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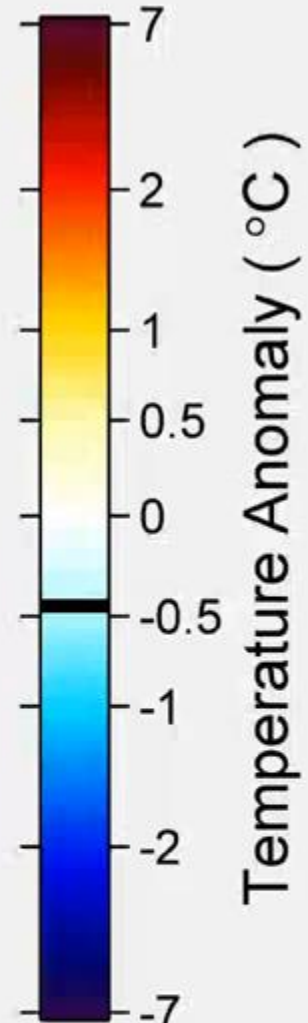
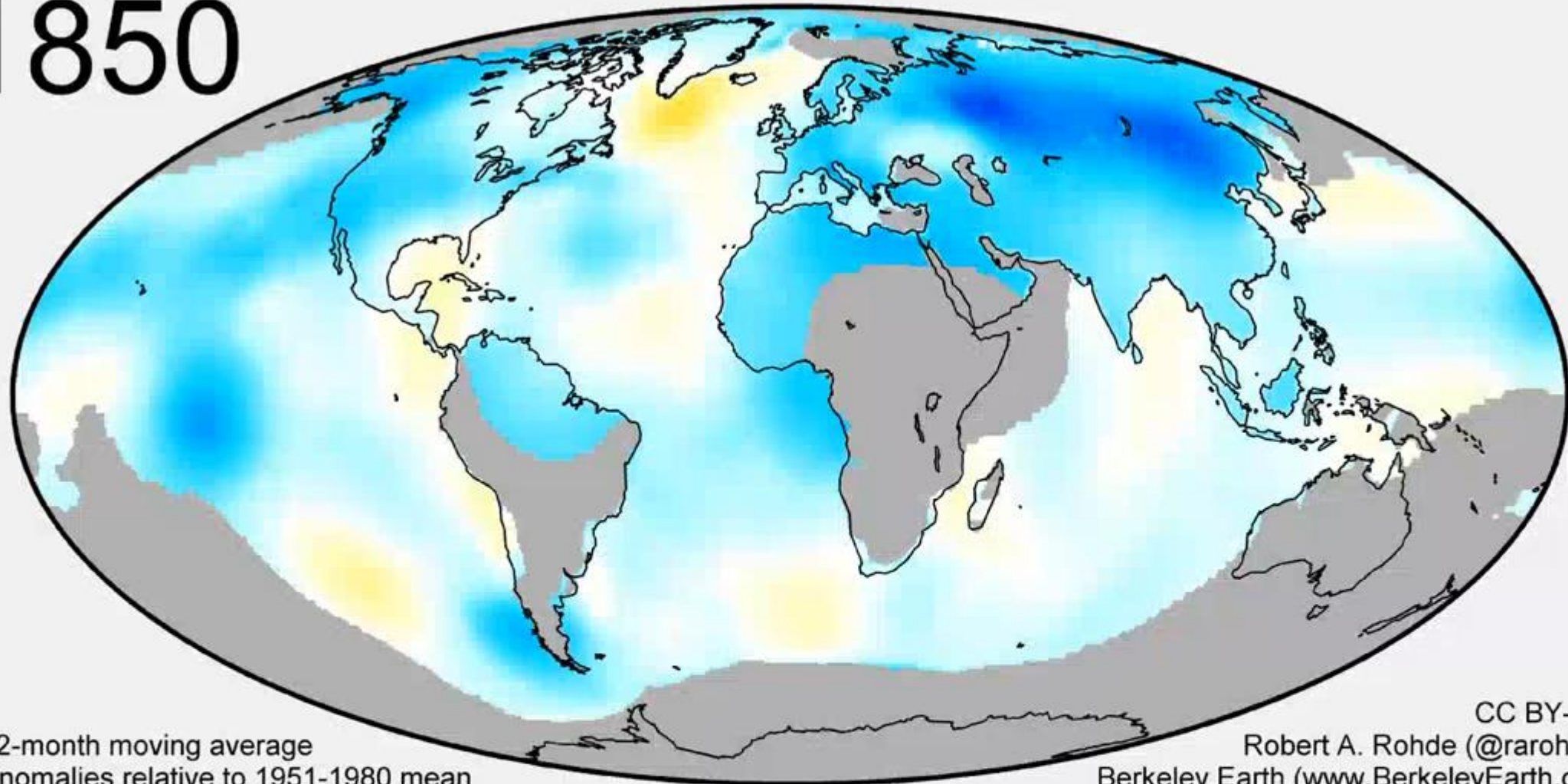
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# **EFFECT OF CLIMATE CHANGE ON FOREST MANAGEMENT**

