image-1 (00-00-04)

California Central Valley Groundwater-Surface Water Simulation Model – Fine Grid (C2VSimFG)

Sensitivity Analysis

Department of Water Resources, State of California

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Environmental and Water-Resource Consultants

image-2 (00-00-36)

Sensitivity Analysis Goals

- To enhance the understanding of the relationships between inputs and outputs,
- To evaluate the robustness and stability of the model,
- To provide an overall range of accuracy to model results.
- To understand the impact of inaccuracies in input data on model results,
- To develop an understanding of the relative sensitivity of the hydrologic cycle components,

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Sensitivity Analysis Parameters

Input	Applied Change
Root Zone Ksat | Root Zone Lambda	Factor of 0.1, 0.2, 0.5, 2.0, 5.0, 10.0 | +/- 20%
Target Soil Moisture	+/- 0.1, 0.2
Evapotranspiration Rate	+/- 10%, 20%
Aquifer Kh, Kv; Aquitard Kv	Factor of 0.5, 0.67, 1.5, 2.0
Specific Yield | Specific Storage	+/- 20% | Factor of 0.1, 0.2, 5.0, 10.0
Streambed Hydraulic K	Factor of 0.2, 0.5, 2.0, 5.0
Layers 1,2 Initial GW Head	+/- 10 ft
Small Watersheds Recession Coefficient & Max. Recharge Rate	Factor of 0.2, 0.5, 2.0, 5.0

Sensitivity Analysis Metrics

Spatial Extent

- Entire Domain
- Sacramento R. HR,
- San Joaquin R. HR,
- Tulare Lake HR.

Model Calibration

- GWL
  - RMSE
  - R2
  - Average Residual
- Streamflows
  - Freeport (Sacramento R.)
  - Vernalis (San Joaquin R.)

Water Budget Components

- Ag. Supply Requirement
- Ag. Surface Water Deliveries
- Ag. Groundwater Pumping

- Total Pumping
- Percolation
- Net Gain from Stream
- Net Subsurface Inflow
- Inflow from Small Watersheds
- Change in GW Storage

