Einführung und Überblick

Sonia I. Seneviratne

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Programm 09:00 - 12:15

09:00 - Sonia Seneviratne
Einführung und Überblick

09:15 - Joachim Gurtz
32 Jahre Forschungsgebiet Rietholzbach:
verfügbare Daten und Informationen, ihre Auswertung und verbundene Probleme

09:45 - Lucas Menzel
Erfassung der Verdunstung auf unterschiedlichen räumlichen Skalen:
vom Rietholzbach in die Mongolei

10:15 - Tomáš Vitvar
Isotopenmethoden:
Anwendung im Rietholzbachgebiet und Bedeutung im Rahmen der UN-Wasserprogramme

10:45 - Kaffeepause

11:15 - Herbert Lang
Historischer Überblick

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ALPEX - EVAPEX

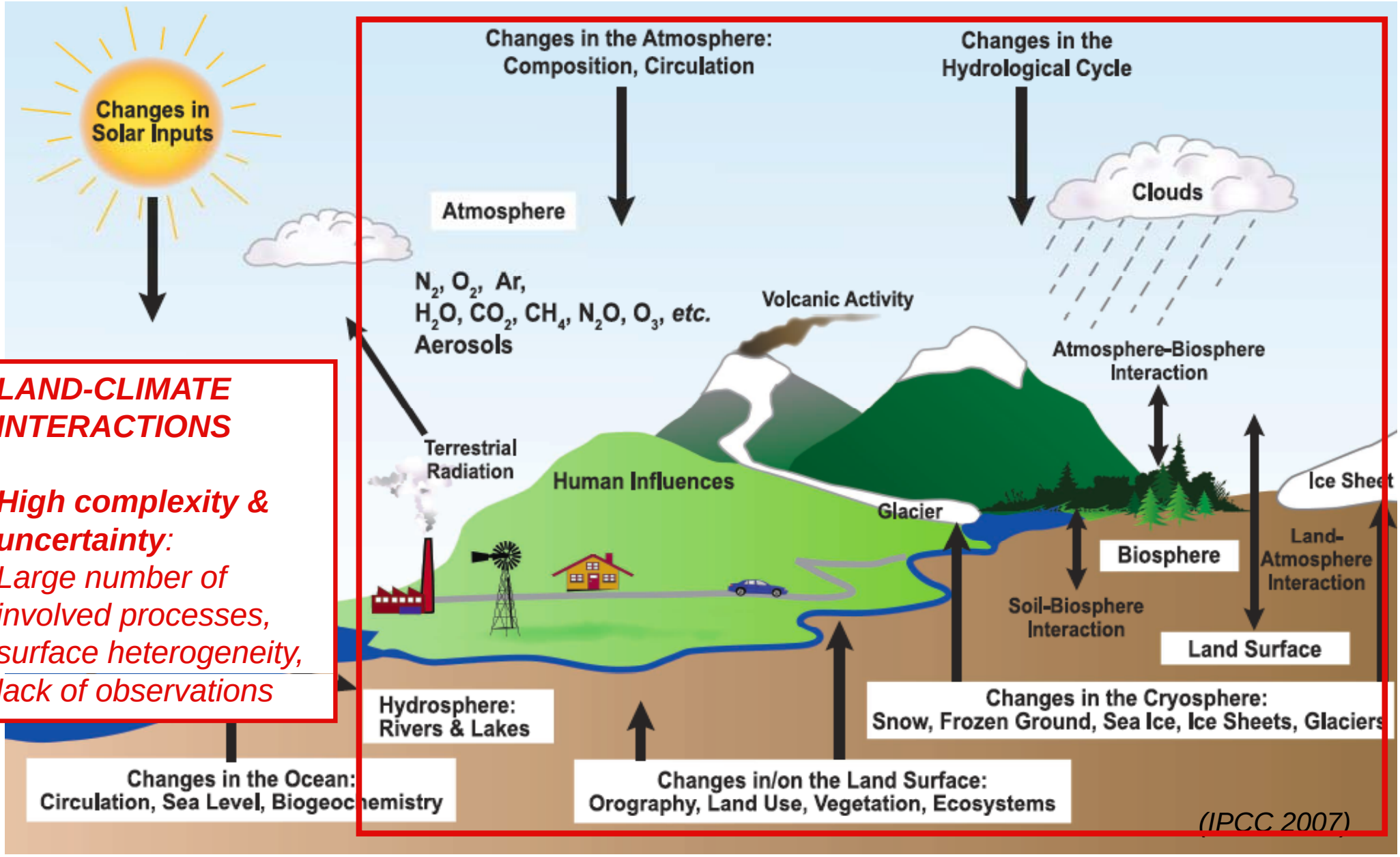
11:45 - Irene Lehner
Wie weiter?
Konzept und Ideen für die zukünftige Forschung im Rietholzbachgebiet

Land-Climate Interactions Group @ ETH Zurich

- We investigate the role of land-climate interactions in the climate system
- Focus on water, energy, and to a lesser extent carbon cycle (especially: role of soil moisture, evapotranspiration)
- Investigation using models and observations

- Rietholzbach: Investigation of evapotranspiration and soil moisture in complex terrain; scaling issues

