Scientific Achievement:
Thermocline tanks are a potential low-cost storage concept for next-generation CSP plants. We developed a new model for thermocline energy storage that is 100X faster than conventional CFD models. Low computing cost enables an advanced system-level simulation of a CSP plant with thermocline storage.

Significance and Impact:
System model provides new insights on thermocline tank response to realistic solar collection and power production processes. Verified that thermal stratification inside tank is sustained over long-term plant operation.

Research Details:
• Simulation is performed with a user-generated finite-volume numerical approach; model validated against experiment thermocline performance data reported in the literature.
• The thermocline model is integrated into a system model of a 100 MW molten-salt power tower plant to investigate storage under realistic and long-term operating conditions.
• Solar collection is simulated with DELSOL and SOLERGY; power production is simulated with a Rankine cycle model.


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