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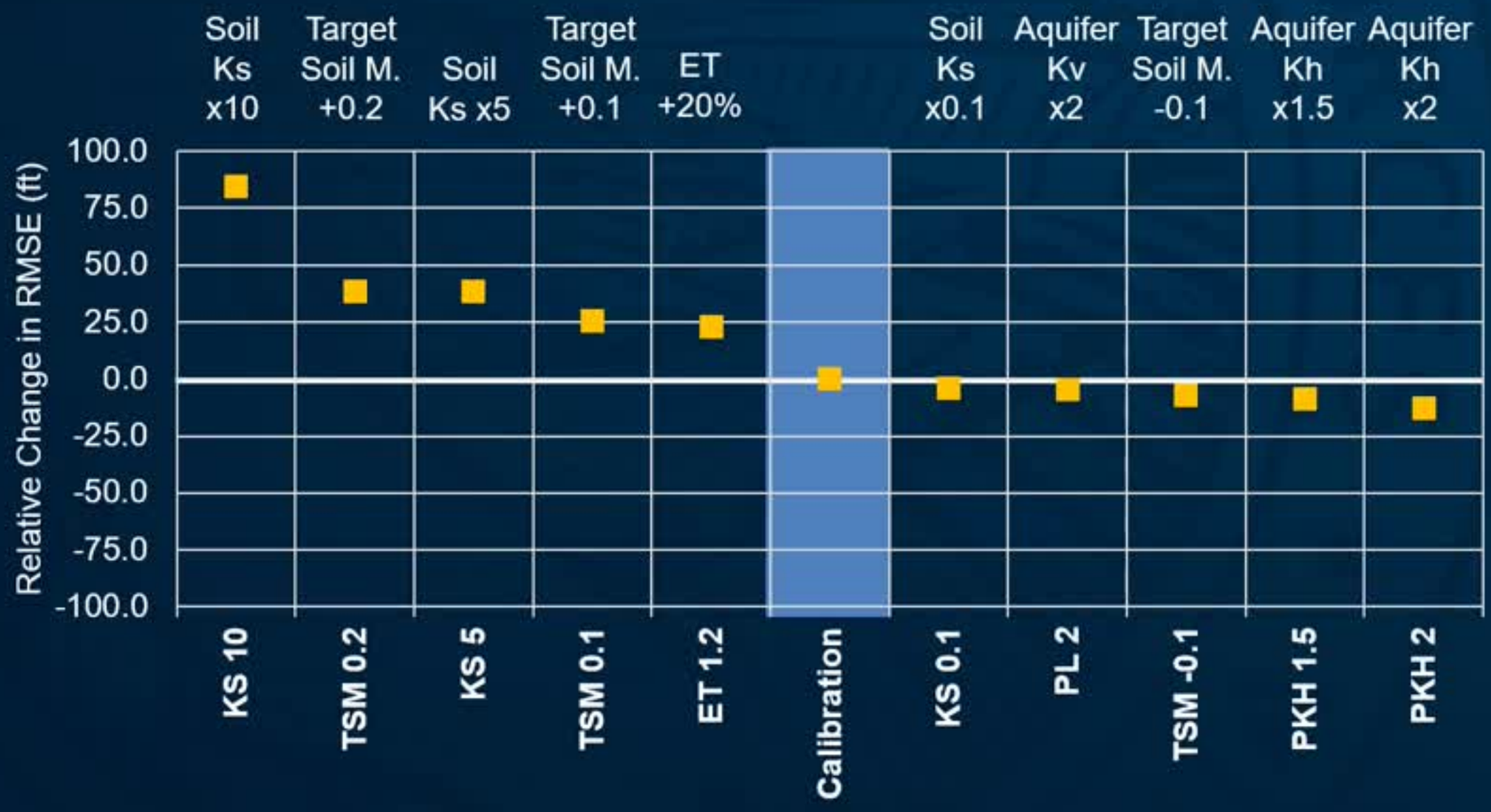
Model Calibration, RMSE