Introduction: The climate system

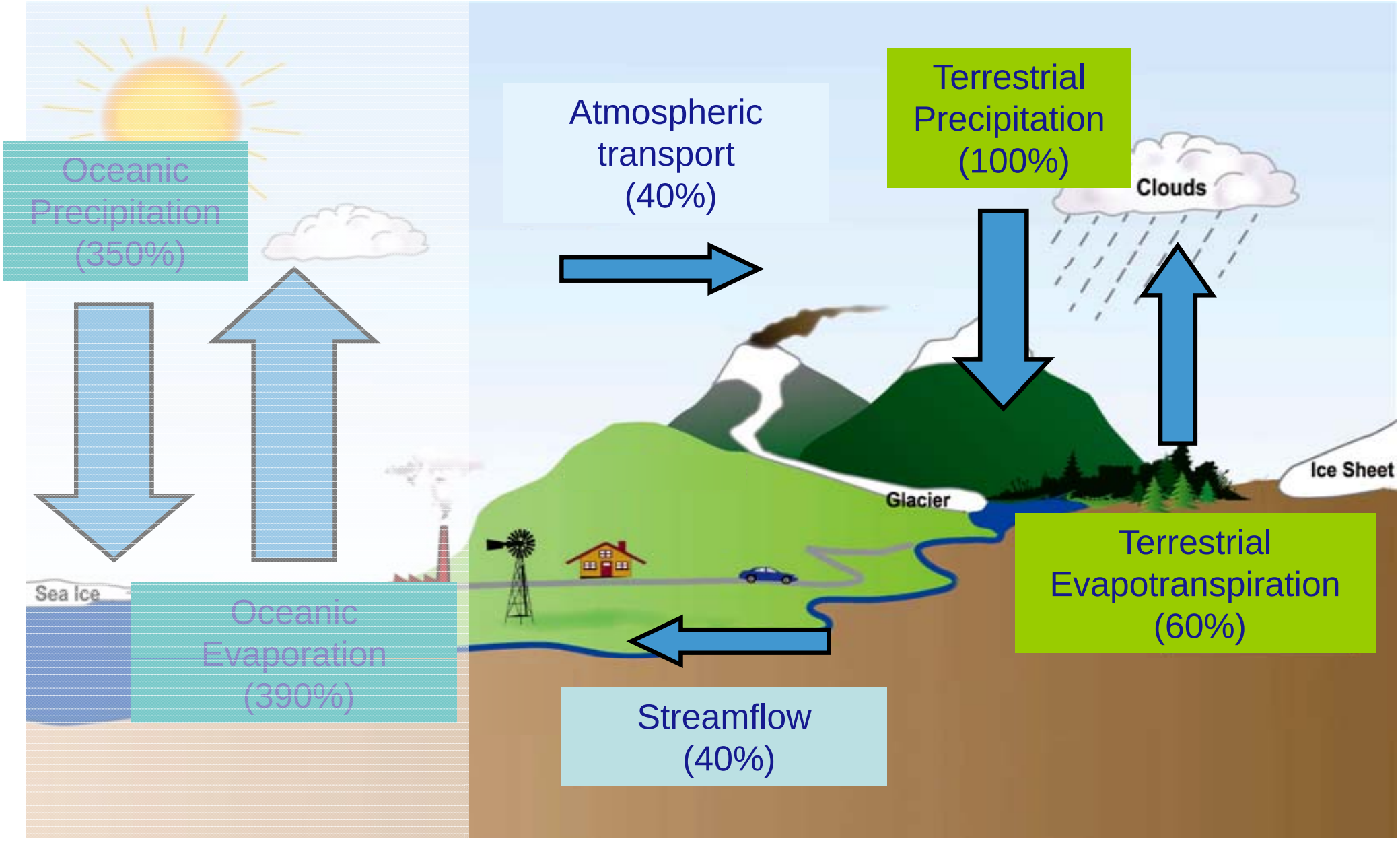


LAND-CLIMATE INTERACTIONS

High complexity & uncertainty:
Large number of involved processes, surface heterogeneity, lack of observations

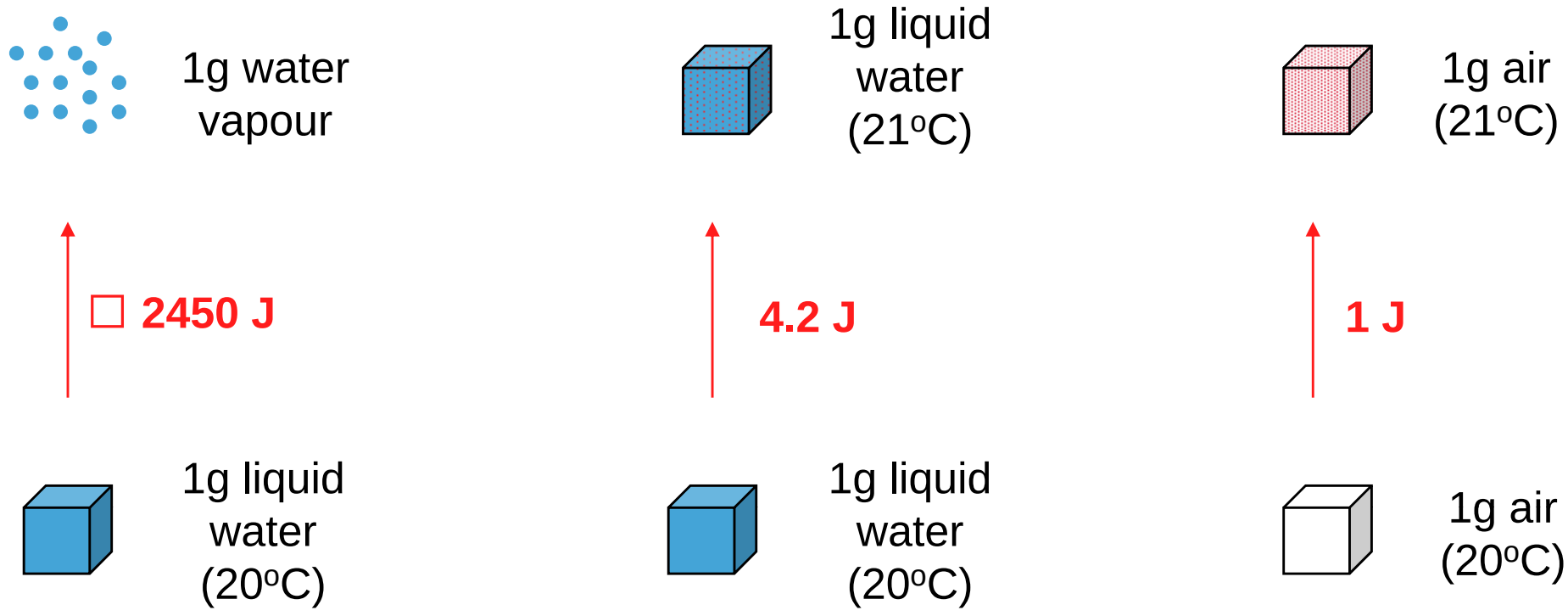
(IPCC 2007)

