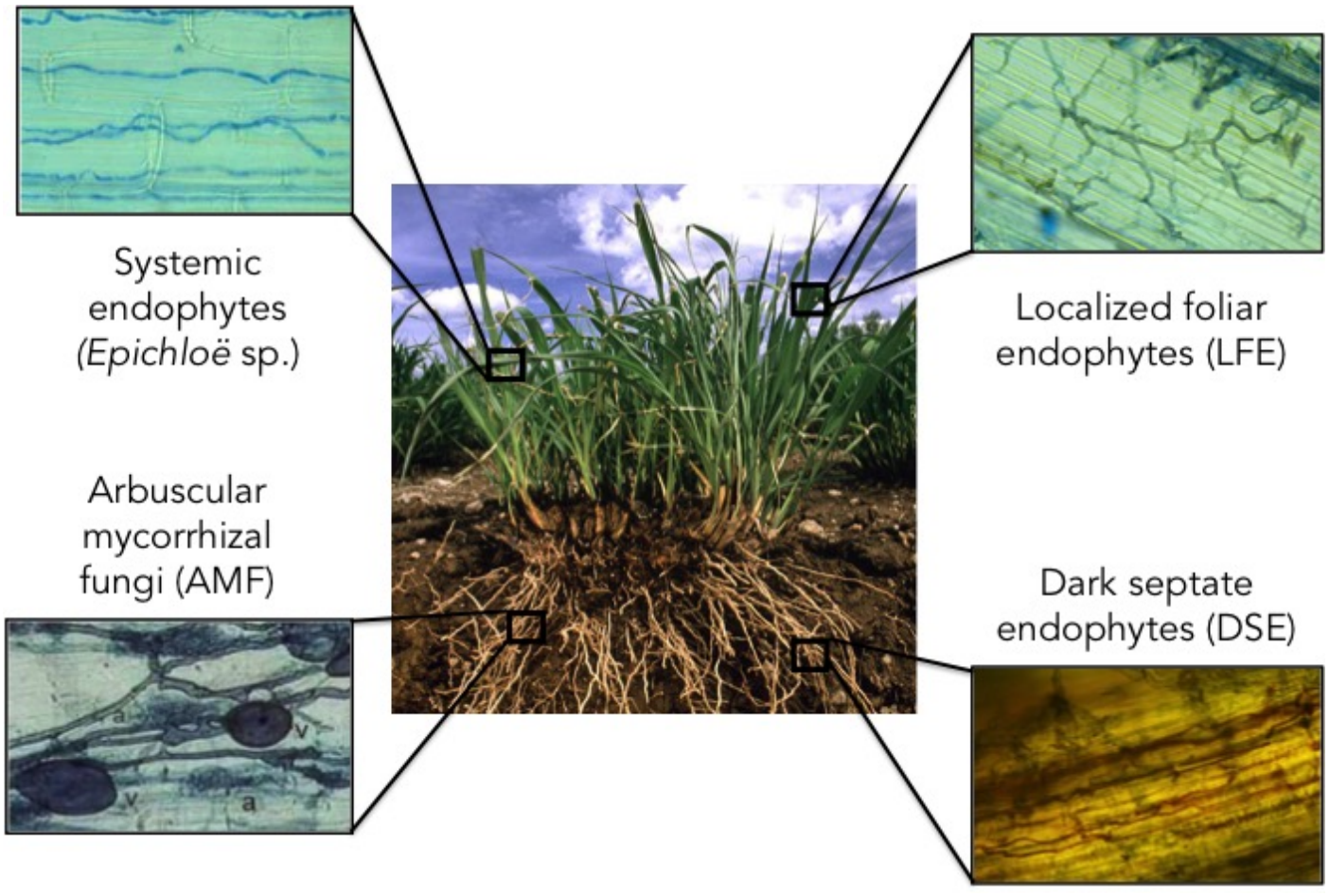
Potential for climate-induced disruption of plant-fungal symbioses in the Rocky Mountains

