ABSTRACT SUBMISSION FORM

TITLE

Modeling Aerial Dispersal of Eastern Spruce Budworm Moths During Summer Migration

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ABSTRACT (Maximum 250 words)

Passive aerial transport depends only on wind speed and direction, but the aerial dispersal of insects is an interactive process in which the individual expresses agency, both acting on and driven by its environment. We have developed an individual-based model of dispersal behavior, refined from decades of empirical research and coupled with the BioSIM phenological model. We use high-resolution wind and temperature fields from the Weather Research and Forecasting (WRF v4) model to drive high-density agent-based simulations of nocturnal dispersal activity for the adult eastern spruce budworm (*Choristoneura fumiferana* [Clem.]; SBW). We applied this approach to SBW moth migration events during the current outbreak period in Québec during an active three-week period in July 2013 along the lower St. Lawrence River with concurrent weather radar observations at Val d'Irène. Our model accurately represented flight/no-flight nights in the radar observations, suggesting general accuracy in our model triggers for moth lift-off (temperature range, minimum wind speed). On individual nights, modeled SBW migratory flights closely follow development of the nocturnal boundary layer inversion, which can support long-range migration events along and across the St. Lawrence River. Our simulated trajectories aligned closely with radar observations of both moth concentration and flight direction and allowed us to reduce the uncertainty in several biophysical flight model parameters. Our migratory flight modeling results are also consistent with observed regional patterns of SBW

dispersal from defoliated areas with known spring feeding activity and will be useful for exploring emergent population dynamics of mass aerial migration across a landscape.