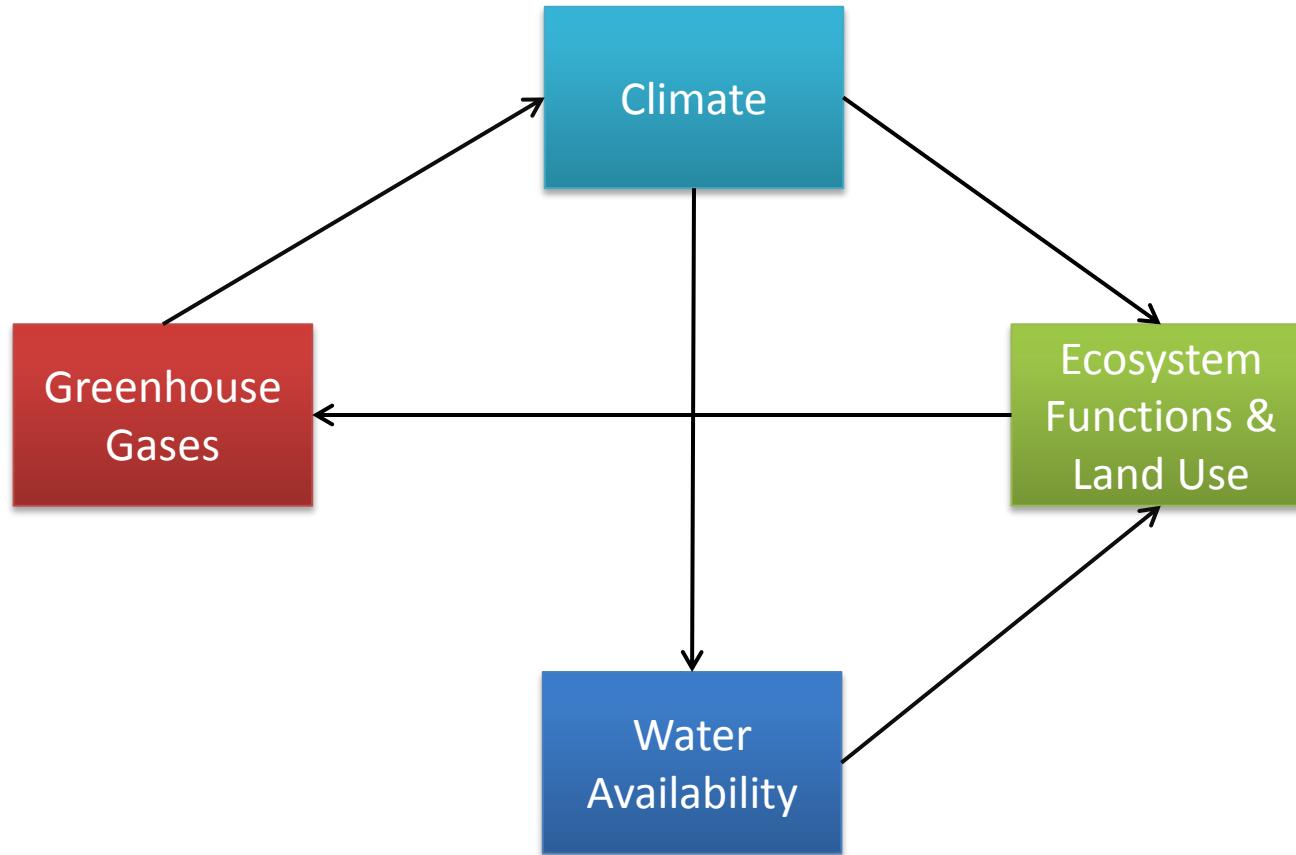


Effects of future climate scenarios on soil water availability and the carbon balance of managed grassland ecosystems in Tyrol

