Impacts of climatic change on mountains

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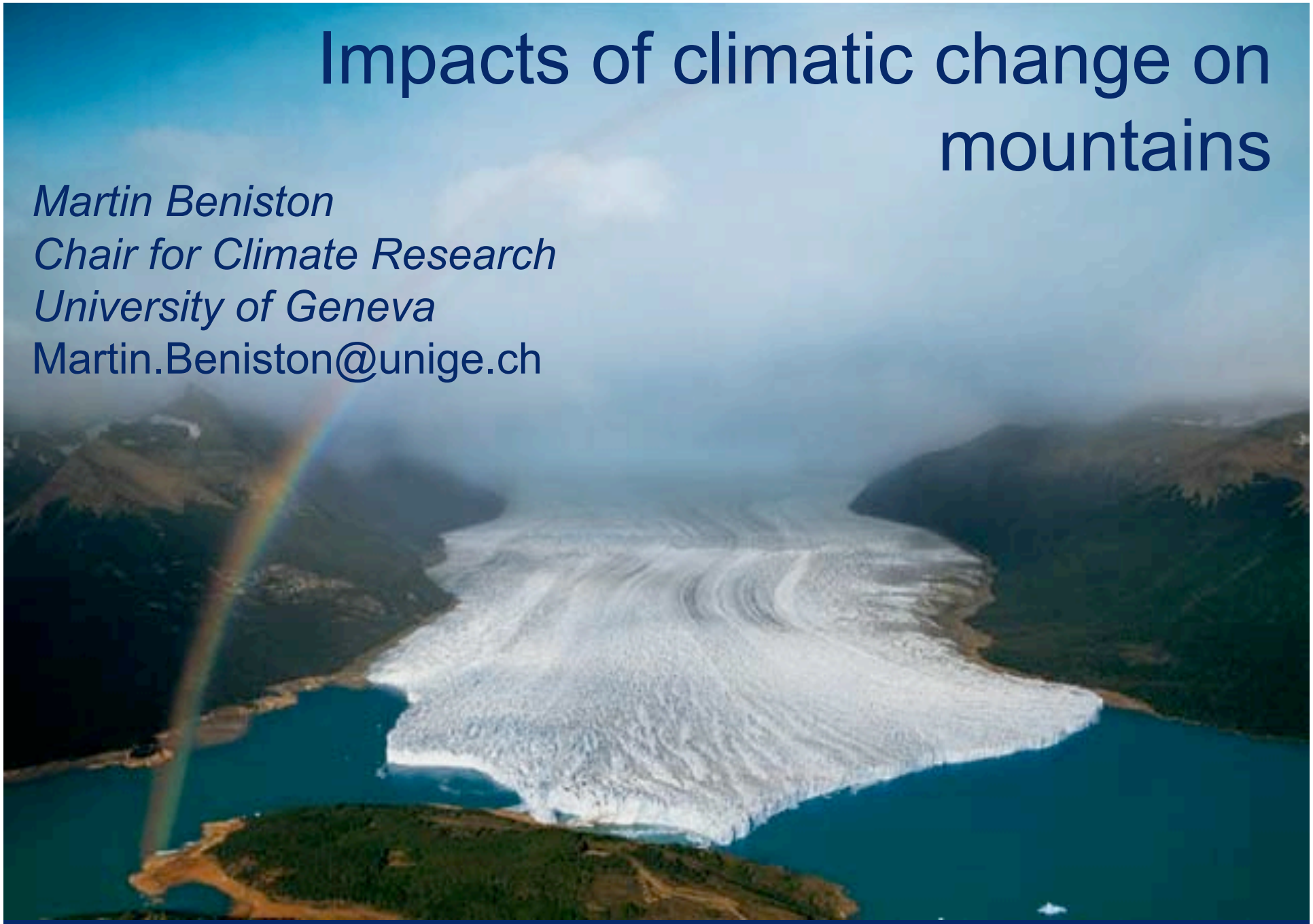
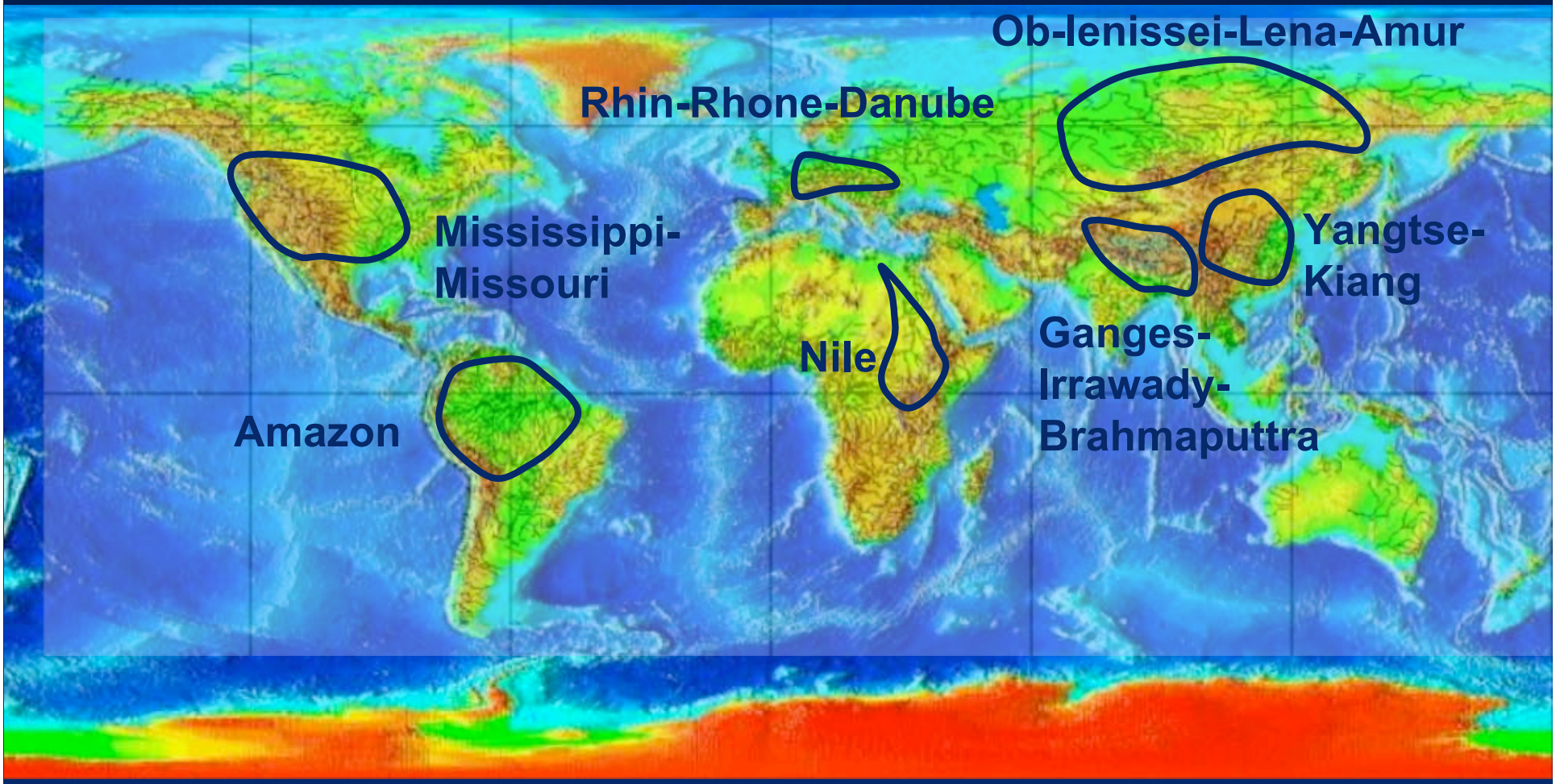