Melanie Kazenel

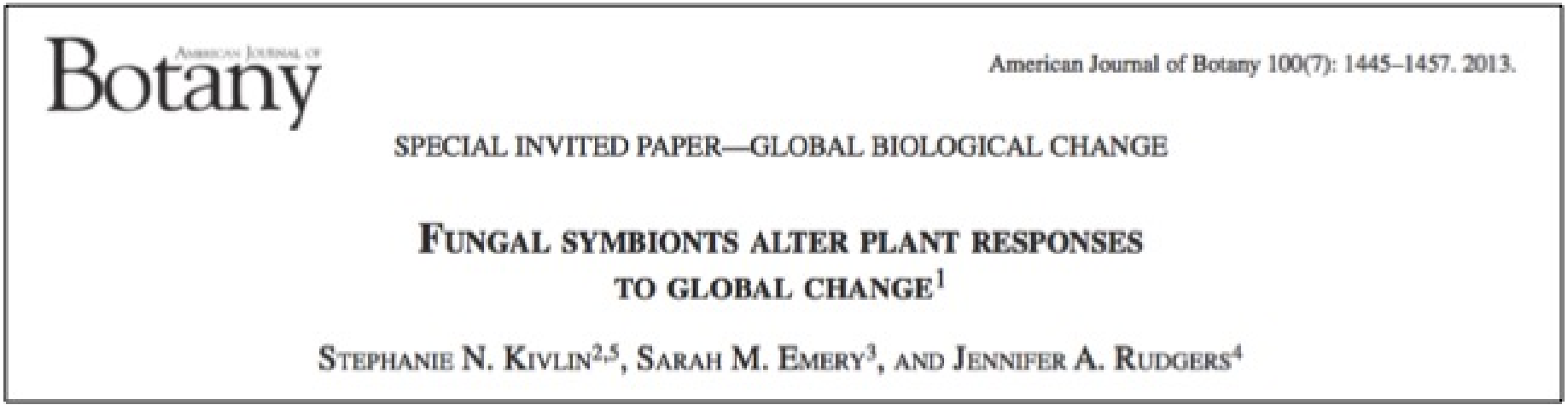
7 April 2016

How will climate change alter plant-symbiont interactions?

Plants and Fungal Symbionts



Symbionts can mediate plant responses to climate change



Botany

American Journal of Botany 100(7): 1445–1457. 2013.

SPECIAL INVITED PAPER—GLOBAL BIOLOGICAL CHANGE

FUNGAL SYMBIONTS ALTER PLANT RESPONSES TO GLOBAL CHANGE[1]

STEPHANIE N. KIVLIN[2,5], SARAH M. EMERY[3], AND JENNIFER A. RUDGERS[4]

Symbionts altered plant responses to drought, N deposition, and warming

Climate change may disrupt symbioses as organisms experience range shifts

SCIENCE VOL 336 20 APRIL 2012

Recent Plant Diversity Changes on Europe's Mountain Summits

Harald Pauli,[1]* Michael Gottfried,[2]† Stefan Dullinger,[2,3]* Otari Abdaladze,[4] Maia Akhalkatsi,[4] José Luis Benito Alonso,[5] Gheorghe Coldea,[6] Jan Dick,[7] Brigitta Erschbamer,[8] Rosa Fernández Calzado,[9] Dany Ghosn,[10] Jarle I. Holten,[11] Robert Kanka,[12] George Kazakis,[10] Jozef Kollár,[12] Per Larsson,[13] Pavel Moiseev,[14] Dmitry Moiseev,[14] Ulf Molau,[13] Joaquín Molero Mesa,[9] Laszlo Nagy,[15,16] Giovanni Pelino,[17] Mihai Puşcaş,[18] Graziano Rossi,[19] Angela Stanisci,[17] Anne O. Syverhuset,[11] Jean-Paul Theurillat,[20,21] Marcello Tomaselli,[22] Peter Unterluggauer,[8] Luis Villar,[5] Pascal Vittoz,[23] Georg Grabherr[1]