Introduction: Global water cycle



(Flux estimates: Oki and Kanae, Science 2006)

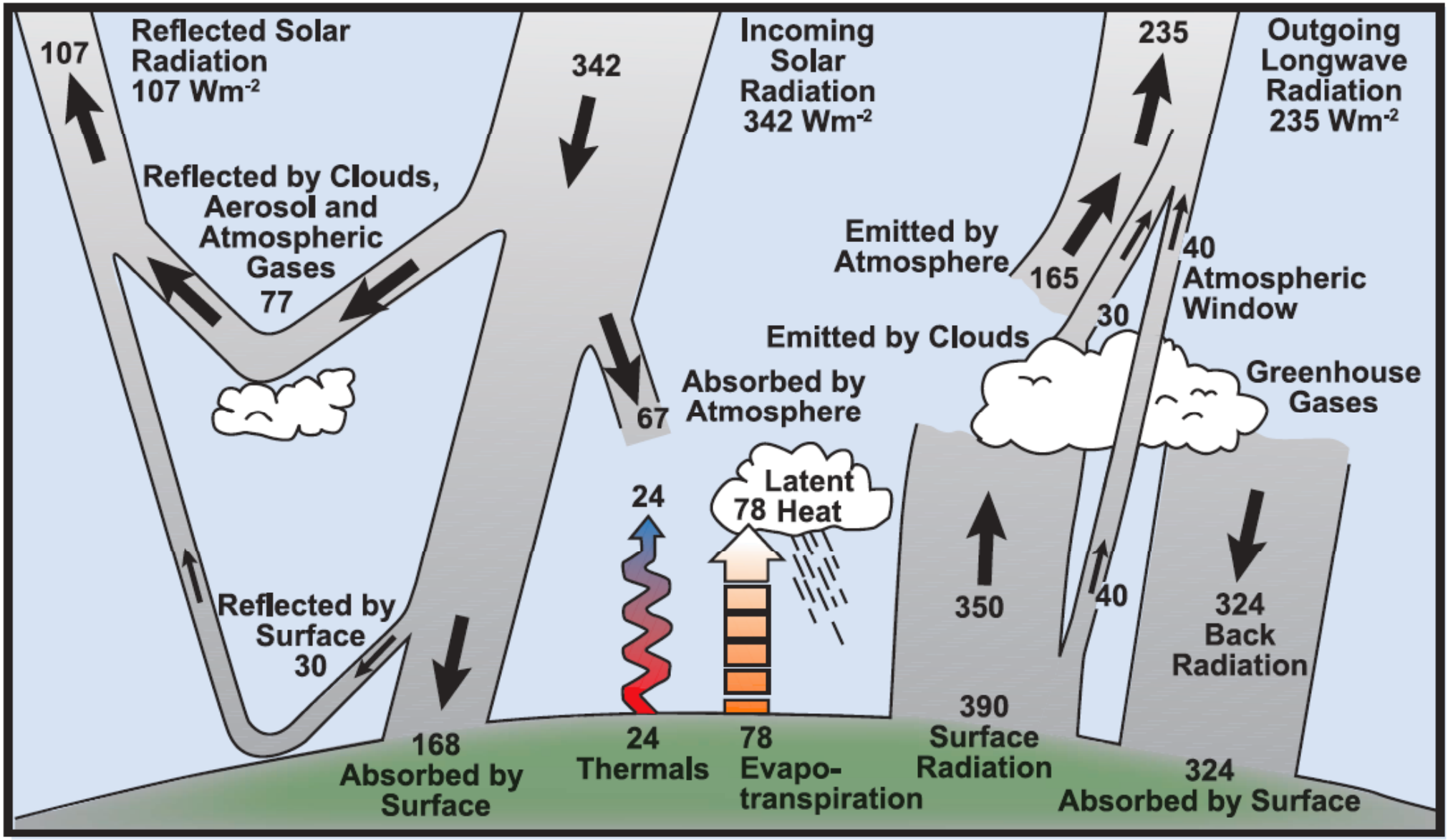
Evapotranspiration is also a flux of energy!



