

The California Central Valley Groundwater-Surface Water Simulation Model Fine Grid- C2VSimFG V2.0 Update

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Overview

- C2VSimFG V2.0-Overview
 - Purpose & Recent History
- Conceptual model updates
 - Model hydrostratigraphy and layering
- Data updates
 - Texture2Par parameters
 - Subsidence
 - Groundwater monitoring wells
 - Pumping well representation
 - Surface water features

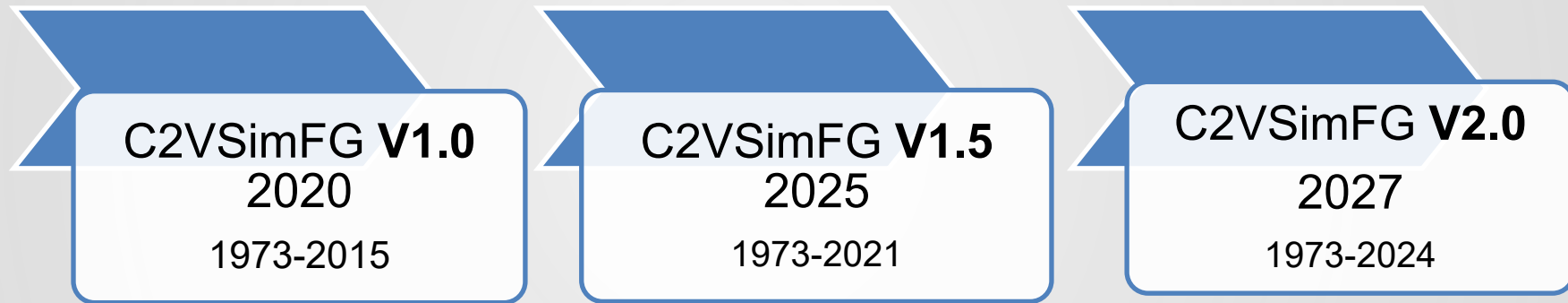


C2VSimFG V2.0-Purpose

- Sustainable Groundwater Management Act (SGMA) requires local Groundwater Sustainability Agencies (GSAs) to develop and implement Groundwater Sustainability Plans (GSPs), which includes developing water budget and addressing any current or future undesirable results*.
 - Requires a numerical models that simulates integrated surface water and groundwater.
- C2VSimFG is a numerical model based on IWFM source code that simulates integrated surface water and groundwater within California's Central Valley, developed to support GSAs in developing their GSPs.
- 25 groundwater subbasins within the Central Valley, use C2VSimFG or local IWFM model to support their GSPs

