

The need for a paradigm shift in forest management to cope with global change



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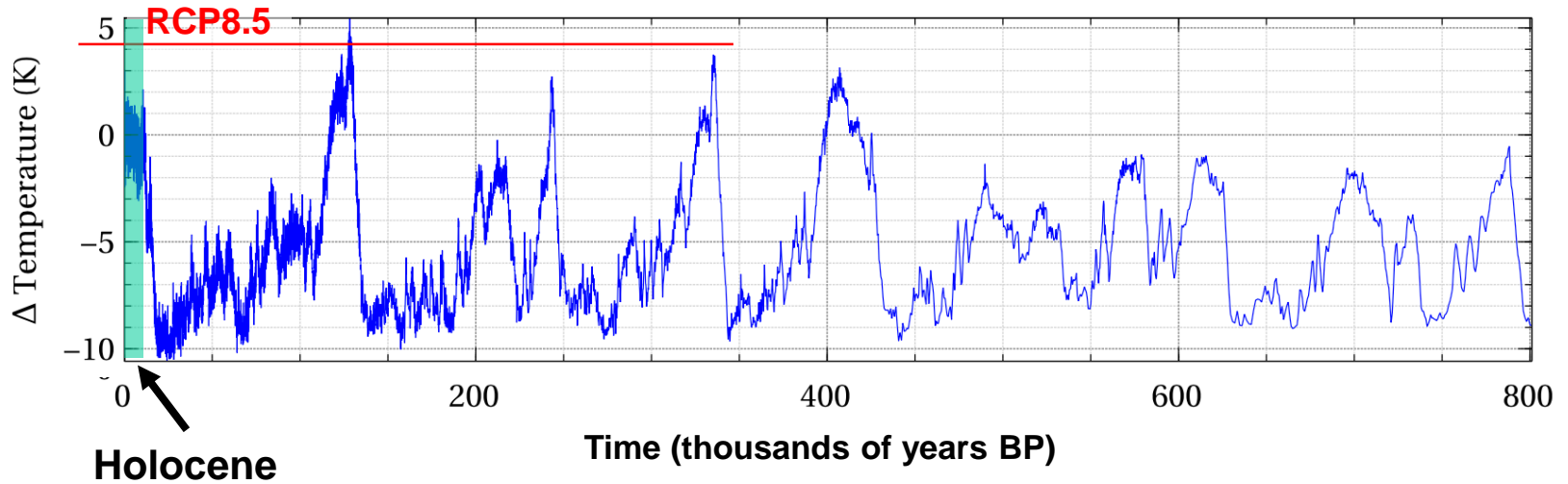


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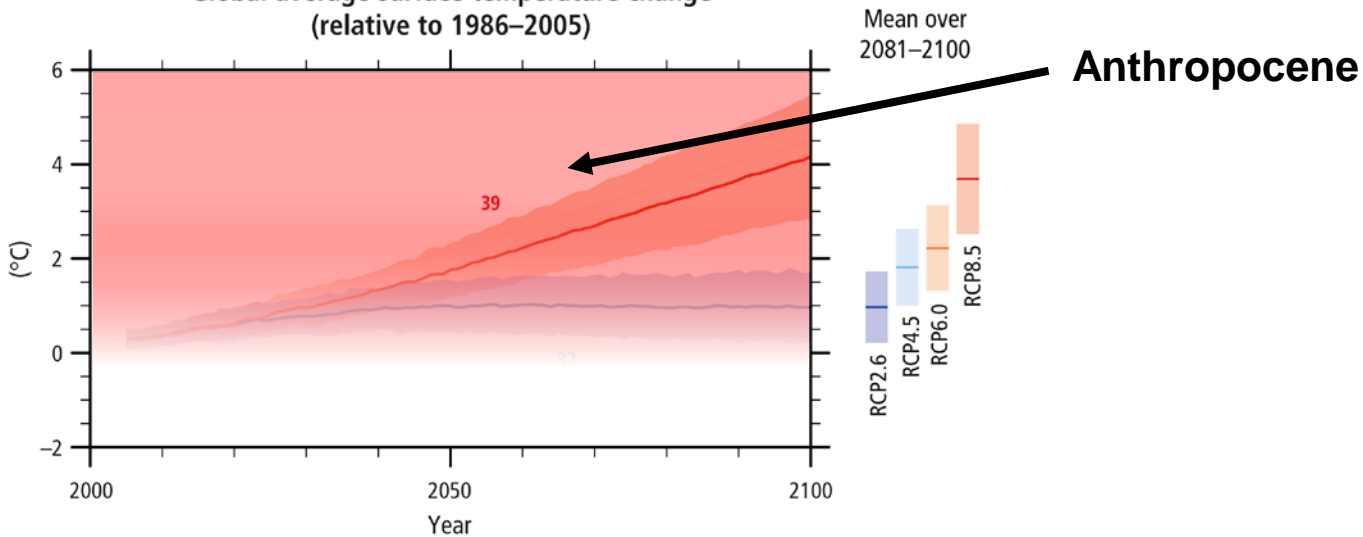
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Climate in a long-term perspective