Latent heat flux

Sensible heat flux

Global energy cycle

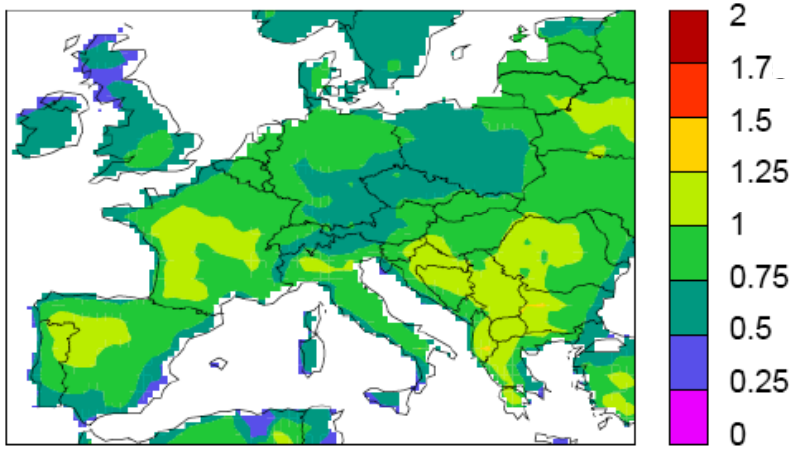


Sensible heat flux Latent heat flux

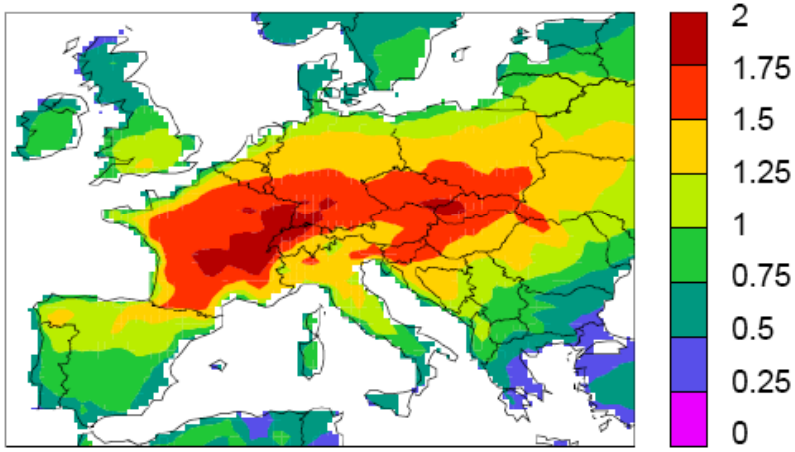
(IPCC 2007)

Impact on summer temperature variability in Europe (present / future)

CTL



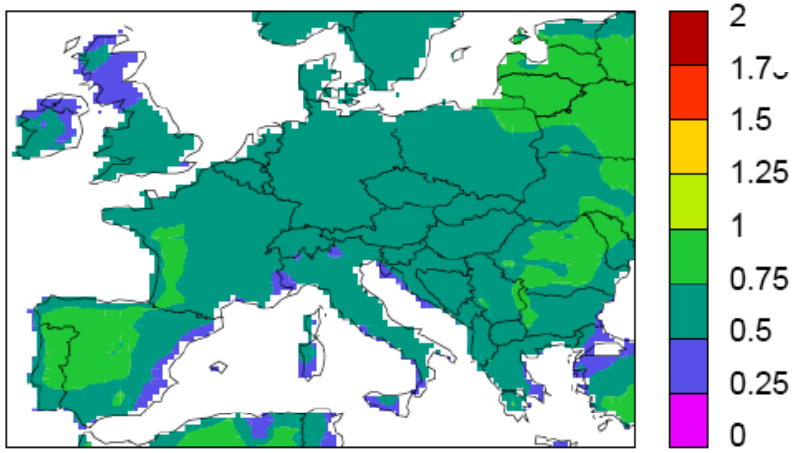
SCEN



Standard deviation of the summer (JJA) 2-m temperature

(no variations in soil moisture)

$CTL_{UNCOUPLED}$



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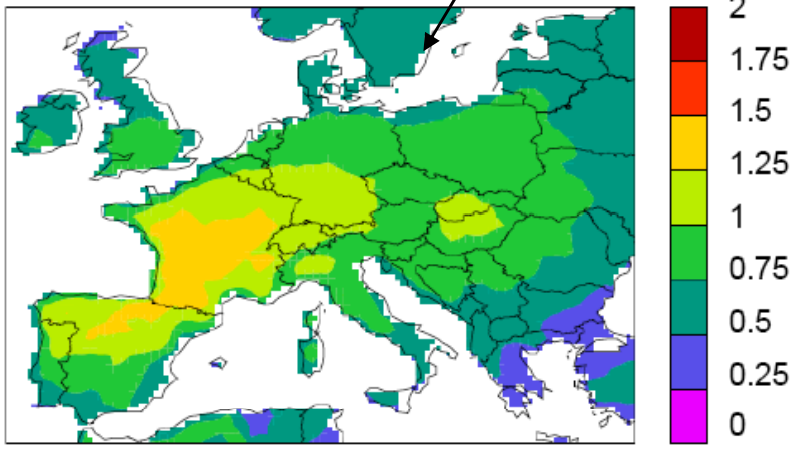


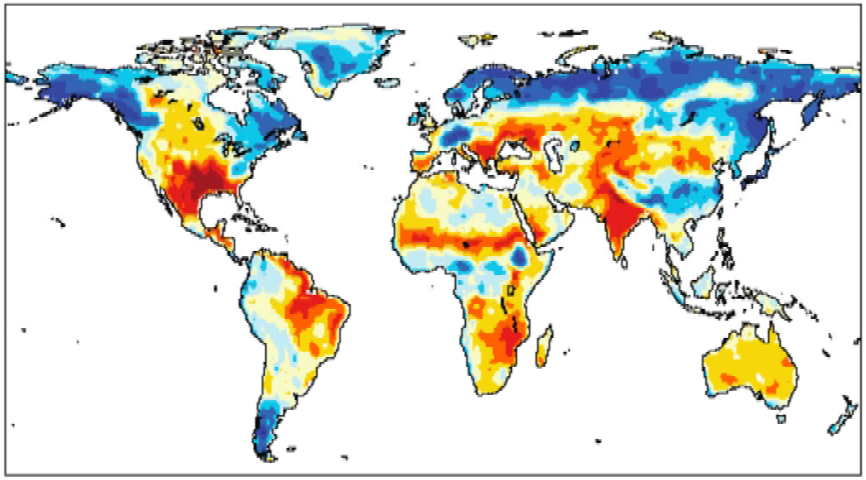
(Seneviratne et al. 2006, Nature)

