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**Technical
Conference
Paper**



SANSMIC C++/Python Open Release

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**SMRI Fall 2024 Technical Conference
22-25 September 2024
Edmonton, Alberta, Canada**

SANSMIC C++/PYTHON OPEN RELEASE

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Abstract

The SANSMIC model has been the solution mining simulator used to support the U.S. Strategic Petroleum Reserve for several decades. While most storage operations do not use raw water for injection, as the SPR does, even brine-drive systems encounter wet oil and undersaturated brine, making leaching modeling important for both solution mining and storage operations.

Various compiled versions of SANSMIC have been made available, on a limited basis, over time, but the source code has not. Sandia has re-written the SANSMIC code in C++ and Python with the goal of making it available for the research community in a modern, open-source manner. A verification and validation of the code to previous versions has been performed, and we present these results.

SANSMIC has been shown to provide simulation results that match real-world leaching at the SPR. Several examples of leaching that were well predicted by SANSMIC prior to sonar surveys being performed are compared to the post-simulation sonar survey results. Results of statistical analysis of the comparison between SANSMIC simulations and post-drawdown sonars from the 200 MMbbl release from the SPR in 2022 are presented. Finally, the impacts of string breaks or deliberate cuts on leaching predictions at the depth of the new end of tubing are discussed, specifically with respect to how well the SANSMIC model does in predicting the leaching that occurs during such events.

Key words: Caverns for Liquid Storage, Computer Modeling, Cavern Leaching, U.S. Strategic Petroleum Reserve, SPR

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