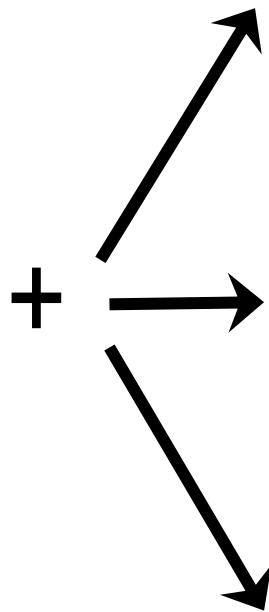
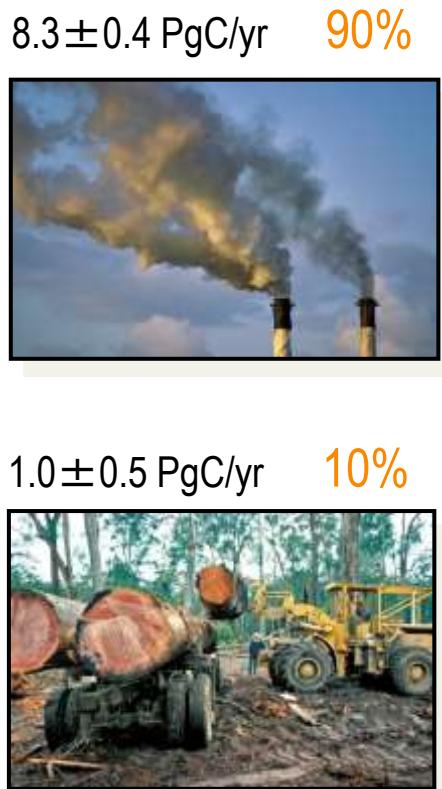


INTRODUCTION





INTRODUCTION | FATE OF ANTHROPOGENIC CO₂ EMISSIONS (2002-2011 average)



4.3±0.1 PgC/yr 46%

2.5±0.5 PgC/yr 26%

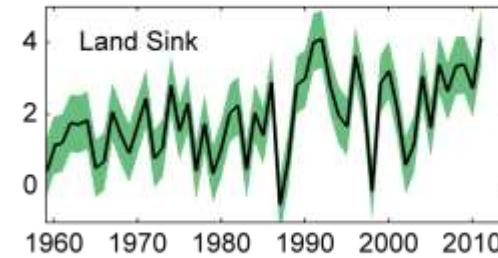
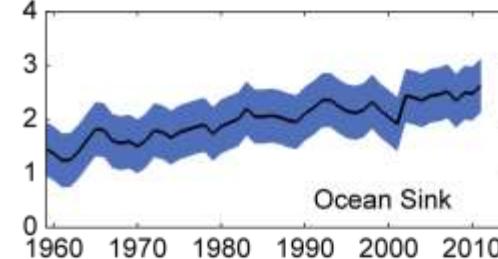
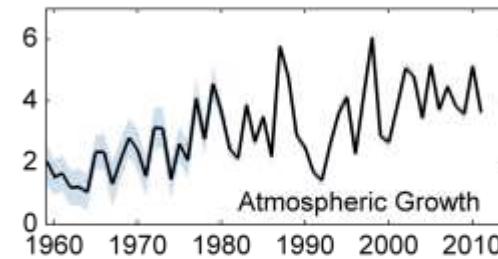
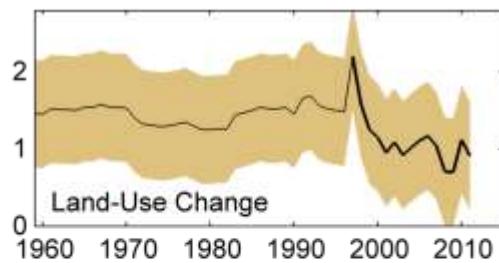
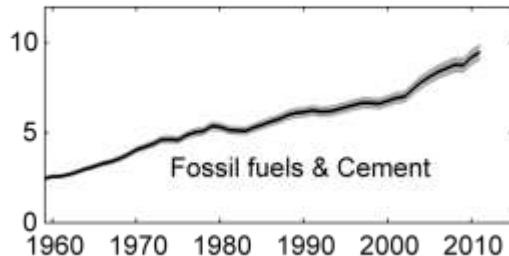
2.6±0.8 PgC/yr
RESIDUAL