Control of evapotranspiration by soil moisture

⇒ *Impacts on precipitation and temperature*

Correlation (temperature, evapotranspiration)

(IPCC simulations: ECHAM5, GFDL, HadGEM1; summers **1970-1989**)



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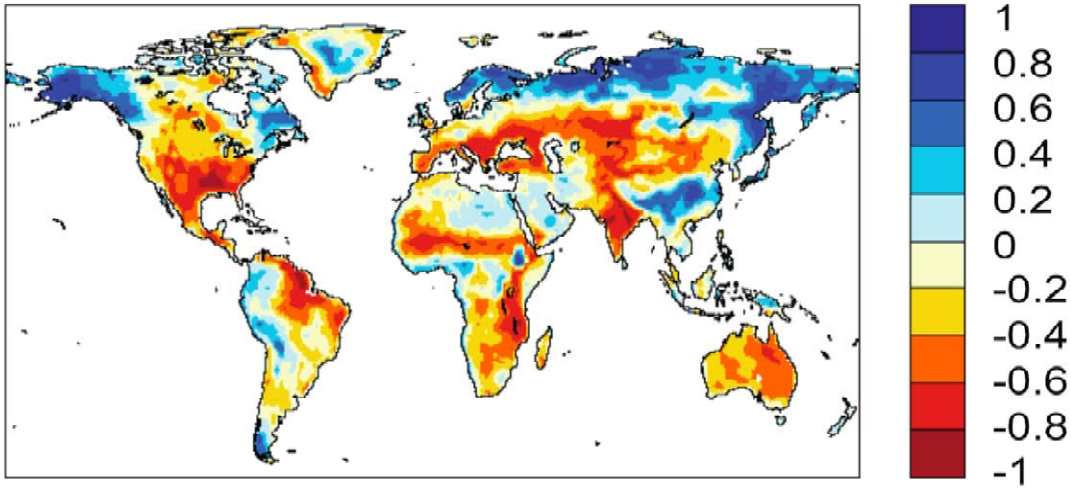

(Seneviratne et al. 2006, Nature)

Control of evapotranspiration by soil moisture

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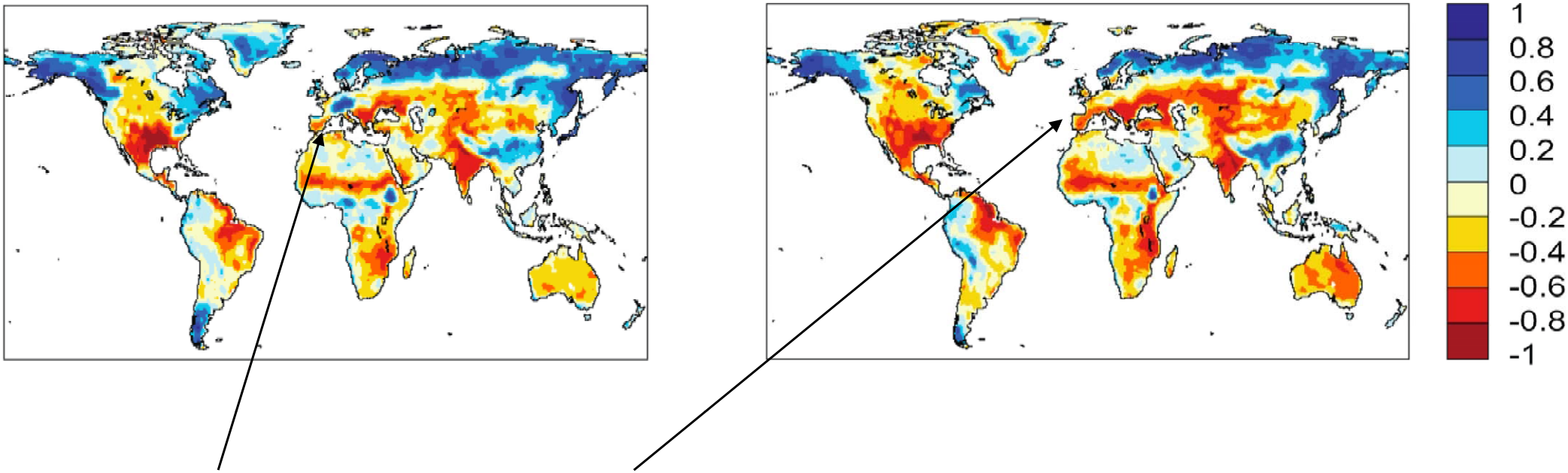
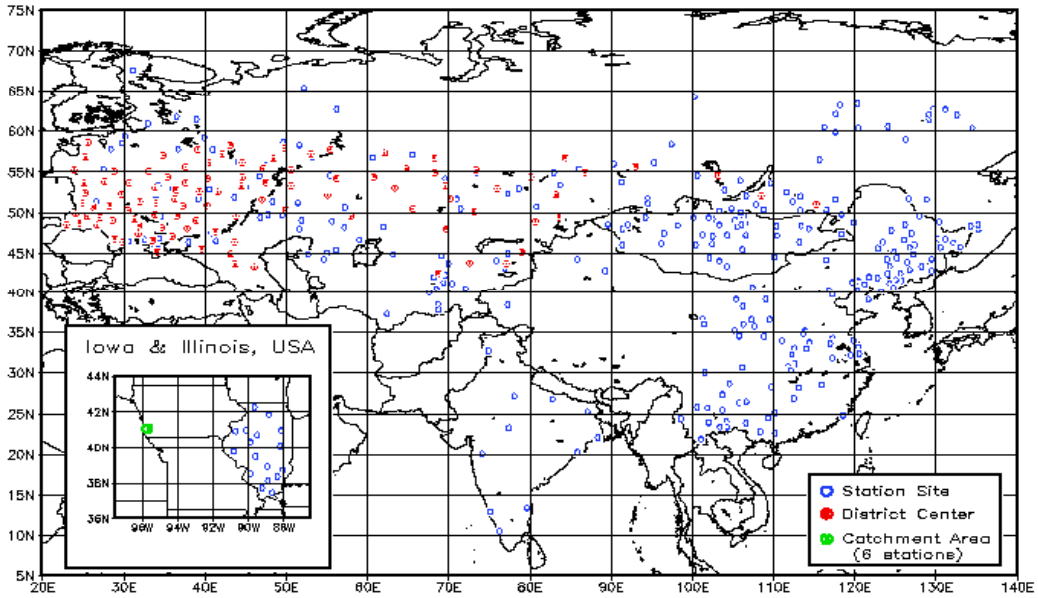


