Journal of ASTM International, April 2005, Vol. 2, No. 4
Paper ID JAI12164
Available online at www.astm.org

Milton E. Teske,[1] *Harold W. Thistle,*[2] *Richard C. Reardon,*[2] *Gerry Cormier,*[3] *Peter Amirault,*[4] *David C. Davies,*[5] *R. Scott Cameron,*[6] *Gary Dorr,*[7] *Andrew J. Hewitt,*[8] *James R. Brown,*[9] *Monique Y. LeClerc,*[10] *and Anandakumar Karipot*[11]

Predicted Deposition Variability Due to Fluctuations in Release Height and Drop Size Distribution

ABSTRACT: An extensive field study has been undertaken to quantify the aerial release of spray material through the changes in meteorology as the day progresses. An important subset of these collected data is one-second interval data of the aircraft behavior and the mechanical release systems. These unique data provide an excellent source of information on bounding the variability in the expected deposition patterns, and how this variability might impact any error bounds established around the time-averaged predictions generated by the AGDISP model. This paper quantifies the variability in aerial application parameters and makes suggestions with regard to possible implications of this variability on the variability of deposition predictions in the flight line direction.

KEYWORDS: aerial spraying, deposition, flight line variability, modeling

Introduction

In the last twenty years, a significant modeling and data collection effort has been undertaken by the USDA Forest Service and its cooperators to develop accurate, validated models that predict the behavior of pesticides applied by aerial application above forests, crop canopies, and open terrain. In a recent paper [15] we concluded that the AGDISP model [17] can be used with confidence out to its downwind validation distance of 800 m, and that model predictions recover the ensemble average deposit that would result when aircraft and meteorological conditions are averaged across the spraying event. The purpose of this paper is to examine the flight line variability inherent in the spray application process and to understand its implications with regard to possible variability in the deposition pattern itself.

Over the years several modeling studies have been undertaken to gain insight into the sensitivity of model predictions to changes in application parameters [10,12,13,14]. The somewhat obvious finding is that the most important application parameters include the release

Manuscript received 15 October 2003; accepted for publication 17 May 2004; published March 2005. Presented at ASTM Symposium on Pesticide Formulations and Application Systems: The Continued Evolution of Agrochemical Formulations on 21-22 October 2003 in Tampa, FL; G. R. Goss, G. C. Volgas and M. Salyani, Guest Editors.
[1] Senior Associate, Continuum Dynamics, Inc., 34 Lexington Avenue, Ewing, NJ 08618.
[2] Program Manager, USDA Forest Service, 180 Canfield Street, Morgantown, WV 26505.
[3] Information Services Manager, Forest Protection Limited, Fredericton, NB Canada E3B 7E6.
[4] Operations Manager, Forest Protection Limited, Fredericton, NB Canada E3B 7E6.
[5] General Manager, Forest Protection Limited, Fredericton, NB Canada E3B 7E6.
[6] Forest Health Manager, International Paper, Savannah, GA 31402.
[7] Senior Research Assistant, University of Queensland, Gatton, Queensland, Australia 4343.
[8] Senior Research Officer, University of Queensland, Gatton, Queensland, Australia 4343.
[9] Division Chief, ERMD/Mosquito Control Division, 1321 Eastport Road, Jacksonville, FL 32218.
[10] Professor, Laboratory for Environmental Physics, University of Georgia, Griffin, GA 30223.
[11] Assistant Research Scientist, Laboratory for Environmental Physics, University of Georgia, Griffin, GA 30223.