MATHEMATICAL SIMULATION OF SOIL MICROCLIMATE CONDITIONS FOR PREDICTING WEED SEED GERMINATION. Kurt Spokas and Frank Forcella, Soil Scientist and Research Agronomist, USDA-Agricultural Research Service, Morris, MN 56267.

Microclimate-based models for weed seed emergence are in the initial phases of development. The major driving forces of weed seed germination in the soil environment are temperature and soil moisture content. In the past these quantities typically were measured at a single soil depth (e.g., 5 cm). However, these variables fluctuate as a function of depth and time. Therefore, to improve weed emergence prediction, the ability is needed to simulate soil temperature and moisture at 1 cm increments throughout the soil profile as a function of time. To accomplish this task a newly integrated user-friendly soil moisture and temperature model has been developed in JAVA. This model builds upon prior heat and moisture transport models but provides embedded empirical models to estimate fundamental physical parameters (e.g., thermal conductivity, unsaturated conductivity). These physical properties are not typically measured at a field site for weed emergence studies. These previously published empirical models require soil texture and organic matter content as input parameters. These estimations of soil physical constants by soil pedotransfer functions allow for a simplified user interface while not sacrificing theoretical modeling accuracy.

2006 North Central Weed Science Society Proceedings 61:89.