

## **Experiment-inspired Software Design and Ecosystem Modular Testing for CLM Development**

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One key factor in the improved understanding of earth system science is the development and improvement of high fidelity earth system models. Along with the deeper understanding of system processes, the complexity of software systems of those modelling systems becomes a barrier for further rapid model improvements and validation. In this paper, we present our software engineering practices for better understanding the Community Land Model (CLM) within an earth system modeling framework. First, we give an overview of the software system of the global offline CLM system. Second, we present our approach to better understand current CLM software structure, data structure computational characteristics using advanced software tools. After that, we focus on experiment-inspired CLM individual ecosystem function testing and new module development, such as preparations for standalone root module development. At last, we layout our plan to further engage broad user communities (modelers, field experimentalists, observation dataset providers, computer scientists, etc.) via web-services and cloud computing. Since better software engineering practices are much needed for general scientific software systems, we hope those considerations can be beneficial to many other modeling research programs involving multiscale system dynamics and legacy scientific software packages.