STEFAN HUNZIKER, CLIMATE SCIENTIST

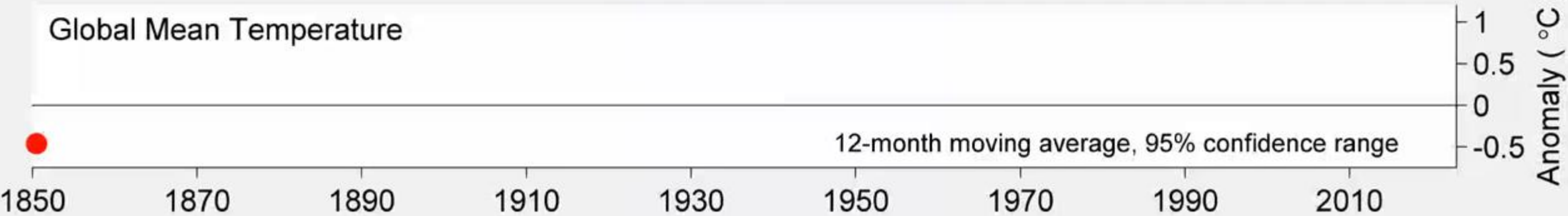
# 1850



12-month moving average  
Anomalies relative to 1951-1980 mean

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Robert A. Rohde (@rarohde)  
Berkeley Earth ([www.BerkeleyEarth.org](http://www.BerkeleyEarth.org))

## Global Mean Temperature



12-month moving average, 95% confidence range

# EFFECT OF CLIMATE CHANGE ON FOREST MANAGEMENT

## CLIMATE CONDITIONS ARE STRONGLY CHANGING

Climate change is strongly affecting the water availability for forests:

- There is a general increase of water loss from vegetation to the atmosphere (mostly, but not only, because of rising air temperature)
- Precipitation is highly variable in time, but there are regional trends towards a precipitation decrease
- Consequently, soil moisture is mostly decreasing
- Forests are more and more affected by drought stress

Besides water in- and output, further climatic changes affect forests such as:

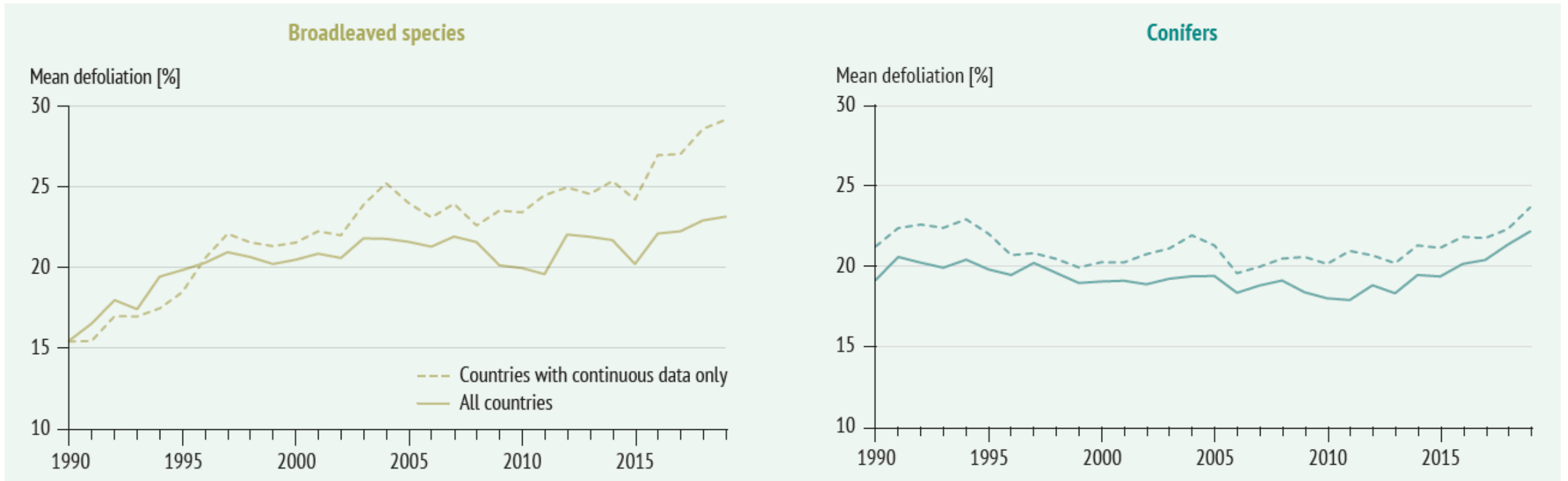
- The frequency and intensity of climatic extremes is changing (e.g. storms, extreme heat)
- The phenological cycle is shifting and increasing the danger of frost damage
- Warmer conditions may increase the number of insect generations per year (e.g. bark beetle)



## THE VITALITY OF FORESTS IS DECLINING

- Climatic changes affect forests on many levels such as the vitality of trees, growth rates, resilience to disturbances, regrowth and mortality rates
- There are often secondary effects involved: After years with periods of drought, for instance, trees are more vulnerable to biotic stressors such as insect infestations

The defoliation (i.e. the fraction of missing leaves or needles) of trees in Europe increased since the 1990s, mostly because of climate change. The defoliation is an indicator for tree health (the lower, the healthier the tree; ICPForests brief #5 2021)



# EFFECT OF CLIMATE CHANGE ON FOREST MANAGEMENT

## POTENTIAL FOREST MANAGEMENT STRATEGIES TO MITIGATE CLIMATE CHANGE IMPACTS

- There is no universal solution – Suitable strategies depend on the main management goal
- Including the findings of multiple research disciplines as well as different stakeholders may result in more sustainable solutions
- Consider not only current but also future regional and local climate conditions
- Practical management strategies may include:
  - Stronger forest thinning to reduce the competition and hence the water stress
  - The introduction of new species that are better adapted to the new climate conditions or the same species with a more adapted genetic fingerprint (e.g. from the southern edge of the species distribution)
  - Increasing the forest resilience by promoting mixed forests
  - Not managing the forests at all

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