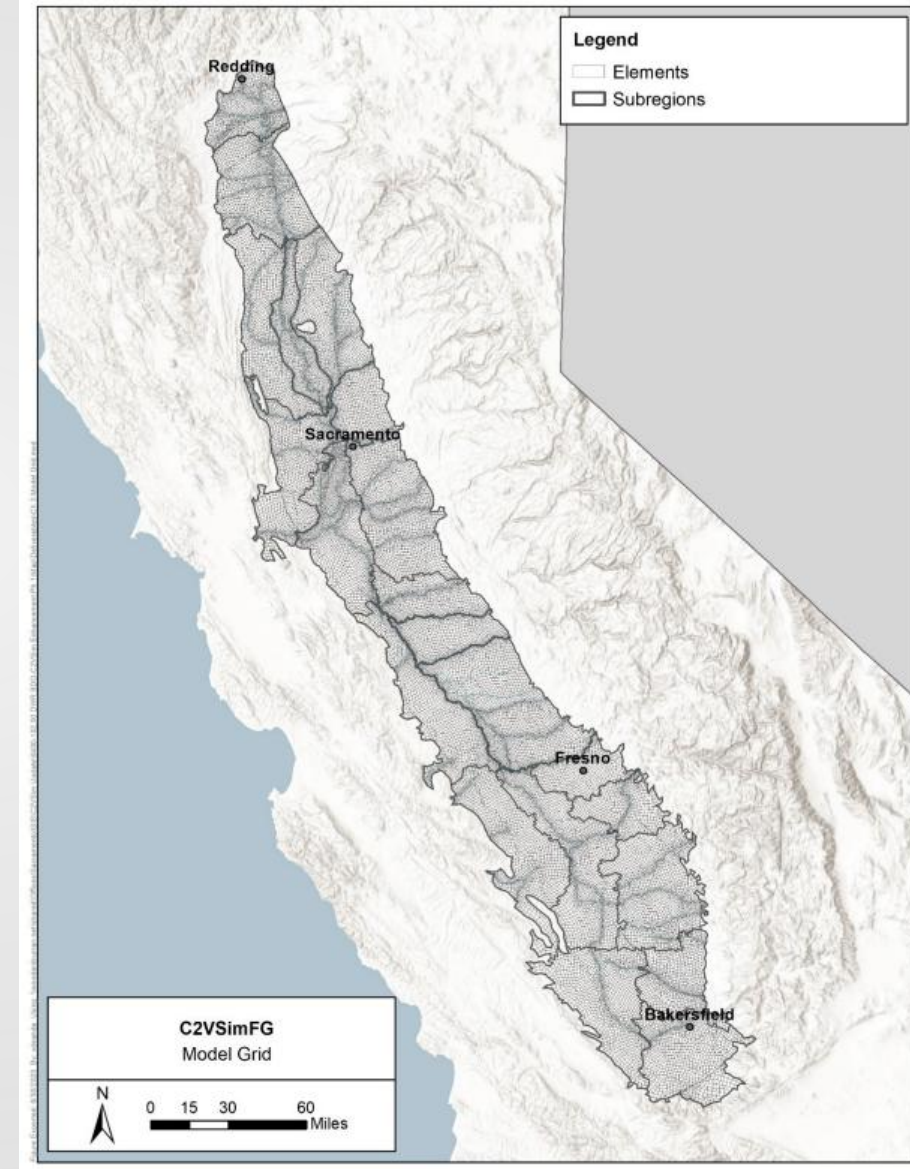


C2VSimFG V2.0- Recent History



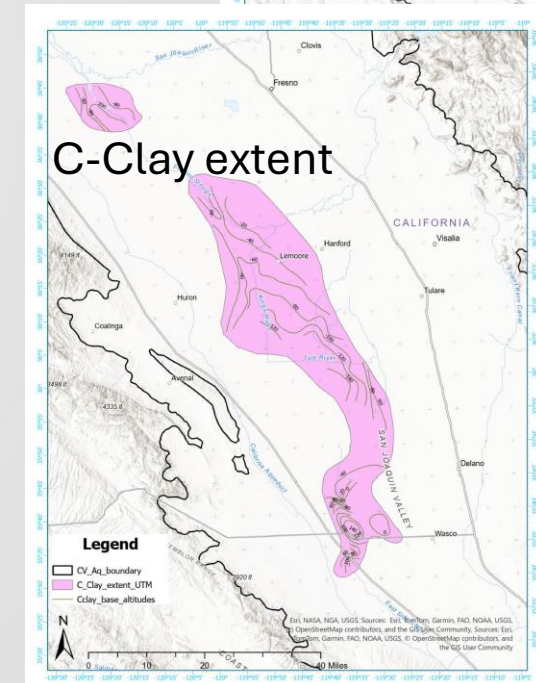
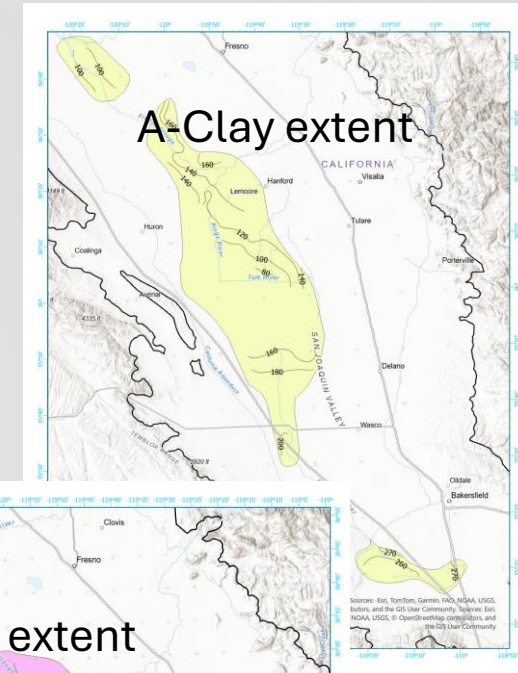
C2VSimFG V2.0-Model Overview

- Finite Element Grid
 - 32537 Elements and 30179 Nodes
 - 0.636 sq. miles average element area
 - 6 Layers and 3 Aquitards (updated)
- Surface Water System
 - 110 River reaches
 - 498 Surface water diversions
 - 58 Inflows and 18 Bypasses
 - 200 Small Watersheds (updated)
- Land Use Process
 - 21 subregions
 - 4 Land use types & 28 operational categories
- Simulation periods
 - 09/30/1973- 09/30/2024 (updated)
 - Monthly time steps
 - Monthly stress periods