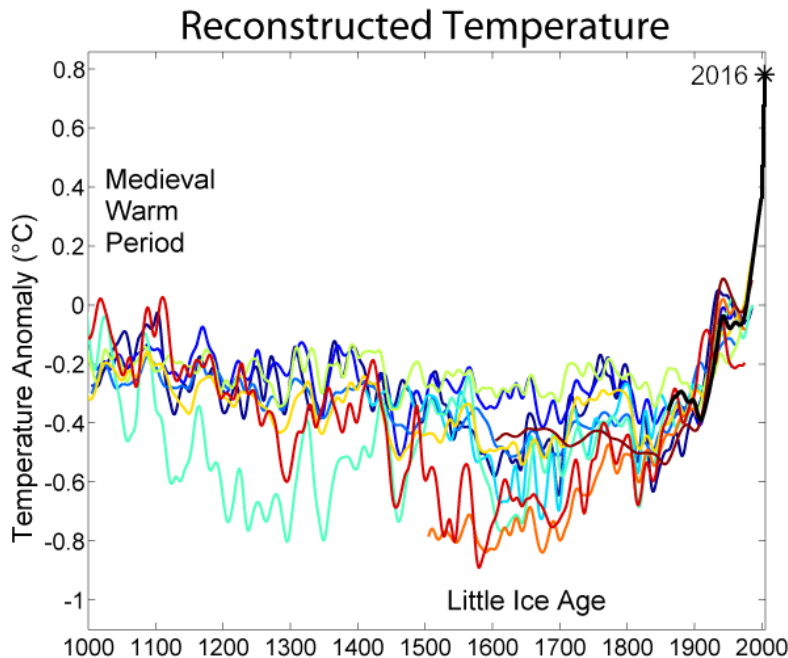


Global average surface temperature change (relative to 1986–2005)



Origins of forest management (1/2)

- First industrialized forestry in late 17th century AD in Europe
- 1713 *Sylvicultura oeconomica* (von Carlowitz)
- 1826 «Normal forest» model (Hundeshagen)
- Climate developing towards maximum of Little Ice Age (ca. 1600-1820)



Hendrick Avercamp, ca. 1620

Origins of forest management (2/2)

- «Frontier forestry» in North America started in 18th century



Pacific Northwest of the US, today

marlimillerphoto.com



Amazon, today

Cassie Werber, qz.com

- No emphasis on sustainability criteria...
...because of (perceived) infinite resource

Consequences (1/2)

Europe:

- «Normal Forest» model implies control over resource
- Risk of disturbances is
 - (often) disregarded entirely; damage → call for governmental intervention
 - (rarely) taken into account: insurance premium, via part of the yield being destroyed

North America:

- Control over resource is not needed because plentiful
- Disturbances are tolerated (for the same reason)
- Most recently, slow & cautious movement towards European-style forestry (→ cf. above)

Consequences (2/2)

- Many insights
 - gained in practical forest management (experience; «traditional knowledge»)
 - from scientific research (silviculture, forest growth; «formal knowledge»)are based on climatic conditions quite different from «1960-1990»
- There may be a need for adaptation...