Source: Le Quéré et al. 2012; Global Carbon Project 2012



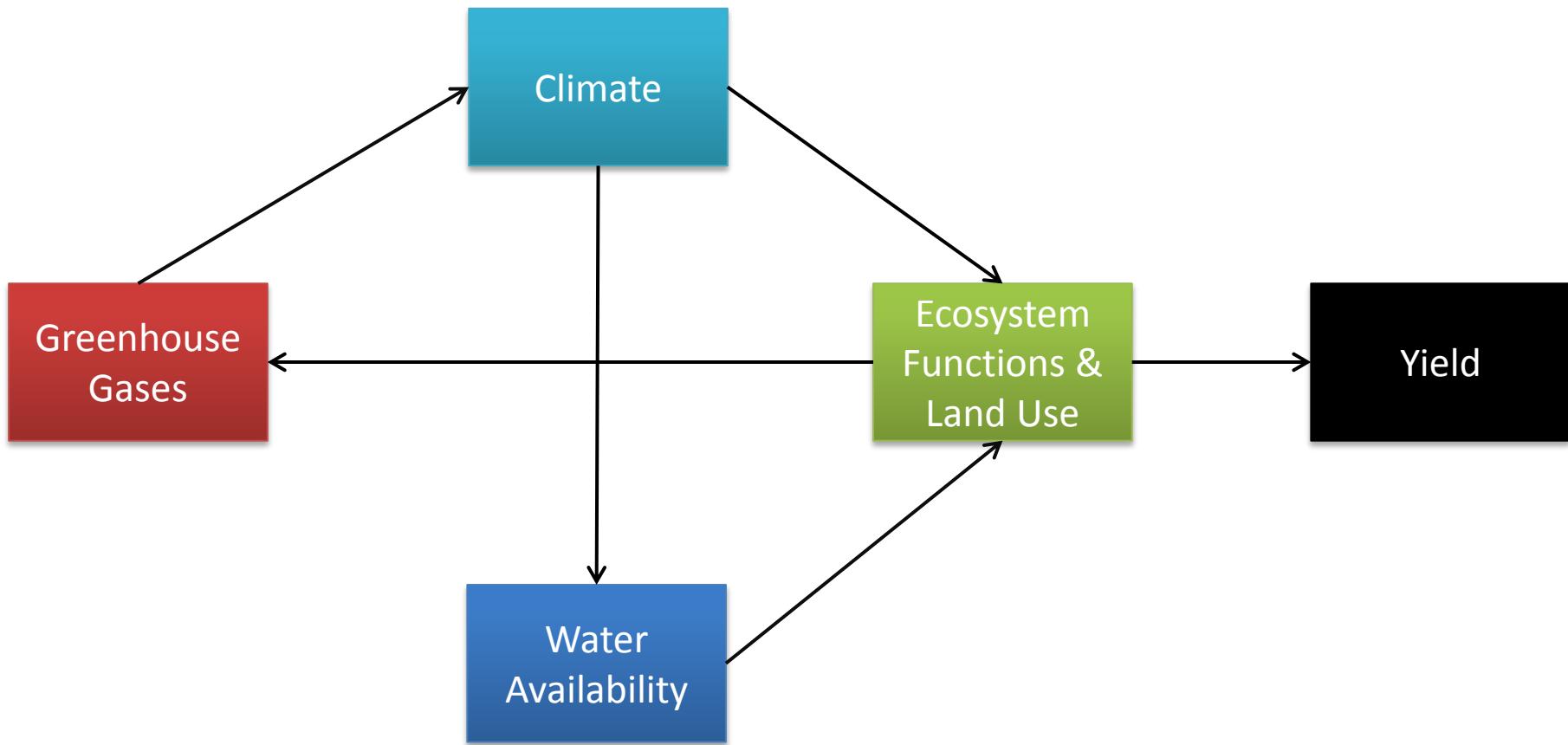
INTRODUCTION | CHANGES IN THE GLOBAL C-BUDGET OVER TIME



Source: Le Quéré et al. 2012; Global Carbon Project 2012