Importance of mountain regions

- Mountain regions contribute directly to the survival of 20% of world population, and indirectly to over 50%
- They are a major source region for the most vital environmental resource, i.e., water

Mountains as a source of more than half the world's rivers



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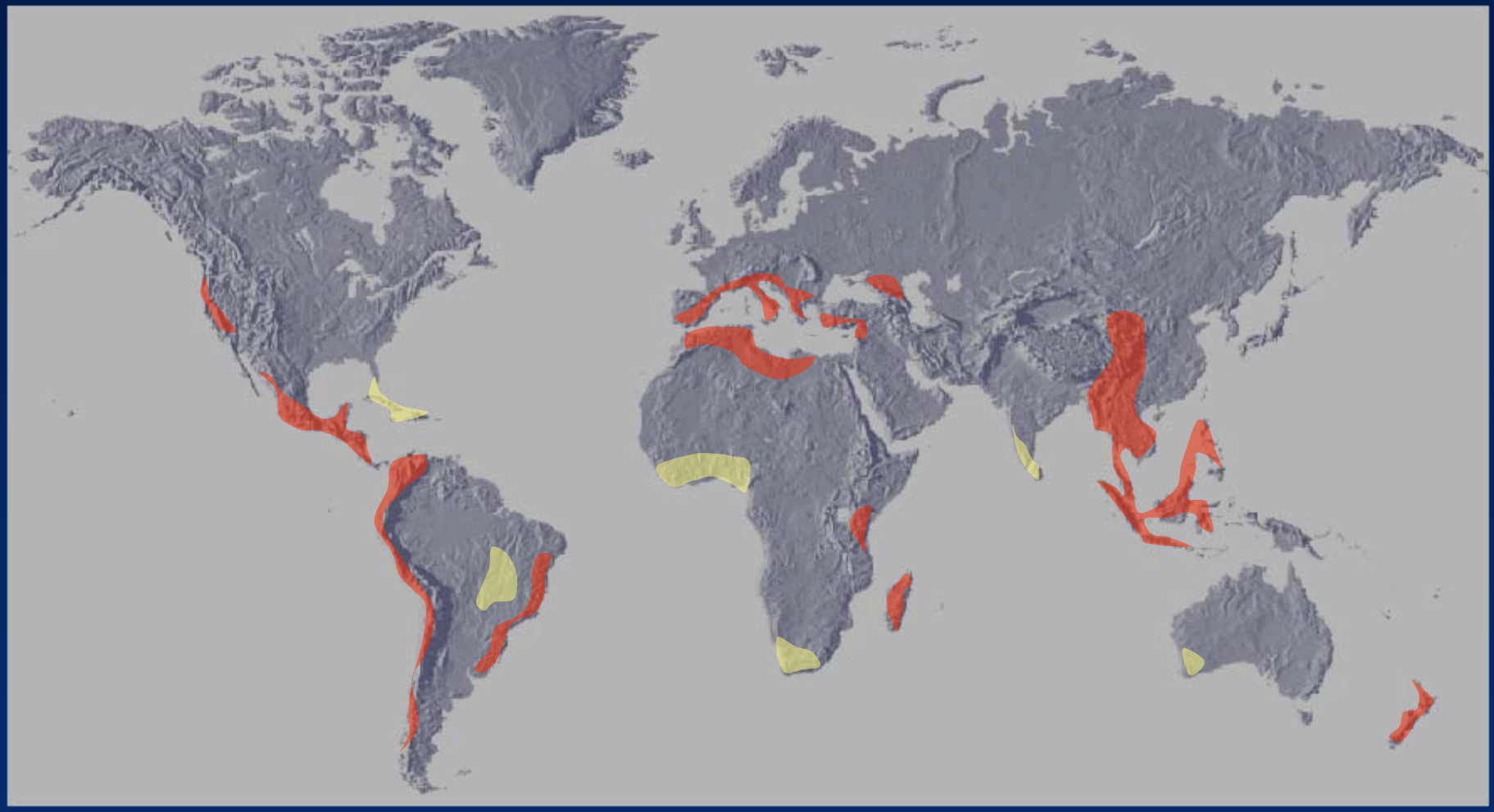
« Hotspots » of continental biodiversity (IUCN)