... towards control under new conditions?



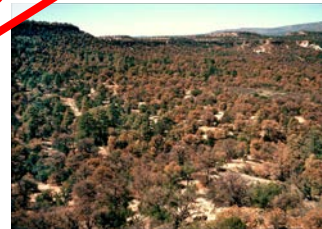
Black swans, “light version”



- Disturbances, e.g.
 - Windthrow
 - Wildfires

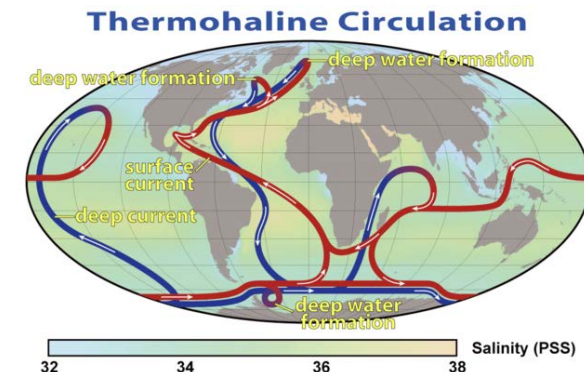


- Physiological collapse, e.g.
 - Drought
 - Insects
 - Frost(?)



Extreme value statistics

- Tipping points in the climate system, e.g.
 - Collapse of thermohaline circulation
 - Runaway greenhouse effect (“the warming feeds the warming”)



Black swans, “heavy version”



Not accessible by probabilistics



Perception and handling of risks





Mit Gott!
SYLVICVL TVRA OECONOMICA,
Oder
Hauswirthliche Nachricht und Naturmäßige
Anweisung
Zur
Wilden Baum-Zucht,
Nebst
Gründlicher Darstellung/
Wie zu förderst durch Göttliches Benedeyen dem allenthalben und insgemein einreißenden
Grossen Holz-Mangel/
Vermitteltst Sie. Pflanz- und Versekung vielerhand Bäume zu prospiciereu/



Bye-bye, Command-and-control

Nature to be commanded must be obeyed

Sir Francis Bacon, 1561-1626



Goal:

To maintain forest properties within boundaries that are likely to satisfy future societal demands for ecosystem services

Implications for forest management (FM)



“To maintain forest properties *within boundaries* that are *likely* to satisfy future societal *demands* for *ecosystem services*”

- “within boundaries”:

- FM acknowledges that global change factors render control over forest resource an

- “are likely”:

- FM cannot take the resources
- FM recognizes m

- “demands for ecos

- FM attempts to in ecosystem servic
- FM aims to anticip



development of forest

developmental pathways

so that the provisioning of . above) to be achieved

ES (not really new, though)