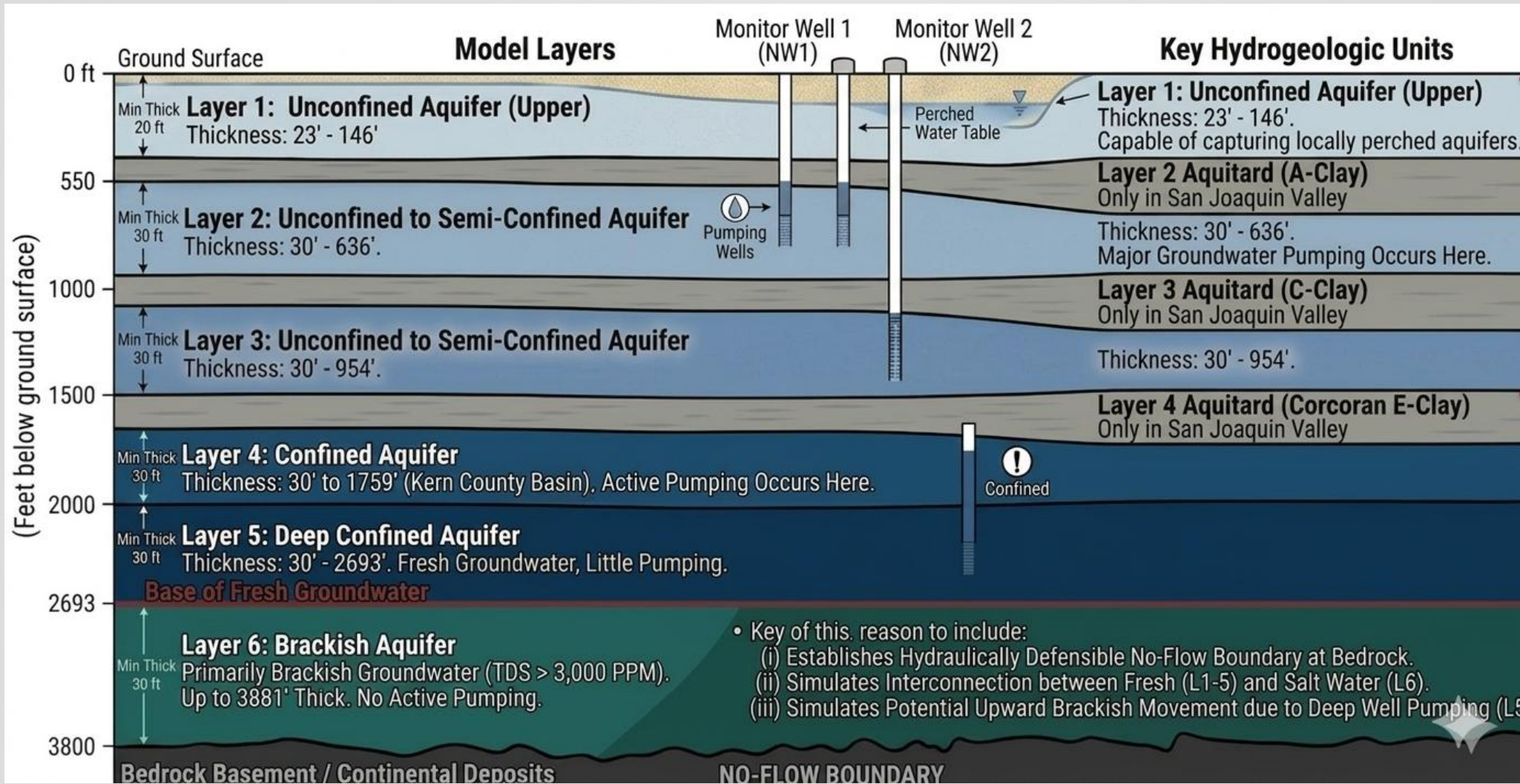


Hydrostratigraphy and Layering Update: Motivation

- To improve calibration in *San Joaquin Valley*
 - *Layer 1 of C2VSimFG V1.0 is significantly thick (more than 1000 ft) in San Joaquin Valley (SJV)*
 - *Multiple significant clay layers within layer 1 (A-Clay and C-Clay) in SJV*
 - *More than **100 ft head difference** within the layer 1 in SJV-> calibration issues*
- To improve interconnected surface-groundwater simulations
 - *Lessons from SVSim- C2VSimFG V1.0 shows **large head difference** between layer 1 and rivers*
- To improve subsidence simulations
 - *Need correct vertical head gradients*
- Incorrect model layer bottom
 - *Feedback from local agencies*
- To facilitate solute transport/water quality simulations
 - *IWFM version with solute transport particle/tracking module will be used*