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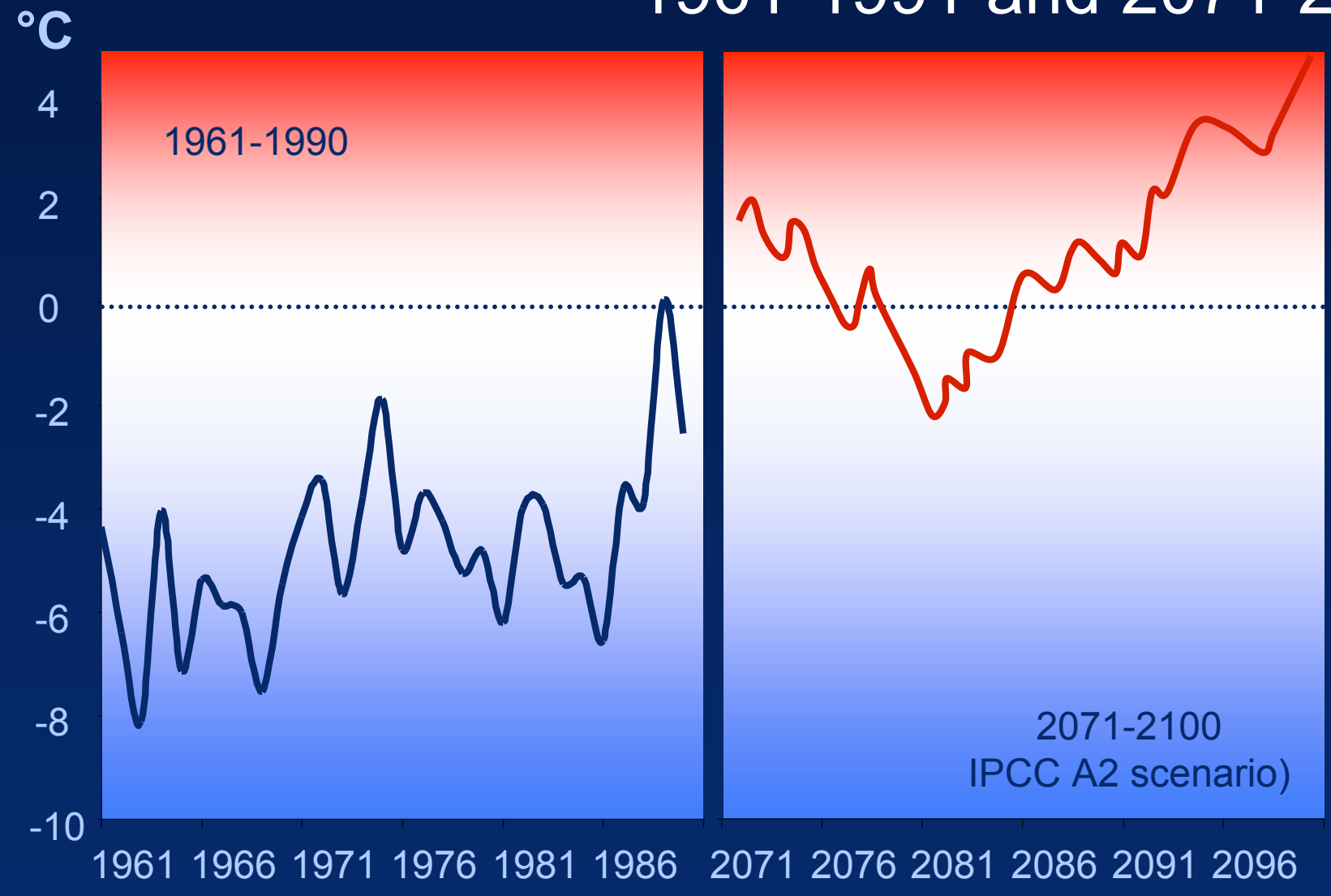
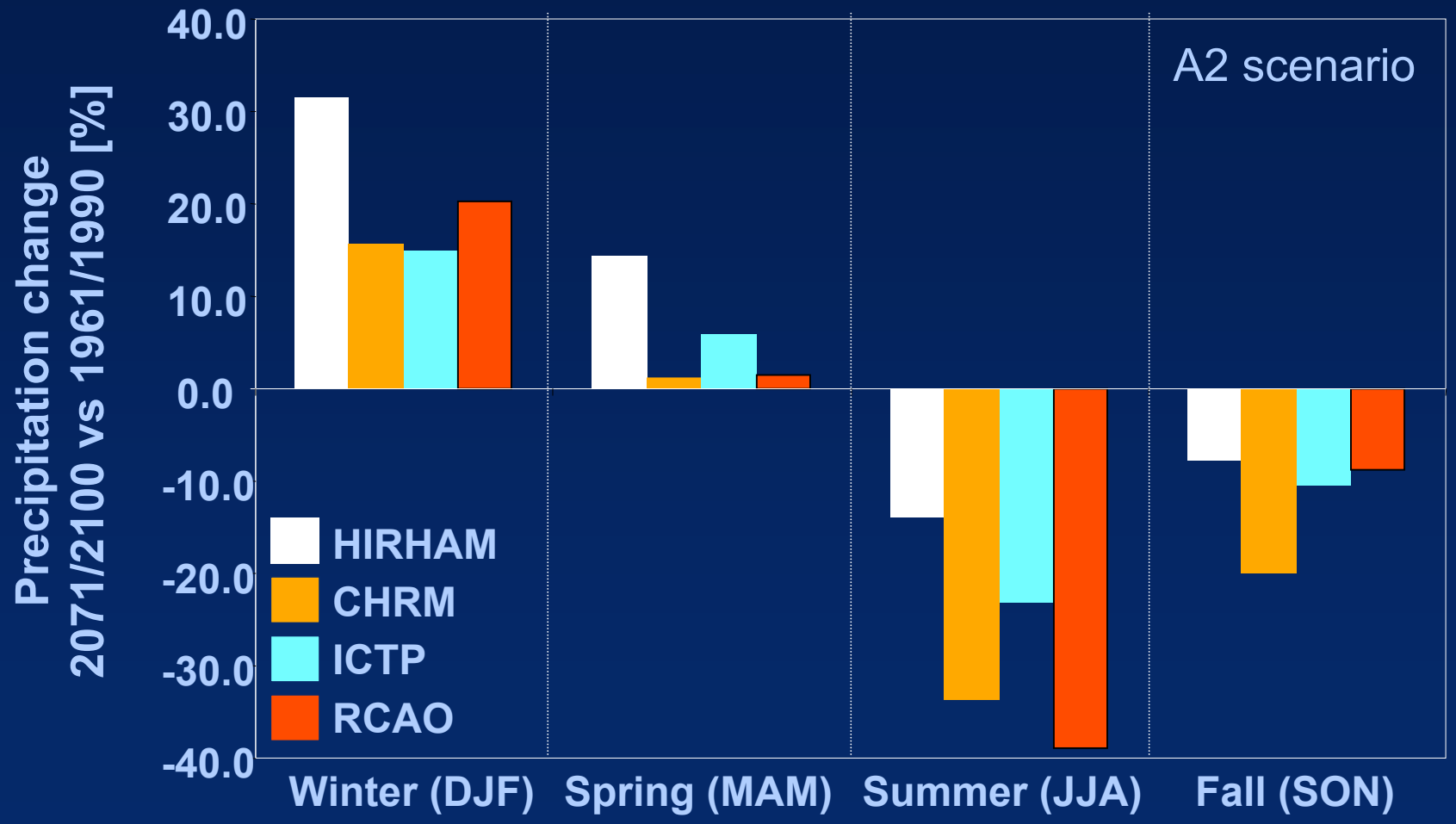
- They are a major source region for the most vital environmental resource, i.e., water
- They feature high biodiversity because of the altitudinal range of climate
- Mountains are not only a passive element of the climate system but also, by their physical presence, influence large-scale atmospheric flows
  - Changing surface characteristics, e.g., snow and ice cover, can also influence regional climate characteristics

