Research Project Title

3D Modeling of Aeration and Fumigation in Australian Grain Silos to Improve Efficacy against Insects

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Statement of Problem:
The warm sub tropical Australian climate poses a number of grain storage difficulties, one of the largest of which is insect growth. The warm air makes ambient aeration more difficult when compared to North American wheat growing regions, and in response fumigations have become the primary form of insect growth control. Additionally, stored product insects are developing genetic resistance to the most common fumigant, phosphine. As such, there is a need to better understand grain storage and fumigation conditions and how the fumigant behaves under a variety of possible Australian conditions in order to help to extend the efficacy of fumigants and reduce the occurrence of insufficient fumigations. The goal of this project is to improve Australian grain storage and fumigations with the goal of better combating insects by adapting the 3D KSU ecosystem model to examine Australian fumigation and grain storage practices with a primary focus on upright cylindrical grain silos.

Goals:
- Goal 1. Aeration modeling with Australian conditions
- Goal 2. Develop fumigation model and validate using past fumigation information
- Goal 3. Conduct ‘what if’ experiments with fumigation model to predict effects of different conditions on fumigations
- Goal 4. Model desorption effects after the fumigation has ended, possibly with physical experiments for validation

Current Activities:
Running aeration simulations for Australian conditions, doing preliminary work to transition to objective 2, and begin modeling fumigation.