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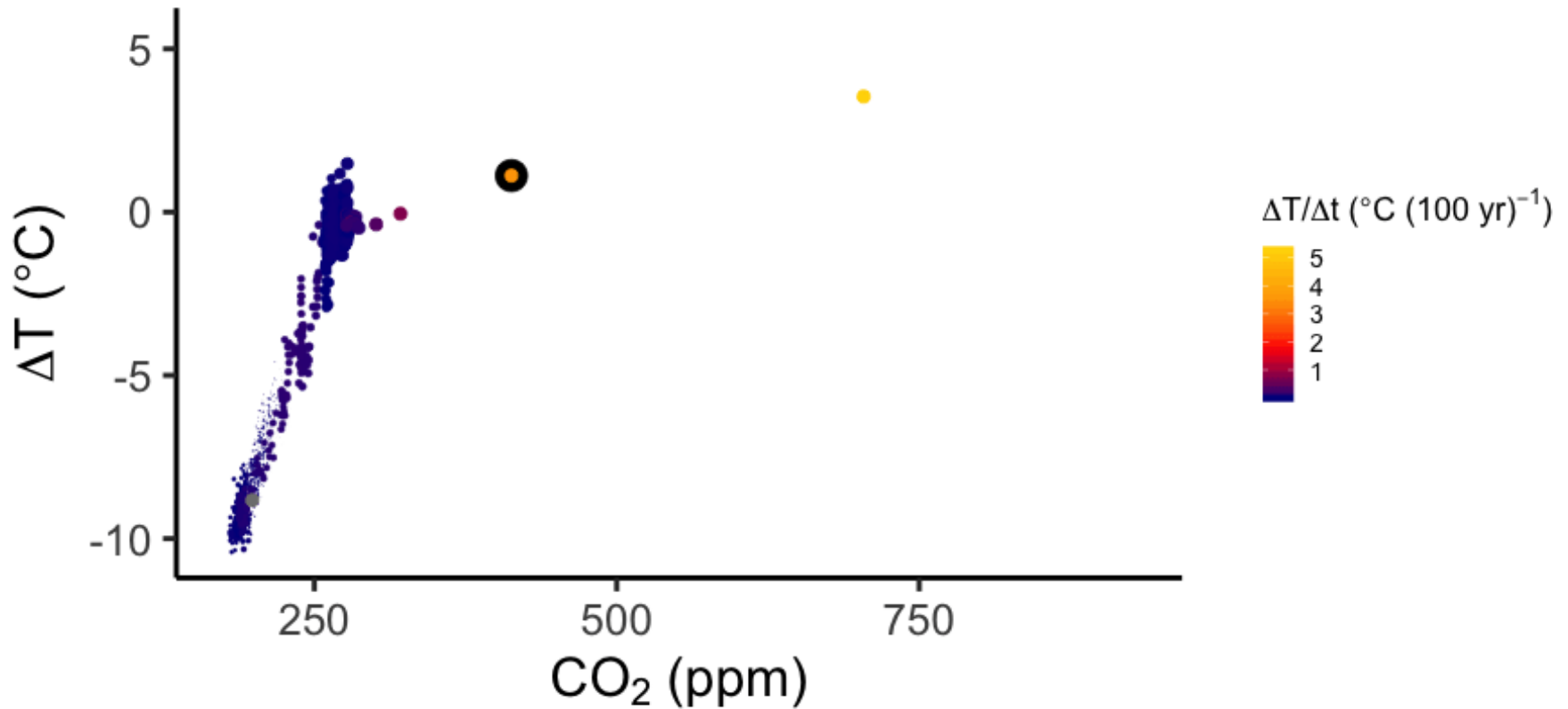
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Thank you for your attention!