Winter temperatures at Säntis (2,500 m): 1961-1991 and 2071-2100



Beniston, 2006:
Geophysical Research Letters

Sesonal shifts in alpine precipitation (central Swiss Alps)



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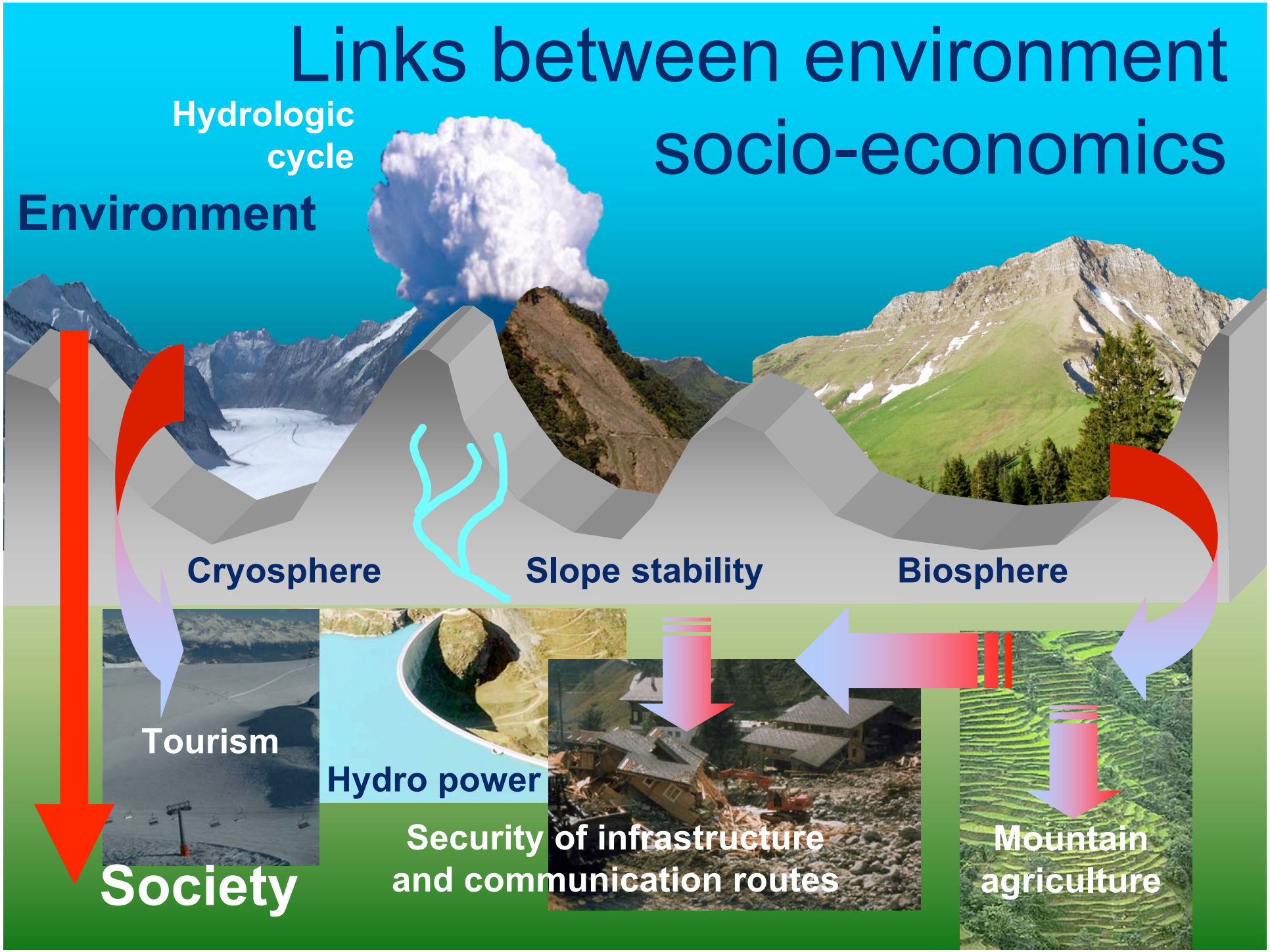
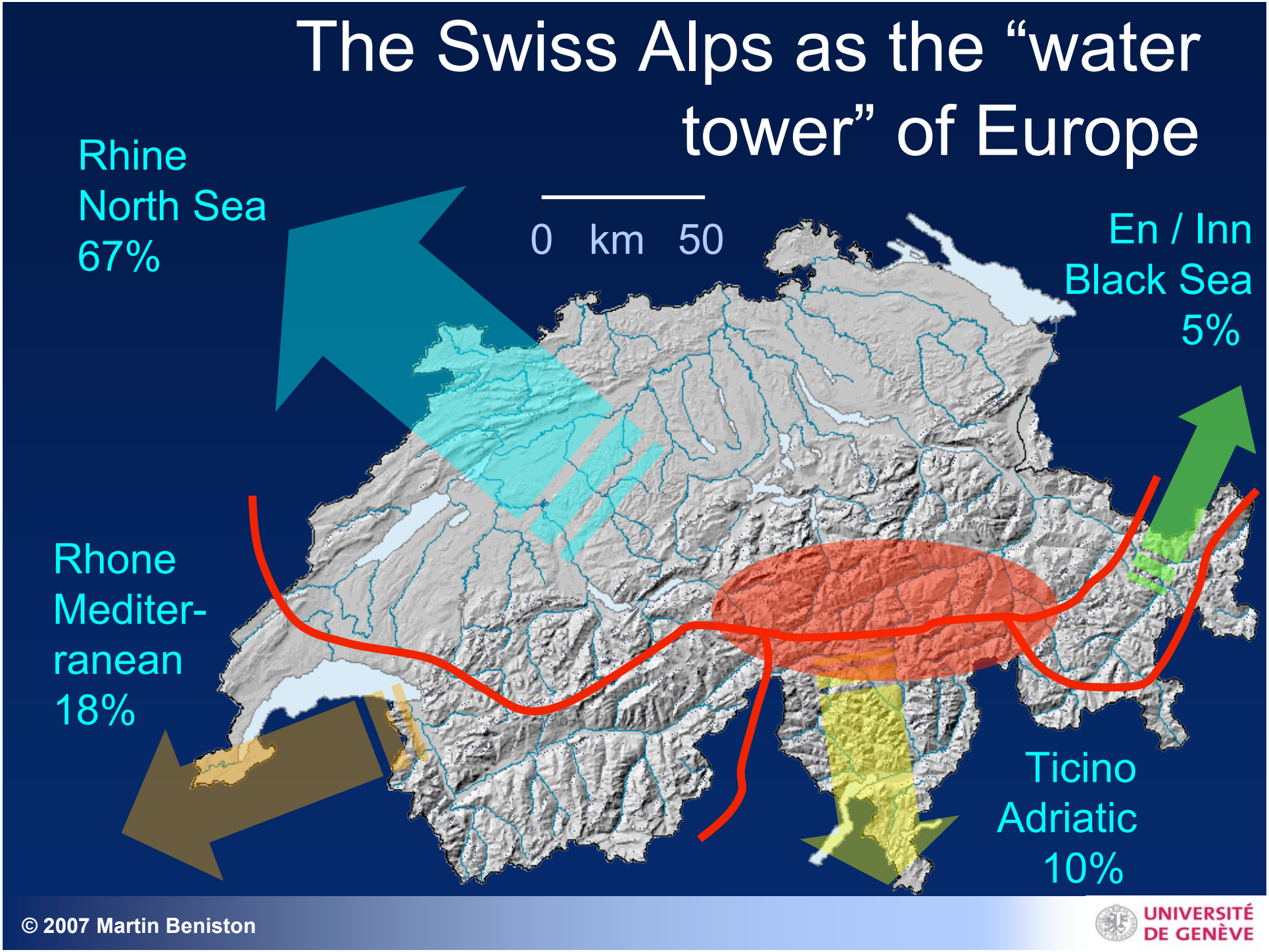