nature climate change

LETTERS

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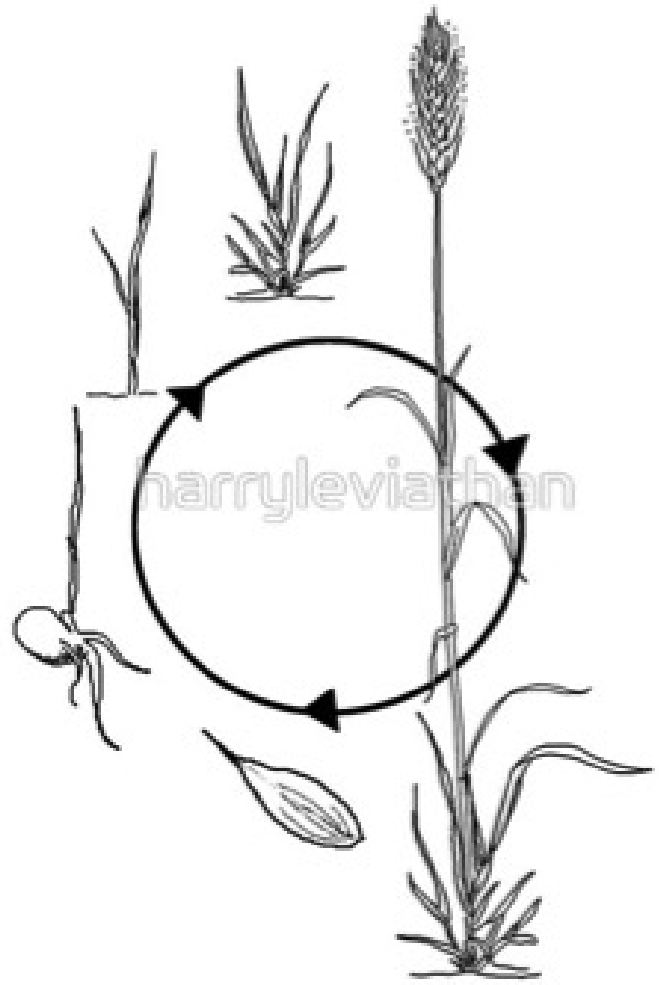
Continent-wide response of mountain vegetation to climate change

Michael Gottfried[1], Harald Pauli[2]*, Andreas Futschik[3], Maia Akhalkatsi[4], Peter Barančok[5], José Luis Benito Alonso[6], Gheorghe Coldea[7], Jan Dick[8], Brigitta Erschbamer[9], María Rosa Fernández Calzado[10], George Kazakis[11], Ján Krajčí[5], Per Larsson[12], Martin Mallaun[13], Ottar Michelsen[14], Dmitry Moiseev[15], Pavel Moiseev[15], Ulf Molau[16], Abderrahmane Merzouki[10], Laszlo Nagy[17,18], George Nakhutsrishvili[19], Bård Pedersen[20], Giovanni Pelino[21], Mihai Puscas[22], Graziano Rossi[23], Angela Stanisci[21], Jean-Paul Theurillat[24,25], Marcello Tomaselli[26], Luis Villar[6], Pascal Vittoz[27], Ioannis Vogiatzakis[28] and Georg Grabherr[2]

Mechanisms for disruption of plant-symbiont interactions

Plants and symbionts may have different:

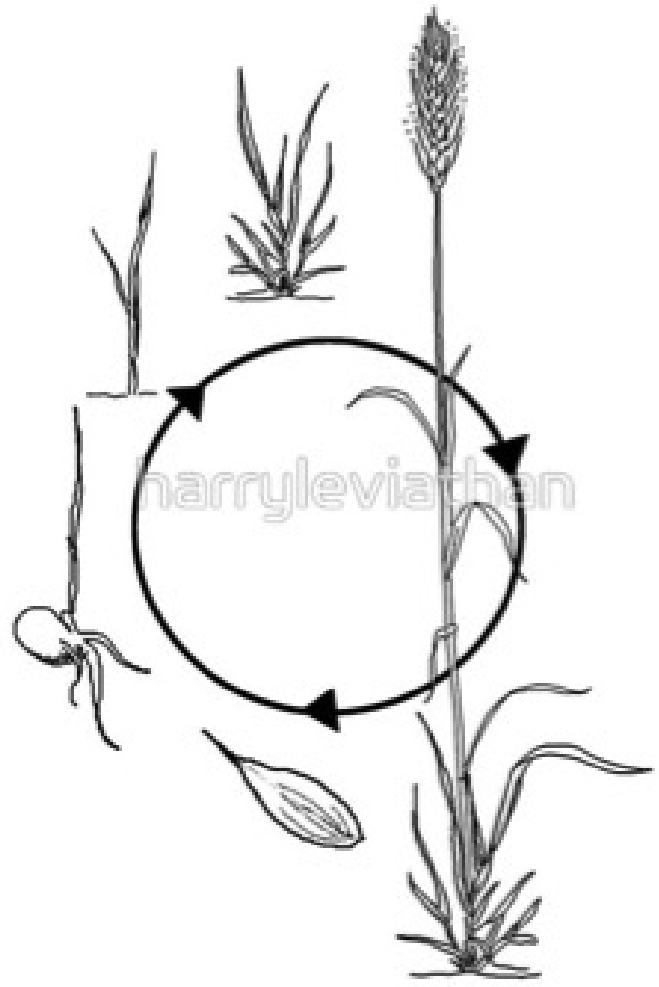
- Physiological tolerances



Mechanisms for disruption of plant-symbiont interactions

Plants and symbionts may have different:

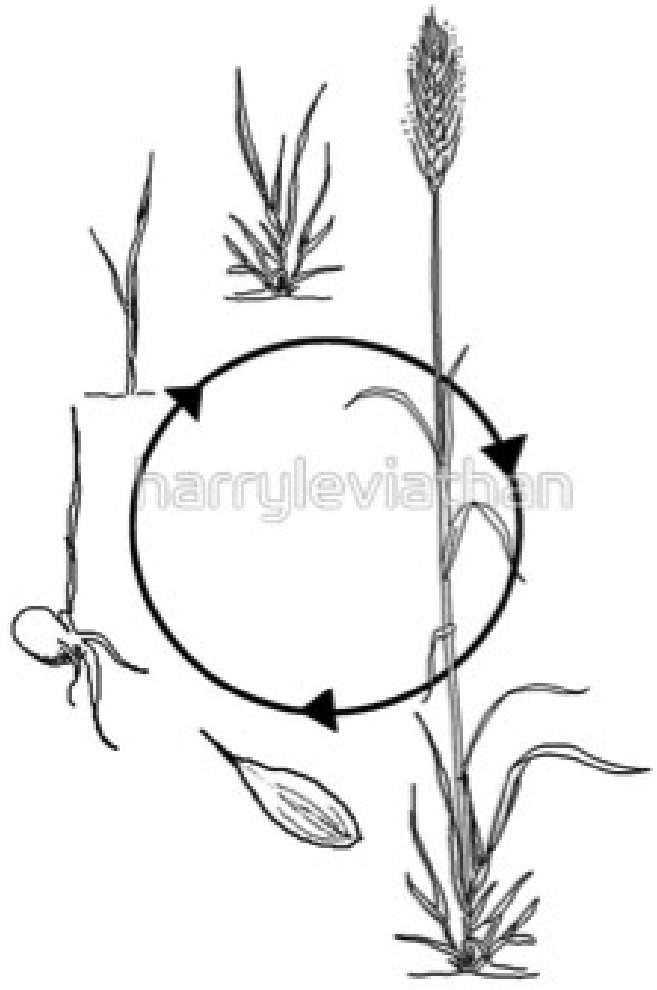
- Physiological tolerances
- Dispersal rates



Mechanisms for disruption of plant-symbiont interactions

Plants and symbionts may have different:

- Physiological tolerances
- Dispersal rates
- Phenological responses



Study System

Mountains
- ~25% of land area on Earth
- 50% of the human water supply
- 1/3 of terrestrial plant diversity

Grasses
- Cover 1/3 of land area (>10,000 species)
- Provide the majority of food for humans and domesticated animals
- All have mycorrhizal fungi in roots and fungi in leaves