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Explicit spatial modelling of long-distance dispersal of plant diaspores by wind

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Dispersal of diaspores is a central part in the life cycle of plant species. It determines the distribution and abundance of species at larger regions and time scales, affects the level of gene flow and dispersal may regulate the dynamics of metapopulation in fragmented landscape.

Particularly the long-distance dispersal of plant diaspores ($>$ 100m) has significant effects on a multitude of ecological and evolution-biological processes. Due to methodical problems these processes are unseizable by measurements. These problems can be solved by using mechanistic/stochastic dispersal models. On the basis of the existing mechanistic wind-dispersal model PAPPUS, a microscale wind field model is developed considering the structure of landscape and permitting a prognosis of the spatial transport of plant diaspores.

The model presented here considers the spatial distribution of turbulences, especially thermal up- and downdrafts (burst events: *ejections* and *sweeps*) in the near-surface atmospheric boundary layer and the different terminal velocities of diaspores. The wind field model considering the mean orographic flow conditions, is used to produce turbulent spectra and flow fields for the area of the plant habitats. The simulated flow fields are correlated with the frequency of probability of the occurrence of burst events to divide a plant diaspore dispersal into propagation classes for certain meteorological conditions and landscape types.

To validate the numerical simulations, experiments in flat (homogeneous terrain – meadow) and structured terrain (low mountain range) are carried out. These experiments provide exact observations of wind conditions and serve for the determination of turbulent structures depending on thermal and orographic conditions. For this pur-

pose several ultra sonic anemometers in different heights (approx. 0.8m to 5m a.g.l.) with a measuring frequency of 10Hz were used to get high-resolution time series of wind and temperature. Furthermore – in the first experiment - the method of acoustic tomography with 8 x 8 combined transmitter/receiver units were used to measure the flow field within a vertically aligned area of approx. 4 x 4m^2.

First results of the model-simulations and the preliminary experiment with diaspores of *cirsium arvense* and *typha* in autumn 2005 are presented.