

## “Simulating Water Retention and Gas Diffusion in Partially Saturated Porous Media with Lattice Boltzmann Methods to Optimize Plant Growth in Microgravity”

### Abstract

Plant growth in microgravity environments confronts difficulties in maintaining necessary gas diffusion. Under microgravity, fluid behavior in porous media is dominated by capillary effects, and paths previously open for diffusion can become blocked, adversely affecting plant growth. Under gravity, water may percolate downward and leaves sufficient open space for gas diffusion. Lattice Boltzmann modeling of liquid-vapor behavior in porous media allows simulation of fluid distribution under varying gravity. Results from ongoing KC-135 flight experiments can be simulated for verification of the model. The model can then be used for design applications of porous media for advanced life support systems programs.