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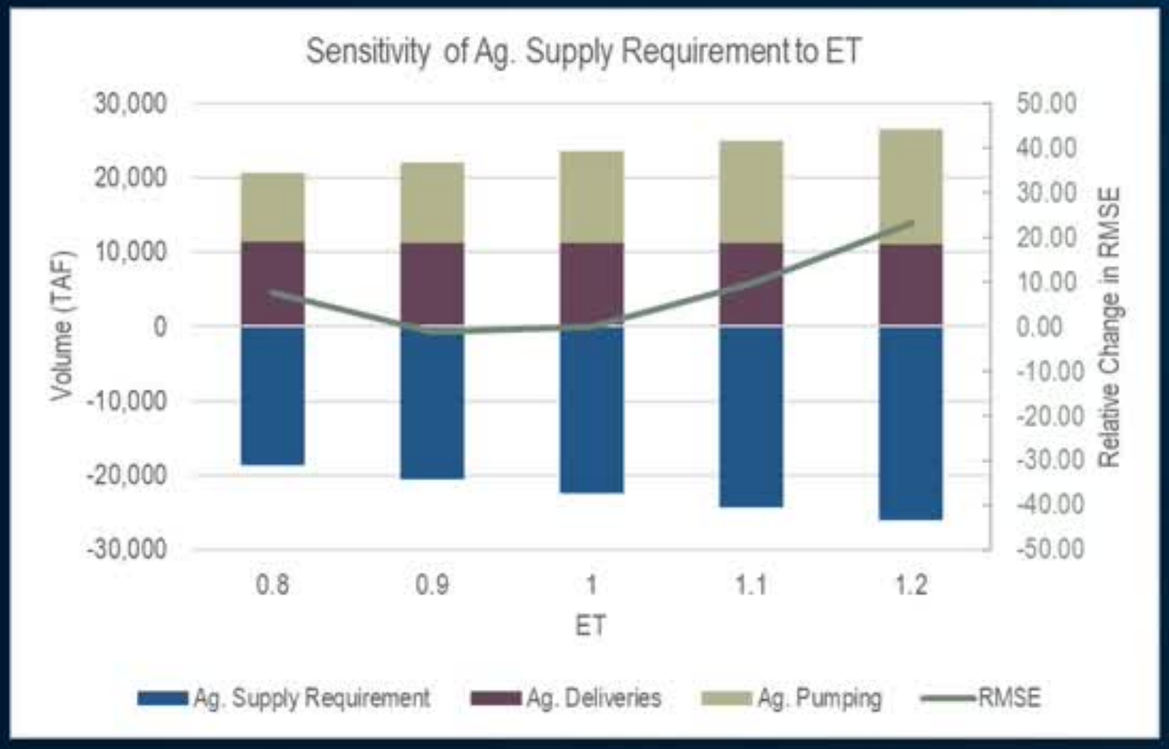
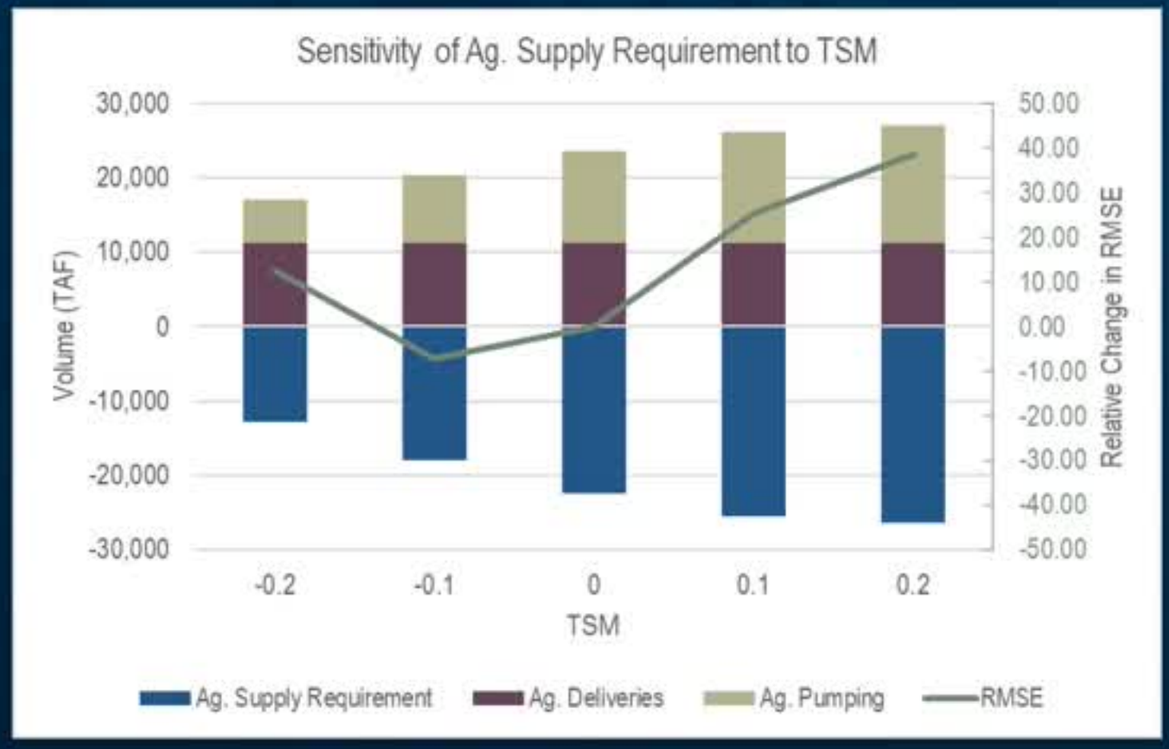
Ag. Supply Requirement