Gradual shift of the transitional climate zone:
Increasing role of soil moisture in Central Europe!

(Seneviratne et al. 2006, Nature)

Observations: Soil moisture

- Current ground observations networks of soil moisture are very limited in space and time (no data for Europe; only few observations in the former Soviet Union after 1990)

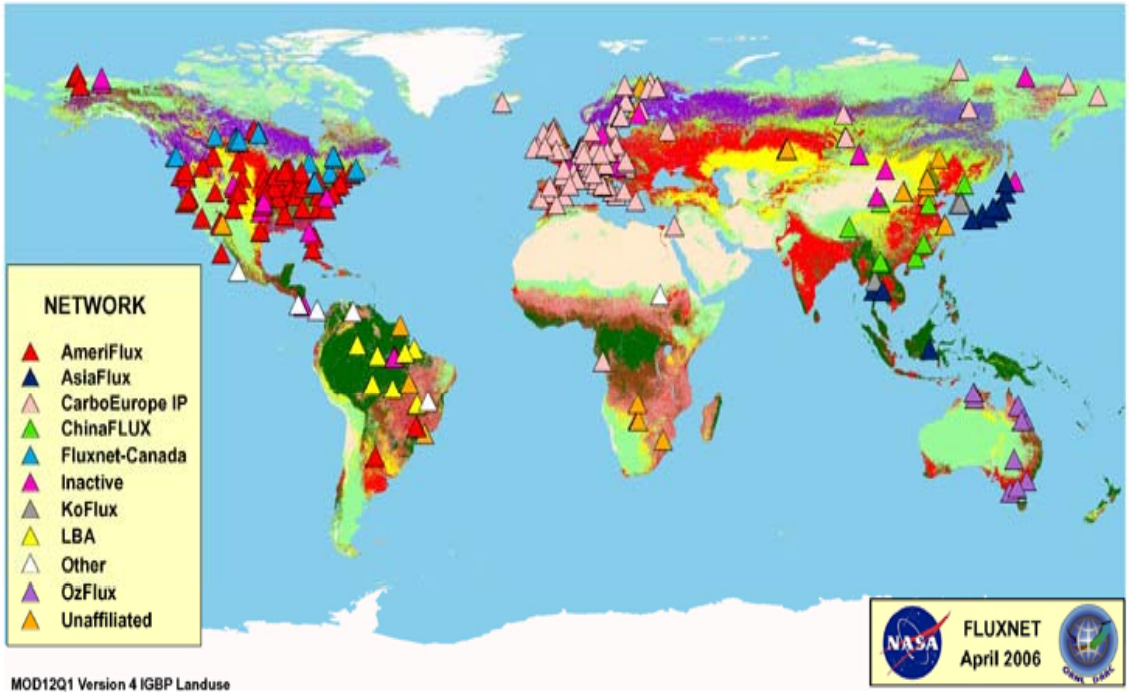


Global Soil Moisture Data Bank
(Robock et al. 2000, Bull. Am. Met. Soc.)

Observations: Fluxnet

- Worldwide CO_2, water and energy flux measurements

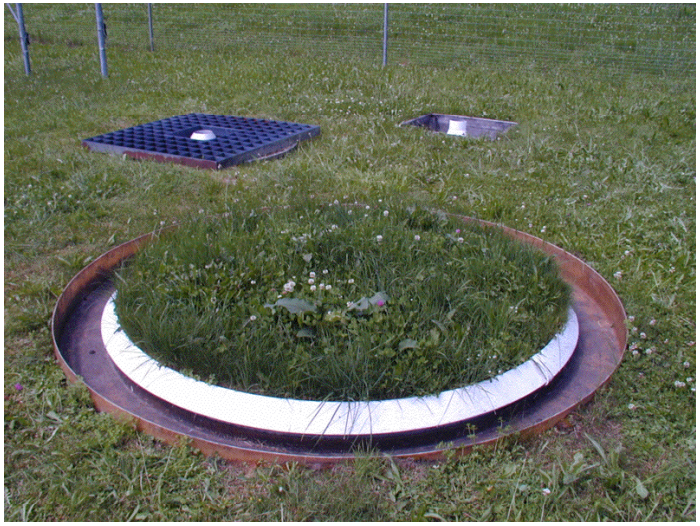
- At present, more than 400 tower sites
  - however, still some serious limitations in temporal availability (in Europe, most measurements available after 1995 only)
  - only few sites with (good) soil moisture measurements
  - **only sites in homogeneous terrain**
  - **problem of up-scaling**