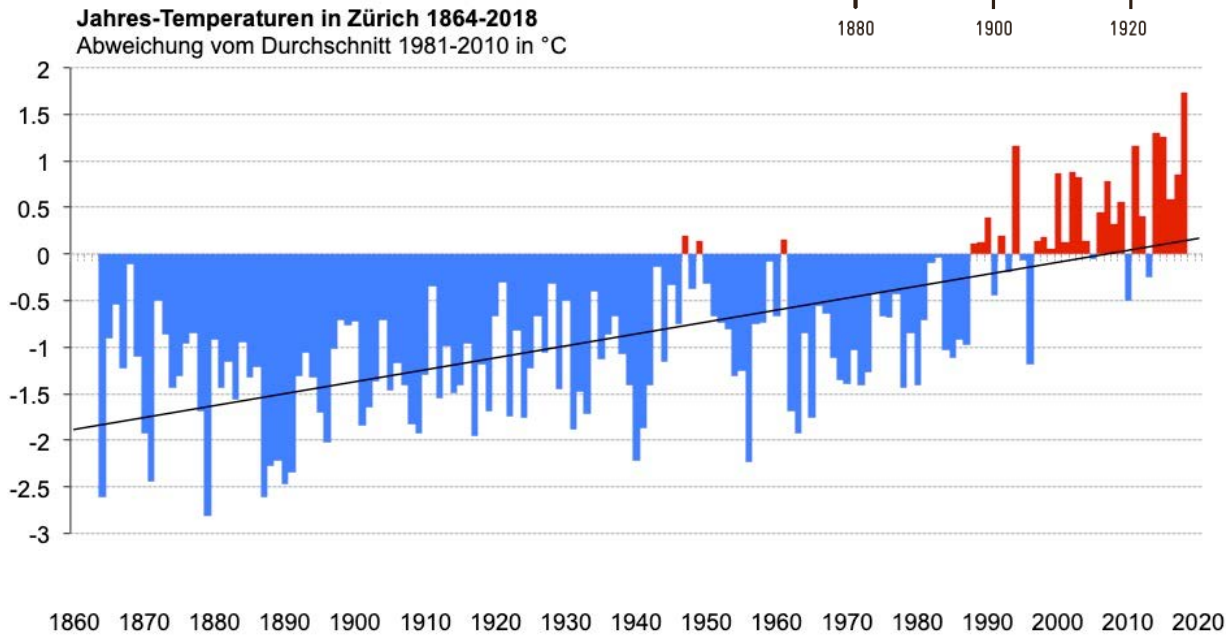
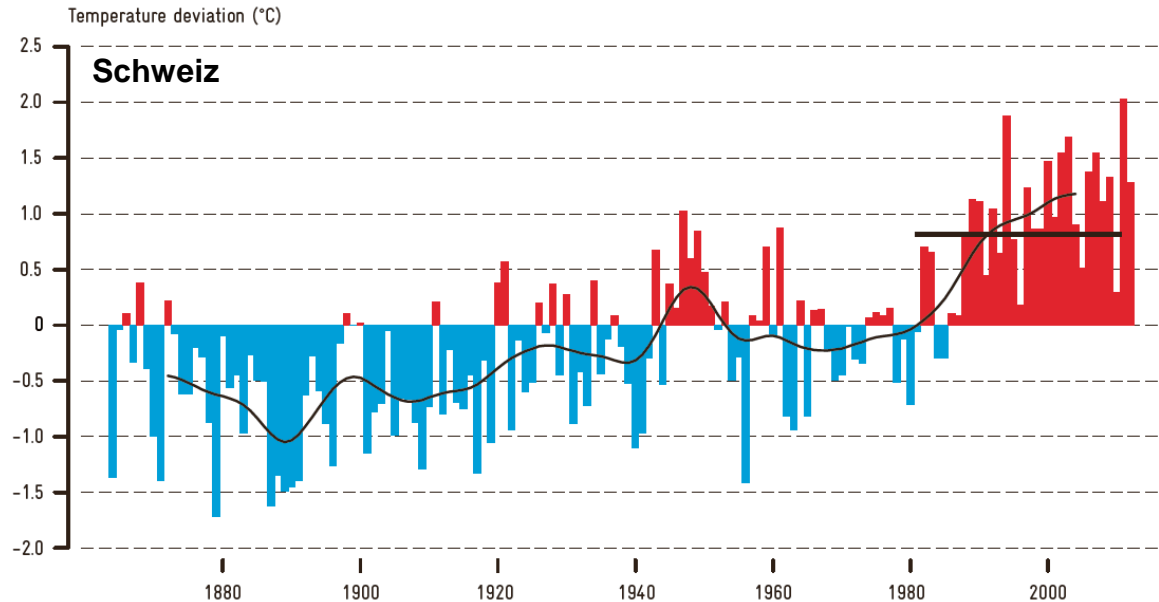
<http://www.fe.ethz.ch>