Evapotranspiration



Target Soil Moisture



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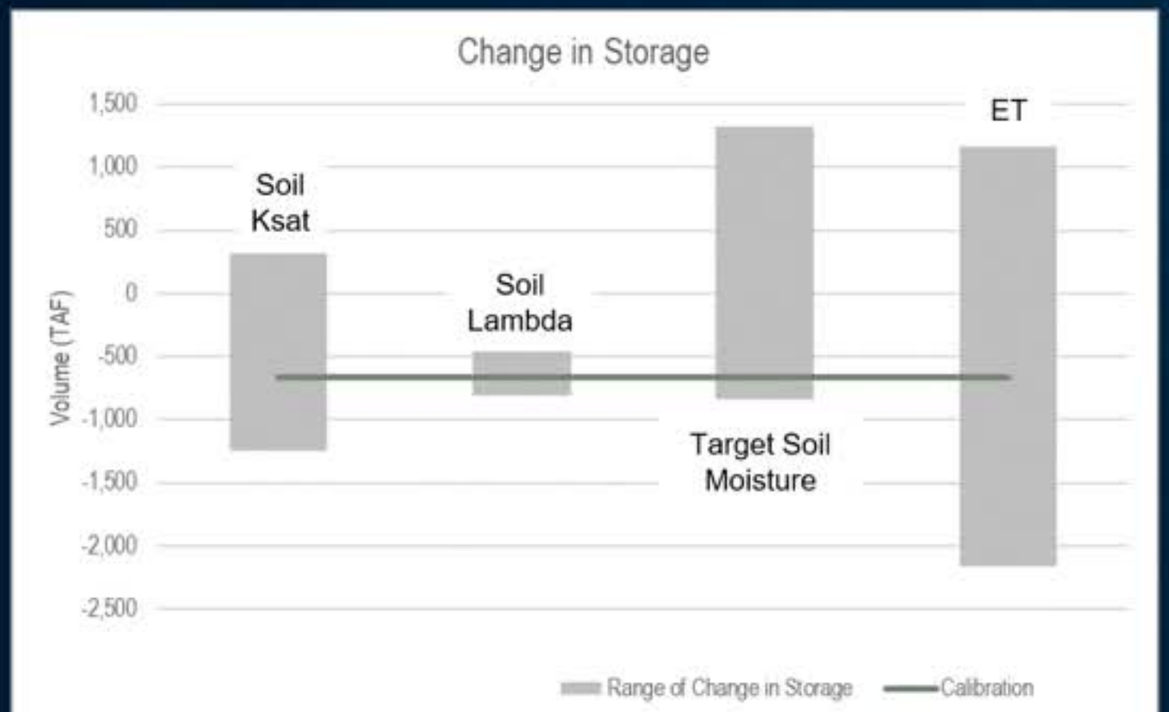
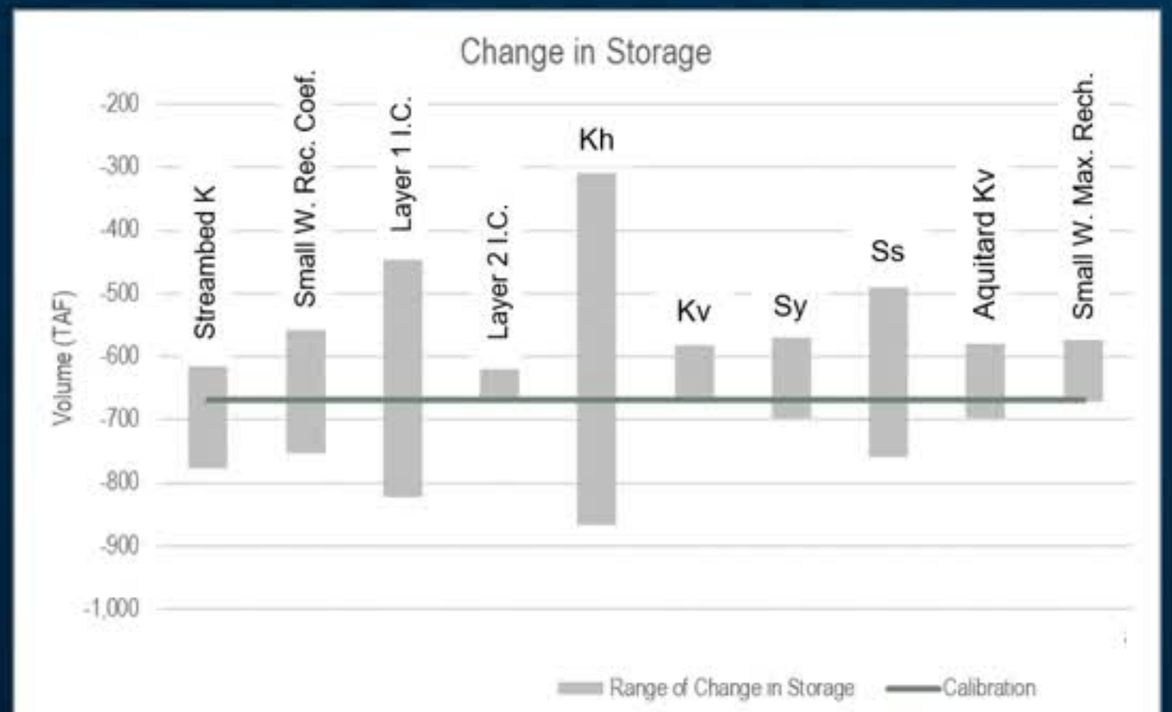
Change in Groundwater Storage