Links between environment socio-economics
Hydrologic cycle
Environment
Cryosphere
Slope stability
Biosphere
Tourism
Hydro power
Security of infrastructure and communication routes
Mountain agriculture
Society

Glacier retreat: Tschierva Glacier, Engadine

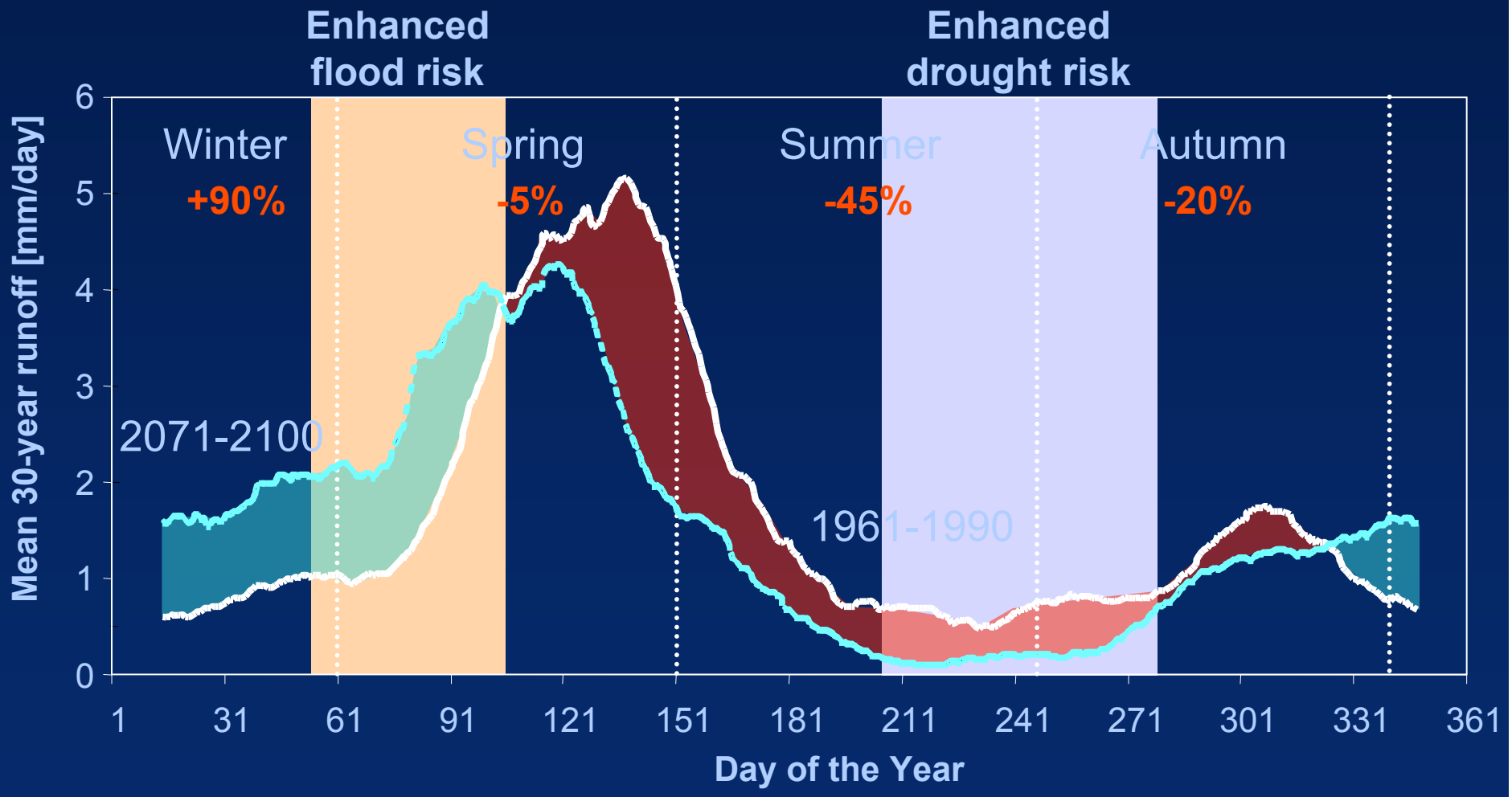
Adapted from work by Max Maisch
University of Zürich, Switzerland