C2VSimFG V2.0-Updated Hydrostratigraphy



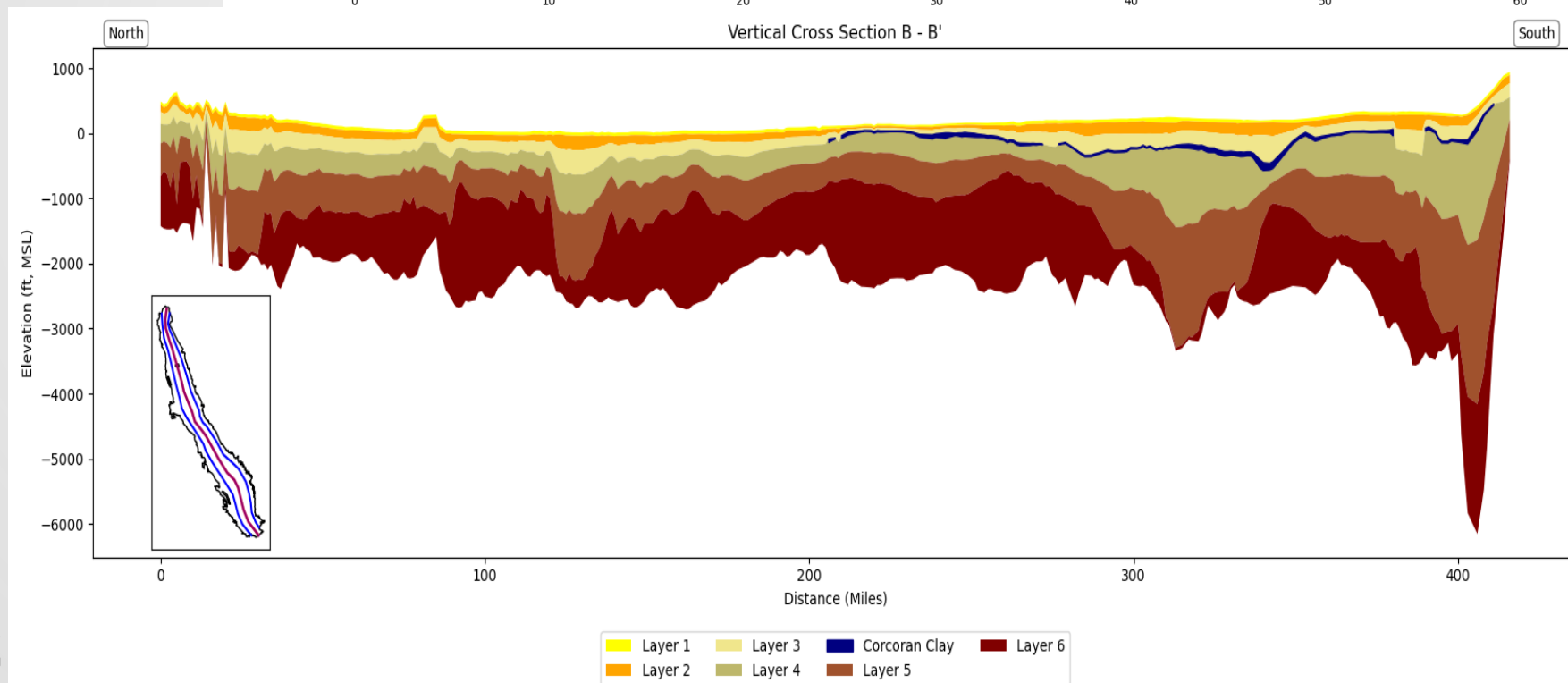
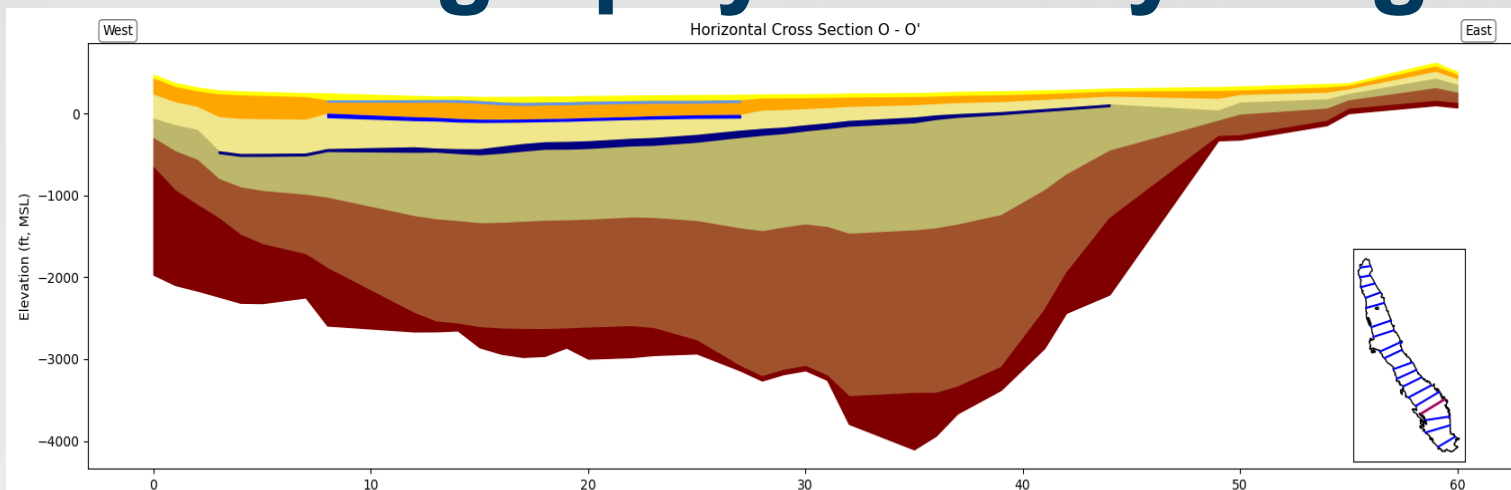
Layer 1
C2VSimFGV1.0



