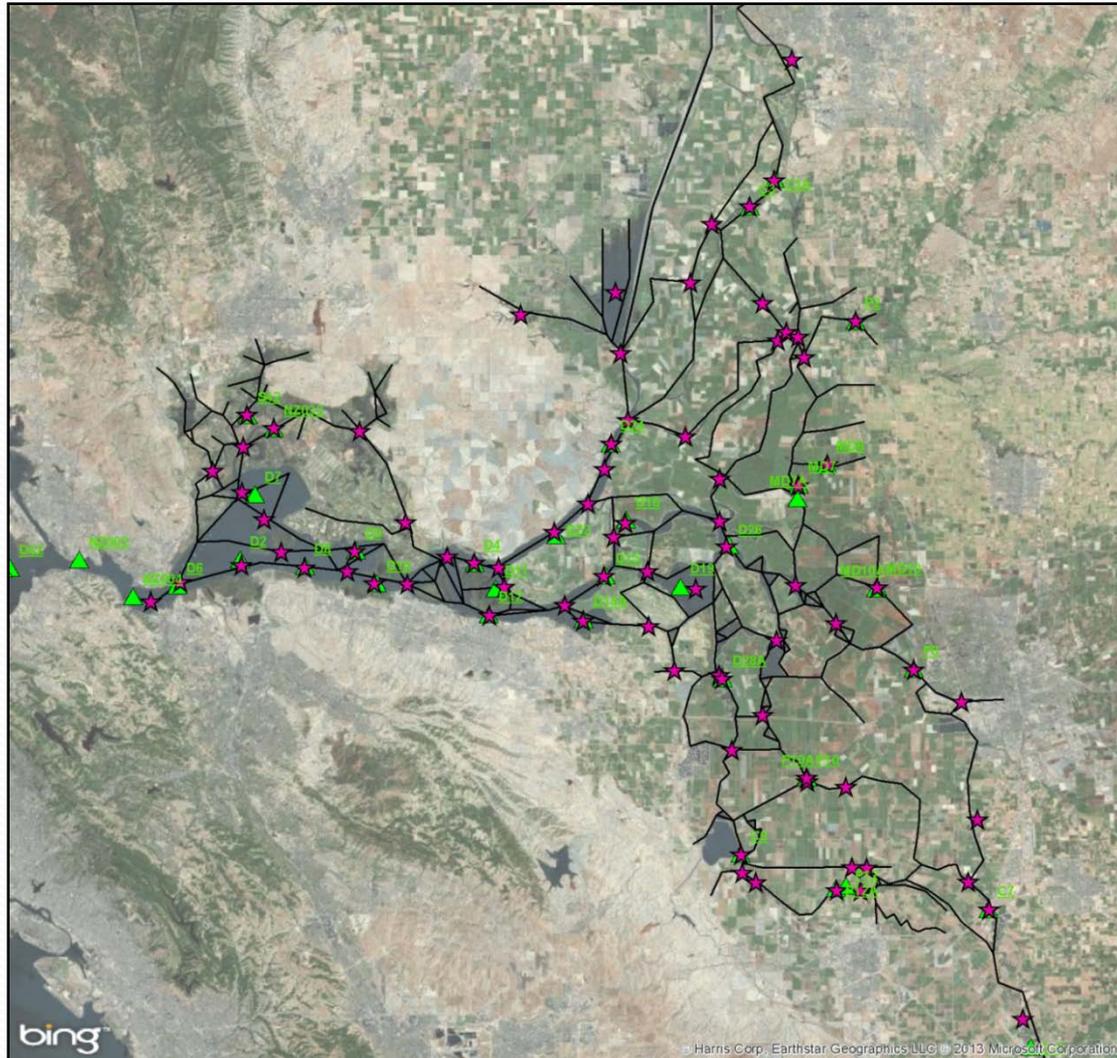
Examples of Weighting Scheme



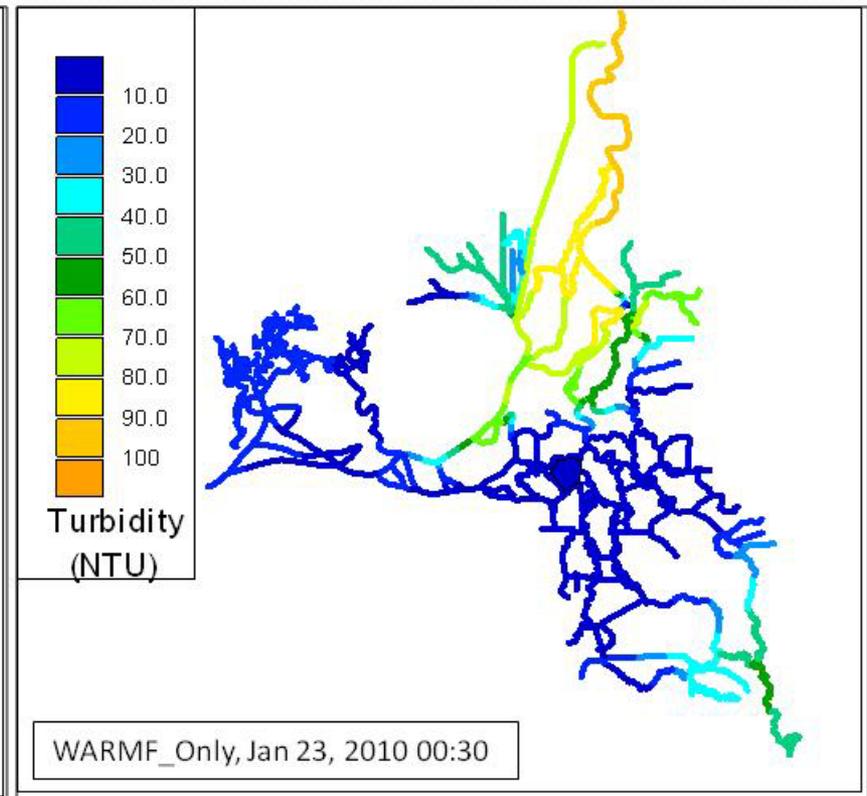
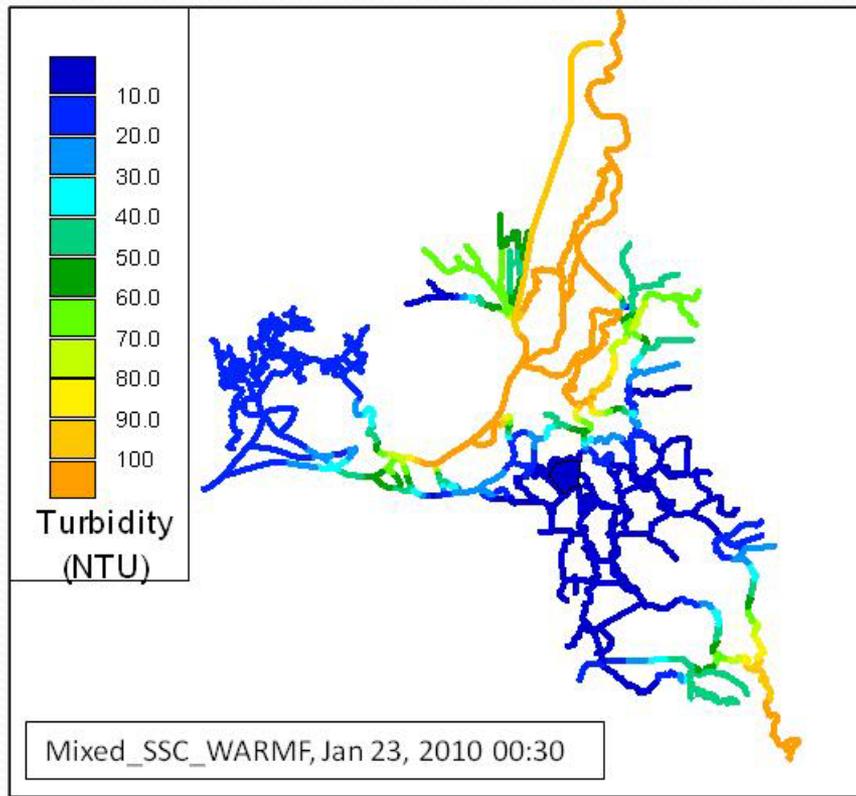
DSM2 Salinity Animation



Turbidity Model Animation: EMP data and additional locations chosen



Model comparison with different sets of boundary conditions – daily averaged output



Summary of RMA Animation Tool

- All of RMA visualization and animation toolsets available
- In current projects, the animations have been used to:
 - Develop intuition and answer specific questions
 - Compare results from scenarios
- User can define the density of QUAL output locations
- Can be used on any water quality time series in DSS format- currently both 15-min and daily average output used
- Availability:
 - In house
 - Special development on request from project partners