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Modelling the Spread of Parasitoid Wasps from Point Release.

Parasitoid wasps are critical for biological pest control and are increasingly being used in agriculture to protect crops via release. However, due to their small size (often less than 1 mm), movement and long-distance dispersal of these wasps have long been poorly understood and likely underestimated. Recent data collected by Kristensen et al. (2013) on the wind-borne dispersal pattern of *E. hayati* (0.7 mm long) provides a new and significant opportunity to develop a detailed multi-scale model for the initial spread of small invasive insects and biological control introductions.

In this talk I will present a new model for parasitoid wasp dispersal from point release. The model is derived from underlying stochastic processes and, as a special case of the Fokker-Planck equation, is fully deterministic. The Python implementation of this model is capable of running month long simulations on the scale of 150 km² while maintaining a resolution of 25x25 m, all within a minute on a common workstation. Speed is an essential component of our model because it permits fitting parameters to data using a Bayesian framework. Evaluation of the model in comparison with multi-scale, first-release data reveals the critical role of non-linear air flow for dispersal further than 1 km. (Received September 20, 2016)