http://www-eosdis.ornl.gov/FLUXNET/

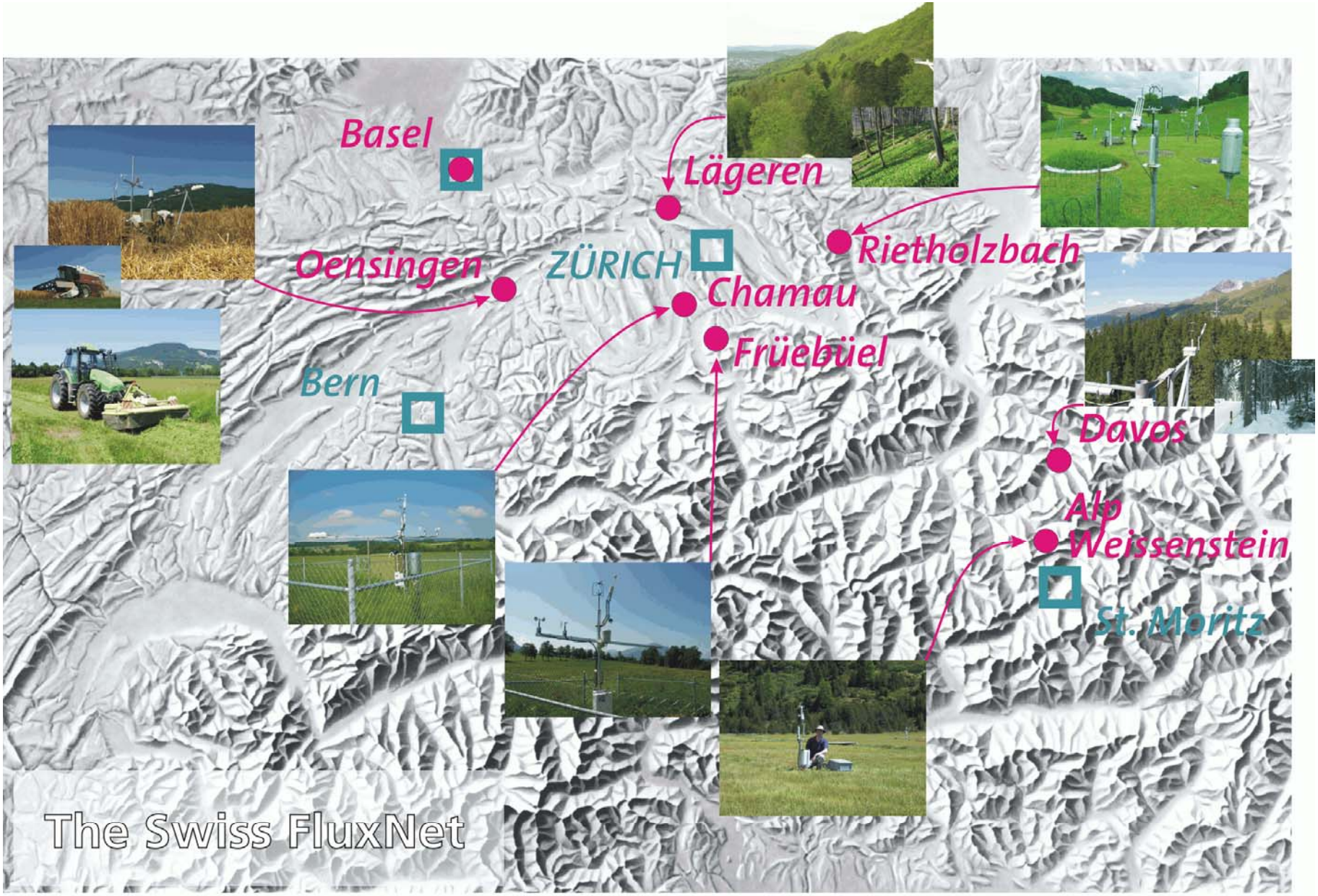
Rietholzbach site: Overview

http://www.iac.ethz.ch/groups/seneviratne/research/rietholzbach



- Research catchment
- Measurements since 1975 (30-year timeseries)
- Evapotranspiration (lysimeter, isotopes), runoff, meteorological variables, radiation (since 1994), soil moisture (since 1994)
- Now part of the Land-Climate Interactions group (Before: Profs. H. Lang, A. Ohmura, Ch. Schär)
- Current plans: Eddy-covariance measurements, enhanced spatial sampling of soil moisture
- Management of the site: Irene Lehner; Instrumentation: Karl Schroff

(N. Buchmann, J. Fuhrer, S.I. Seneviratne; ETH Zurich, Agroscope)



(S.I. Seneviratne, J. Fuhrer, M. Rotach; ETH Zurich, MeteoSwiss, Agroscope)

Proposal for 3-year intensive soil moisture campaign (SNF, submitted)