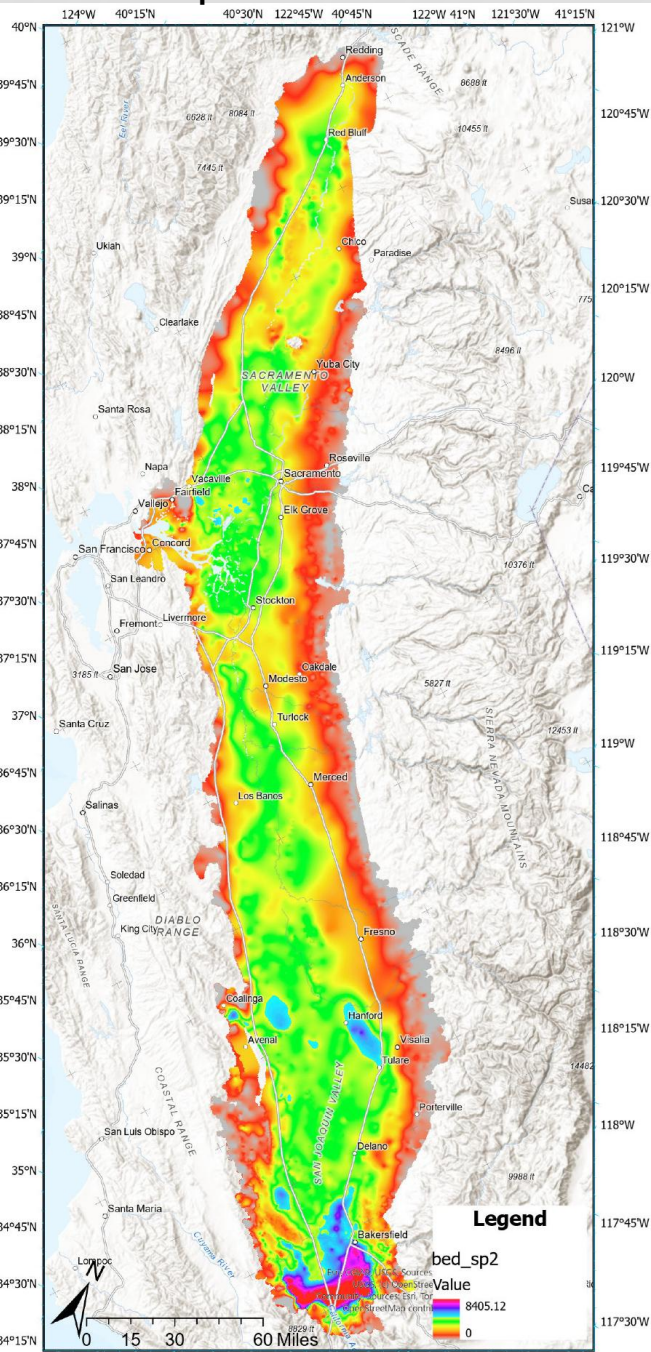
Updated Model Hydrostratigraphy and Layering