The Swiss Alps as the "water tower" of Europe



Surface runoff change in the Alps

Beniston, 2004:
Climatic Change and Impacts,
Springer Publishers



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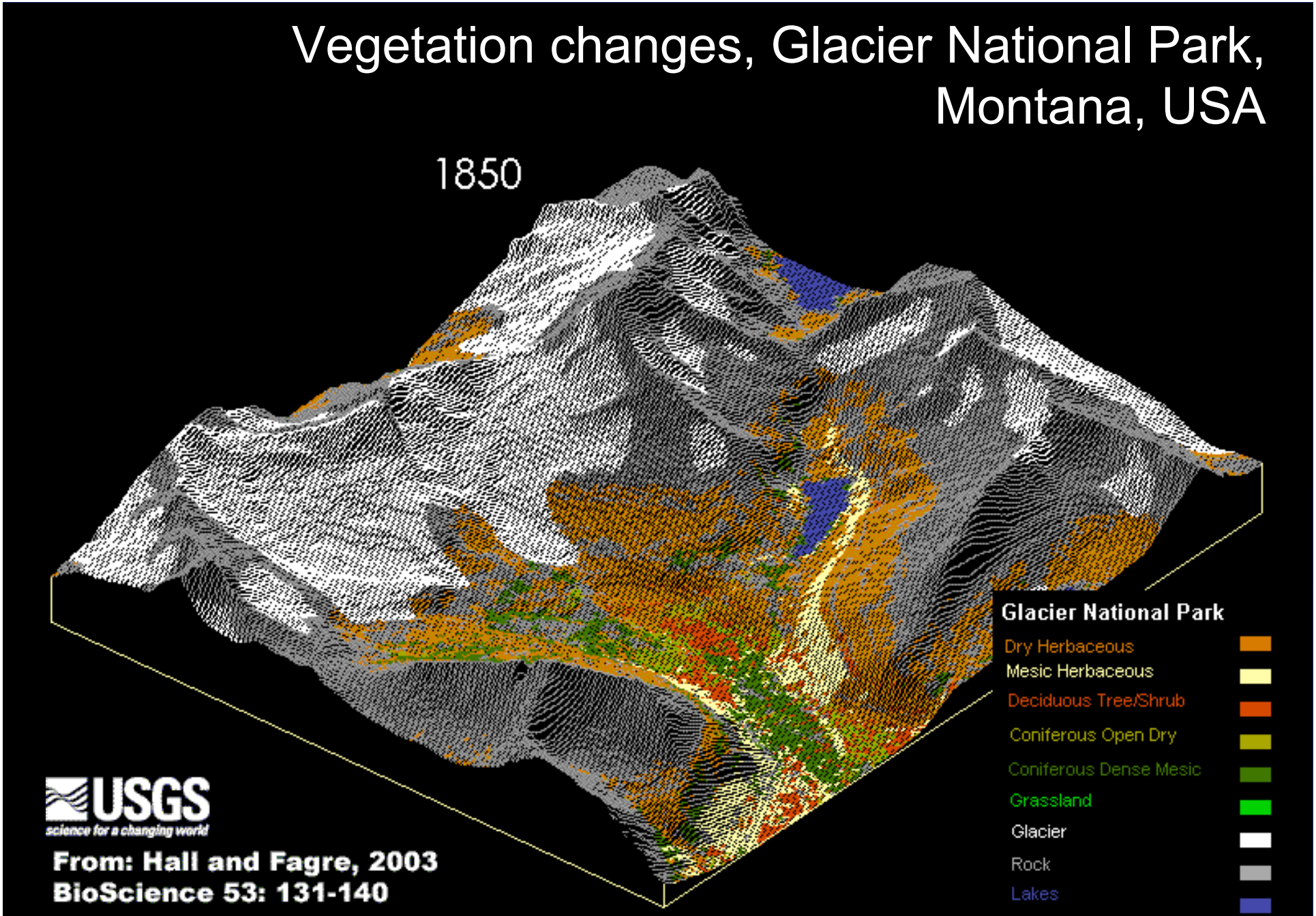
Impacts on mountain vegetation

- Biological diversity is expected to decrease as climate warms in mountains
  - Competition between species
  - Different adaptation capacity of species to change
- One strategy to adapt to climatic change is for plants to migrate towards higher elevations
- Species already at the tops of mountains will need to either adapt on the spot or are likely to face extinction

Vegetation changes, Glacier National Park, Montana, USA



Summary

- Despite their imposing mass, mountains are often fragile ecosystems
- They provide key resources (e.g., water) often well beyond their boundaries
- Climatic change will modify atmospheric circulations and thus temperature and precipitation patterns
- Mountain cryosphere, hydrology, and vegetation will be very sensitive and vulnerable to the rapid changes in climate projected for the 21st centuy
- Economic activities will be affected
  - Health
  - Winter tourism
  - Hydro-power
  - Insurance in the face of more frequent natural hazards
- In some parts of the world, social and cultural structures may be at risk after centuries of survival

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www.unige.ch/climate

Thank you for your attention…