Year: -799712

Data: Jouzel et al. (2007); Bereiter et al., (2015); PAGES2k; Riahi et al. (2007); CMIP5 RCP 8.5

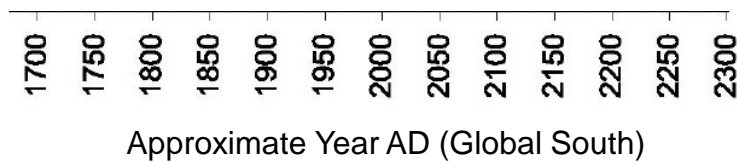
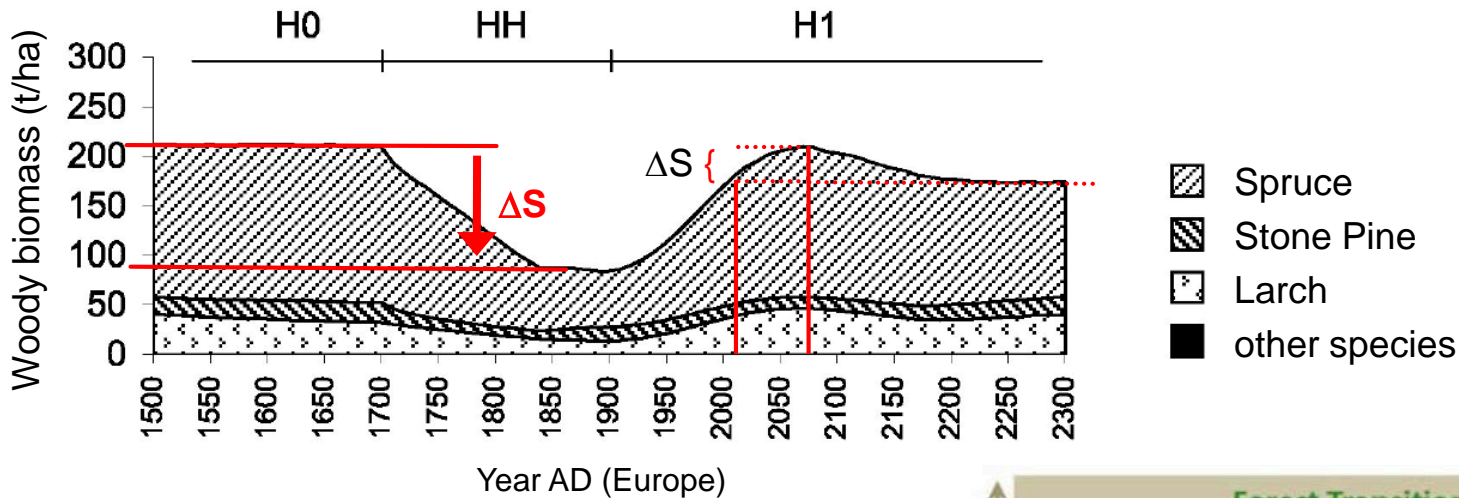


Temperature development 1864 - today



Past forest dynamics

- Woody biomass in the Dischma valley (Switzerland)



based on Schumacher (2004), *PhD Thesis ETH Zürich*; Hudson et al. (2013), *UNFF*

Conclusions

- Past forest management...
 - ... implicitly relied on the assumption that forest dynamics can be controlled, or at least governed
 - ... attempted to take responsibility for the state and dynamics of forests
 - ... emphasized one desired development pathway of a forest, and worked towards it
- Future forest management...
 - ... acknowledges that global change factors render control over forest resources an illusion
 - ... cannot take the responsibility for the development of forest resources
 - ... recognizes multiple developmental pathways
 - ... influences forest dynamics so that the provisioning of desired ecosystem services is more likely to be achieved