C2VSimFG-V2.0

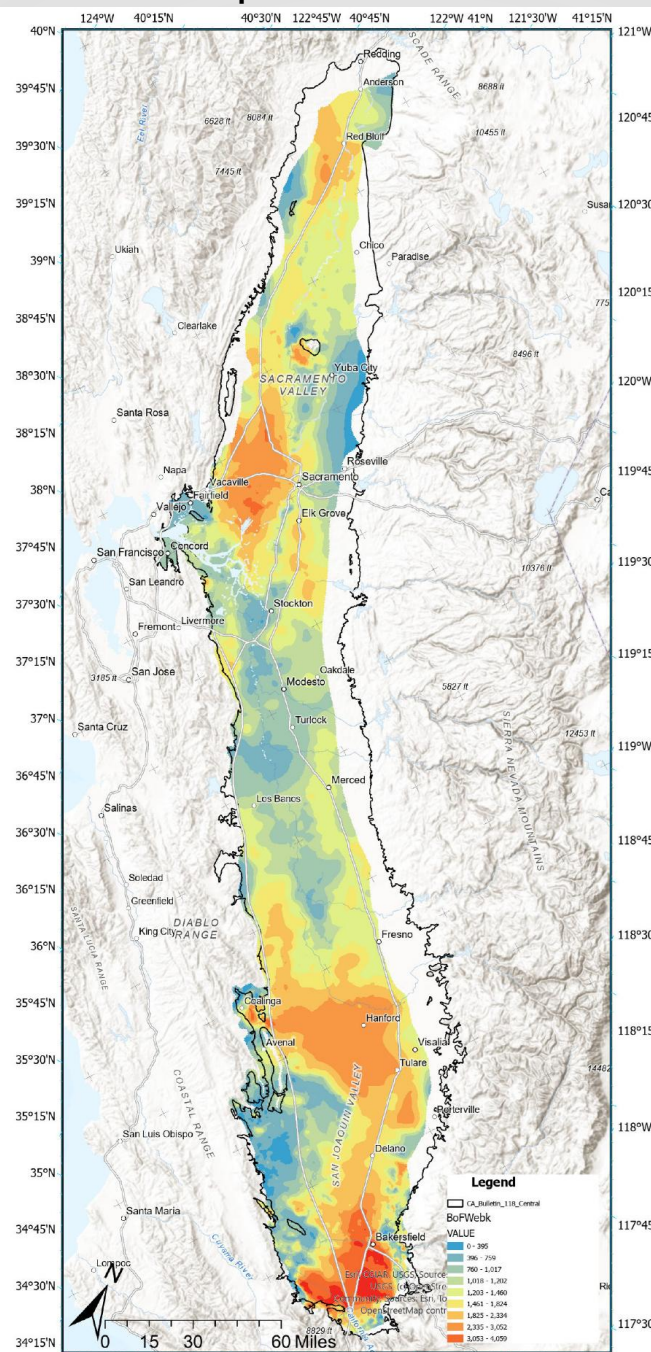
- 6 layers(aquifers)
- 3 aquitards



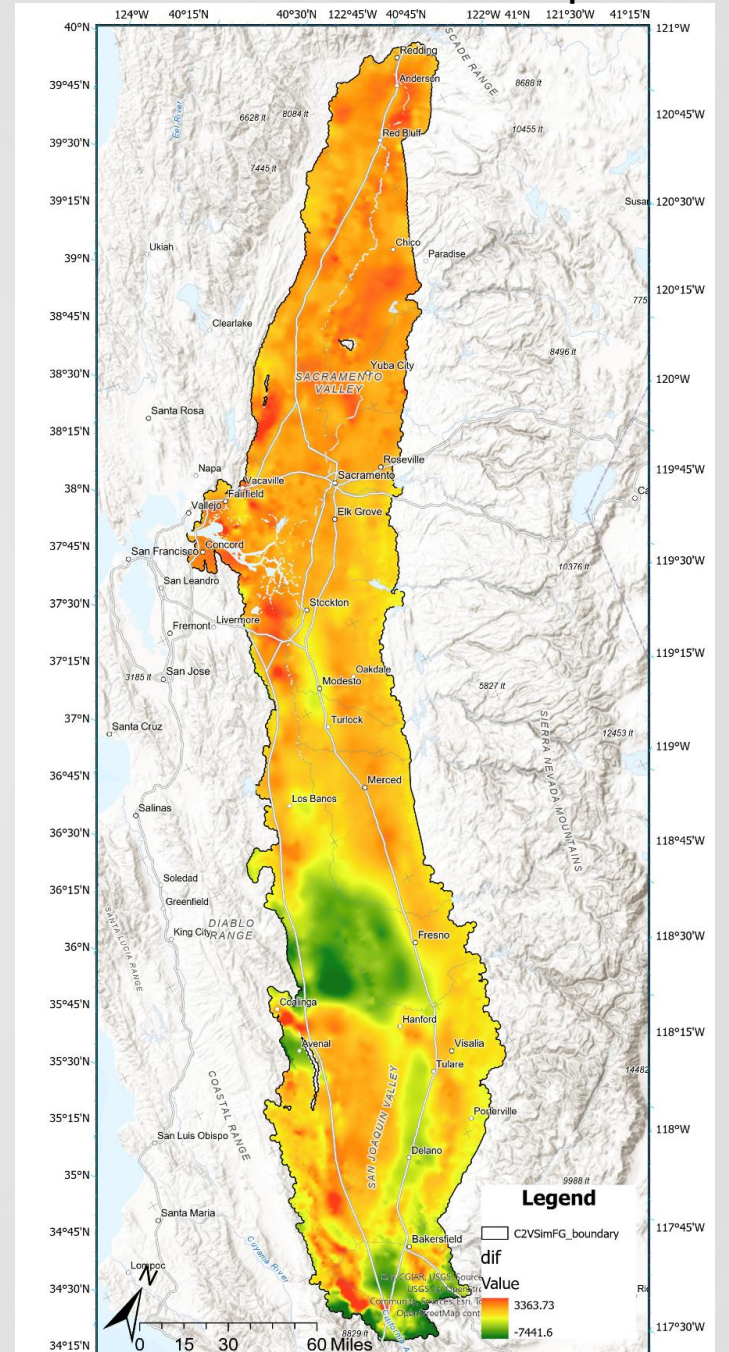
New depth to base



Old depth to base



Difference New minus Old depth to base

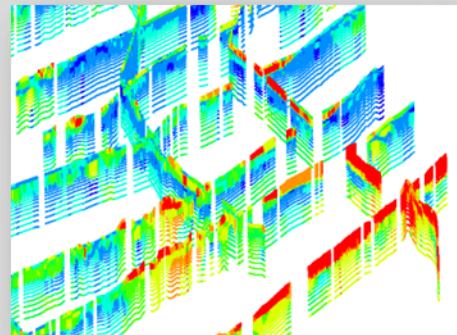
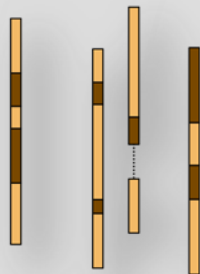




Updated Texture2Par

- * Improved subsurface characterization through AEM
- * Generates subsidence input data

Texture data
from well logs



AEM resistivity or
percent coarse



Geostatistical
Interpolation
(Kriging/Co-Kriging)

Hydraulic parameters
for textures

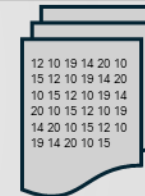
Texture	K (ft/d)	Sy	Ss (1/ft)
Sand	100	15%	10^{-7}
Clay	1	5%	10^{-4}

$$X = \left[P_c X_c^p + (1 - P_c) X_f^p \right]^{1/p}$$

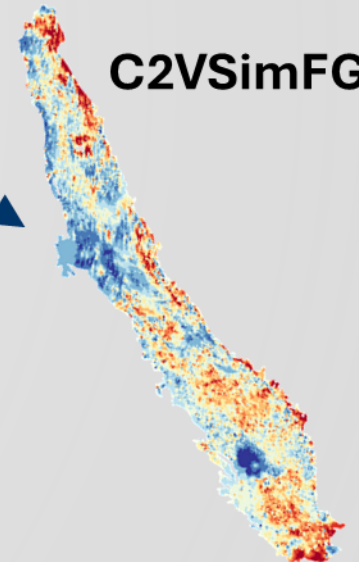
Power-law averaging
for grid-scale aquifer
parameters