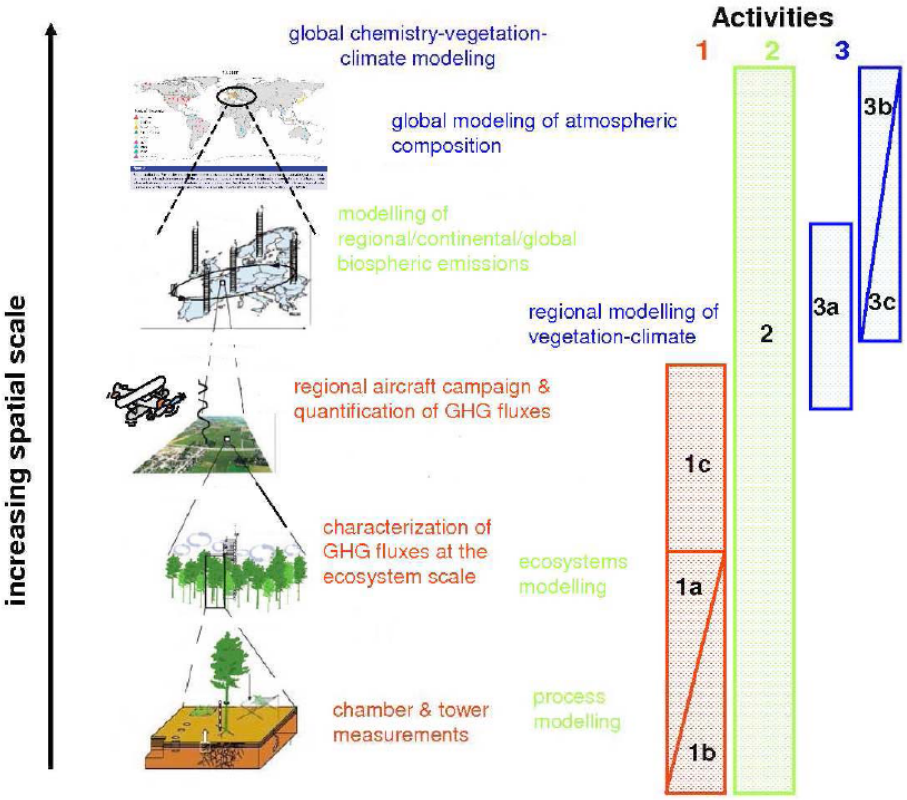
"Modelling And experIments On Land-surface Interactions with atmospheric Chemistry and climAte"

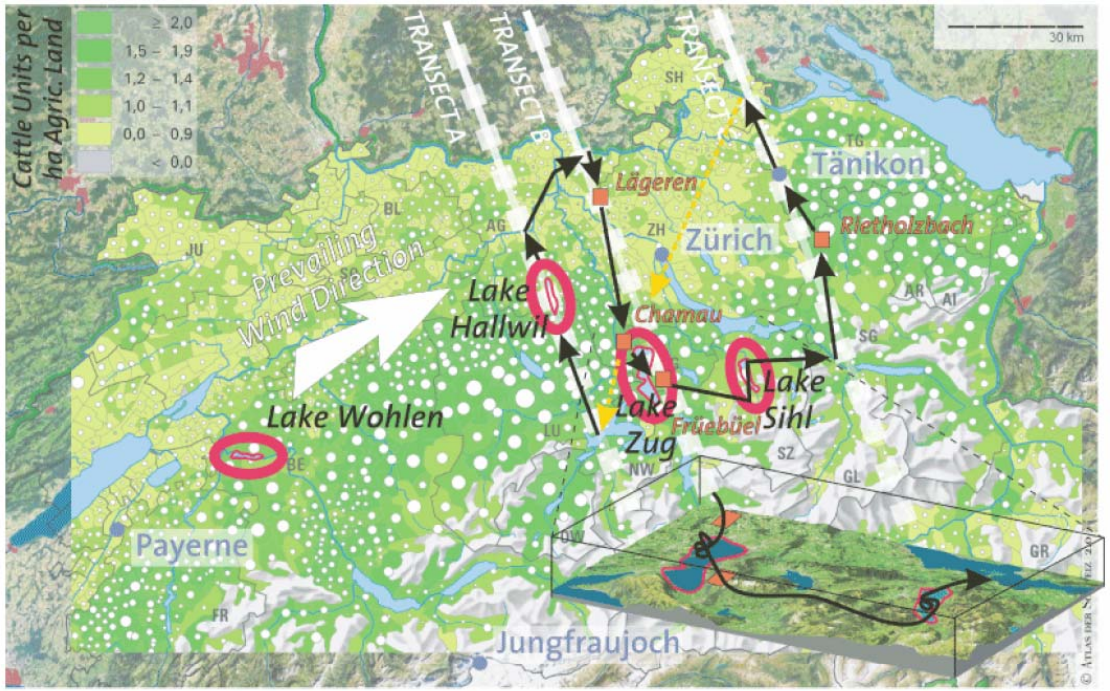
Participants:

Isabelle Bey, EPFL
Brigitte Buchmann, EMPA
Nina Buchmann, ETH Zurich
Werner Eugster, ETH Zurich
Thomas Peter, ETH Zurich
Carsten Schubert, EAWAG
Sonia Seneviratne, ETH Zurich
Hubert van den Bergh, EPFL
Annett Wolf/Harald Bugmann, ETH Zurich
Niklaus Zimmermann, WSL

+ Bruno Neininger, MetAir

Bey et al. 2007 (CCES): 10 partners within ETH domain





Measurements of regional fluxes of CH_4, CO_2, and H_2O

Conclusions

- We are thankful for the great work performed at Rietholzbach in the past!

- We look forward to exciting research:
  - Analysis of catchment-scale evapotranspiration, soil moisture, carbon exchanges
  - Upscaling issues
  - Links between water, energy and carbon exchanges
  - Past and current trends in climate and surface hydrology

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