Root Zone Parameters



GW System Parameters



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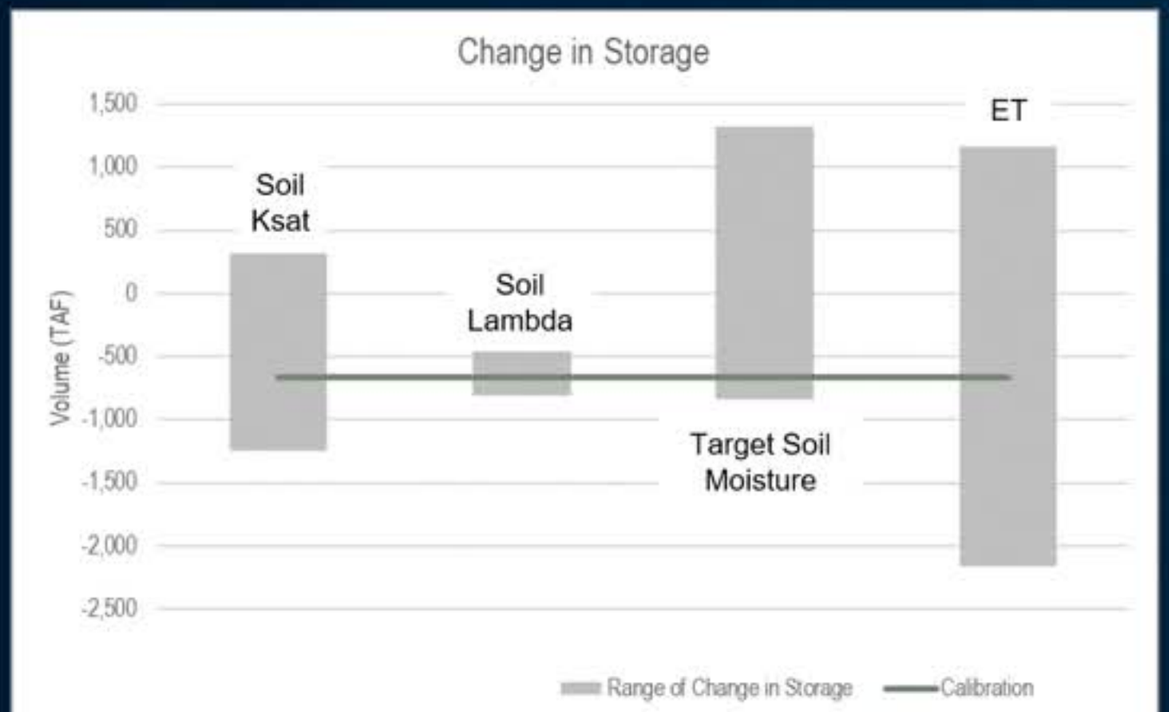
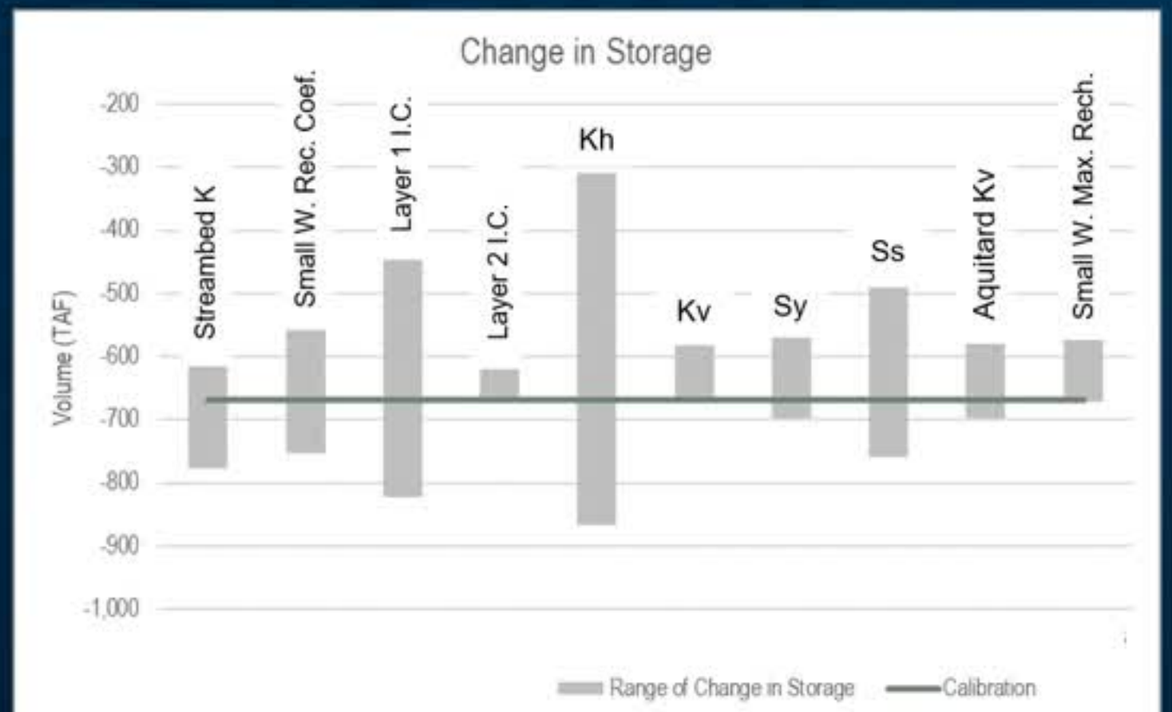
Change in Groundwater Storage

Root Zone Parameters



GW System Parameters



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Sensitivity Analysis – Key Takeaways

- Parameter values tested usually decreased model performance, while a few showed slight improvement in residual statistics
  - Kh x 2 lowered RMSE by 12.7 feet, increased R2 by 0.08
  - TSM – 0.1 lowered RMSE by 8.7 feet, increased R2 by 0.05
  - These parameter changes may cause unreasonable parameter values and/or affect calibrated agricultural water demands.
- Ag. Supply Requirement is most sensitive to soil saturated K
- Percolation and pumping are most sensitive to soil saturated K
- Change in Storage is most sensitive to ET
- Gain from stream is most sensitive to soil saturated K