Parameter estimation loop

Write IWFEM Groundwater
and **Subsidence** files



C2VSimFG

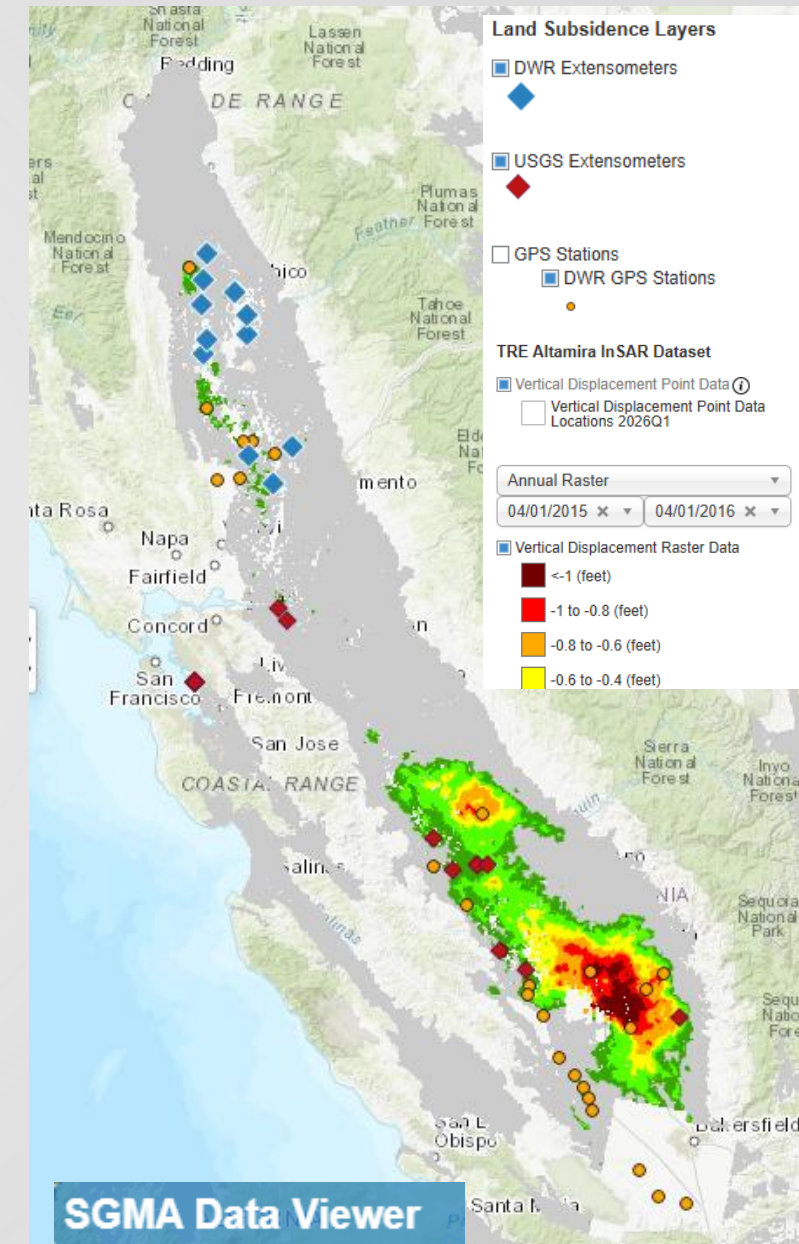


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AEM: Airborne Electromagnetic

Updated Subsidence Package

- Only instantaneous subsidence in C2VSimFG V1.0
 - Parameters were not well calibrated
- C2VSimFG V2.0 includes both **instantaneous** and **delayed subsidence**
 - Subsidence parameters will be calibrated
- Subsidence observations
 - 34 Extensometers (DWR+USGS)
 - Measures subsidence at specific depths
 - Starts from 1950s
 - 99 Continuous GPS (CGPS) stations
 - InSAR data rasters



Calibration Strategy

- Sequence: Subregional/Basin level->Nodal
- Subregional/basin level targets
 - Water budget (ET, pumping, diversions, etc.)
- Nodal Level
 - Manual & PEST parameter estimation program with Texture2Par
- Calibration targets
 - Groundwater monitor wells- 6796
 - Vertical head differences -1243
 - Stream gages-58
 - Subsidence targets -34 extensometers, 99 CGPS stations & InSAR



Comparison of C2VSimFG V1.0 vs C2VSimFG V2.0

	C2VSimFG V1.0	C2VSimFG V2.0
Number of aquifer layers	4	6
Number of aquitards	1	3
Groundwater head targets	3473	6796
Vertical head difference targets	None	1243
AEM data	None	Incorporated
Subsidence	Only instantaneous Not calibrated	Both instantaneous and delayed and will be calibrated
Particle tracking/ solute transport capability	None	Will be included
Simulation period	1973-2015	1973-2024



Thank you!



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