

Integrating variable traits and inheritance into the individual-based model LAVESI for evaluation of their importance for larch forest performance under future adverse conditions

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Background

- Siberian boreal larch forest covers a large area
- Changing climate leads to vegetation changes
- taking adaptive traits and inheritance into account predictions will be more realistic

How do adaptive traits change simulation results?
How are predictions affected by these changes?

Methods

- Modelled species: *Larix gmelinii*
- Vegetation model LAVESI
- Adaptive traits through mixed inheritance

Considered traits:

- Migration meliorated by seed weight
- Continuous climate warm enough for tree growth
- Survival: drought resistance
- Sensitivity test. Climate being raised to future conditions after initial phase

Simulation Results

Migration: seed weight

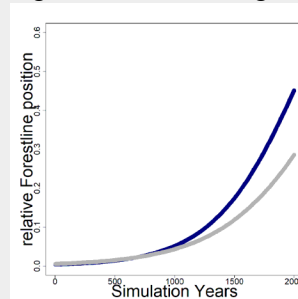


Fig. 1 Relative position of the forest line over time. The quasi-binomial regression lines of the two main variants are shown over the simulation Length. The adaptive variant shown in blue

- Faster migration through adaptation
- Effect not immediate as gradient has to establish it selves with lighter seeds being faster migrators

Survival: drought resistance

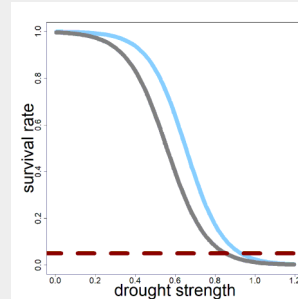


Fig. 2 Comparison of rate the Stem Count survival before the climate changes to at the end of the simulation over the drought strengths experienced under future climate. Survival of the adaptive version is shown in blue. The red line shows the extinction line

- Adaptation allows for survival of harsher drought
- Below 5% survival assumed extinction

RCP 4.5 (MPI-ESM-LR, r1i1p1) Eastern Siberia, year 2300

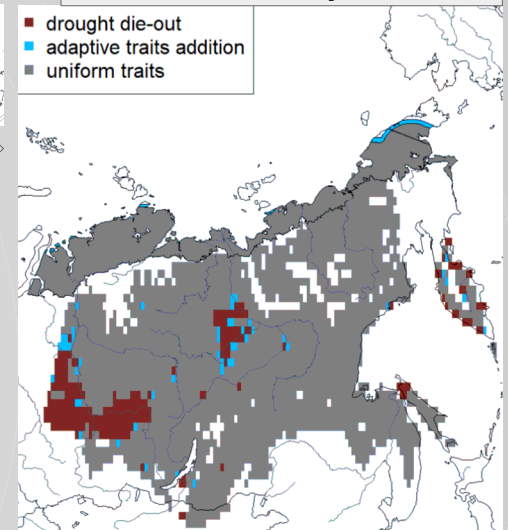


Fig. 3 Extrapolation of results onto larger area. The southern shape describes the effect of drought and the Northern the treeline migration. Effects of adaptation are shown in blue (see legend). White areas were not assessed.

Conclusions

- The inclusion of adaptive traits has an effect:
 - Faster migration and delayed local extinction
 - Climate still has large influence

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