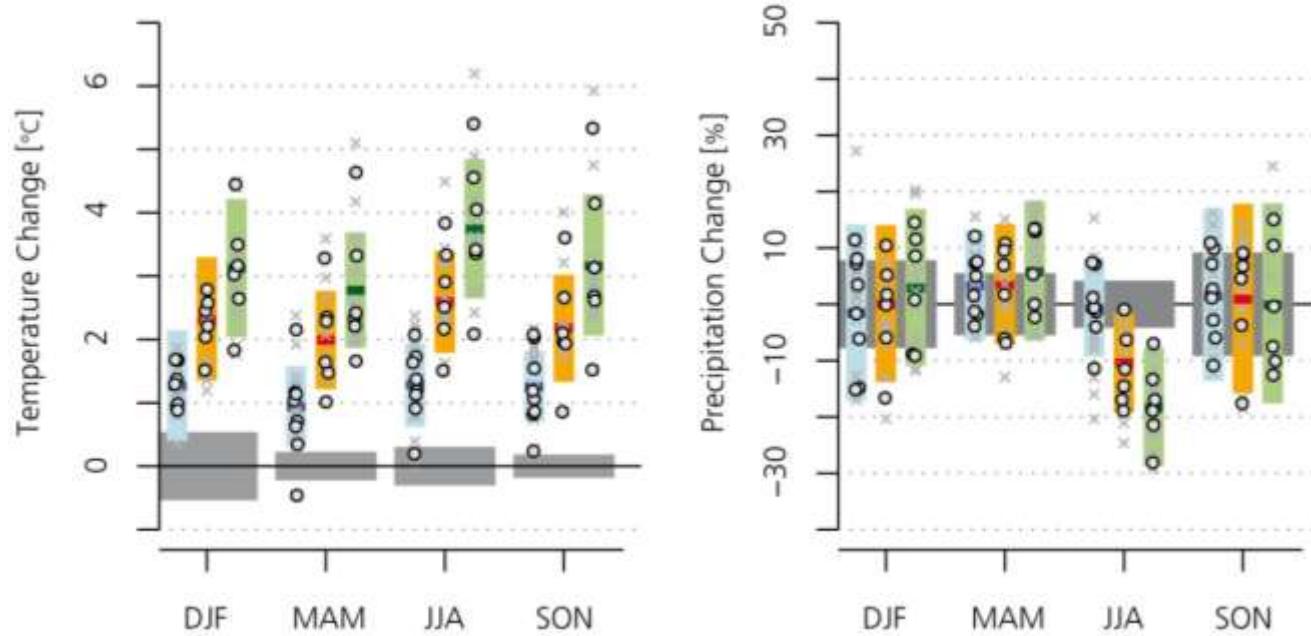


INTRODUCTION





Future Climate in the Alps (north-eastern Switzerland)

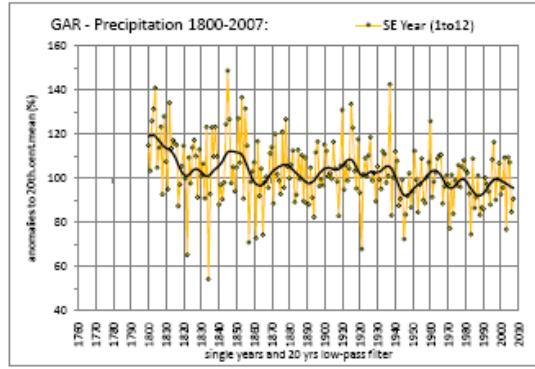
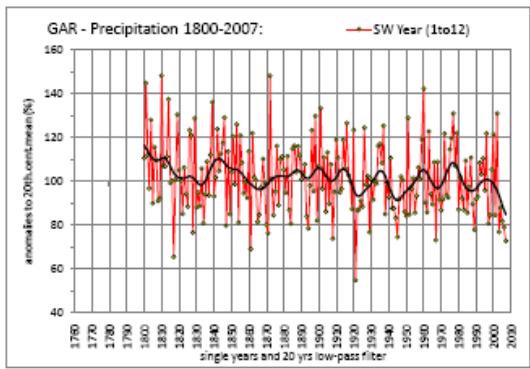
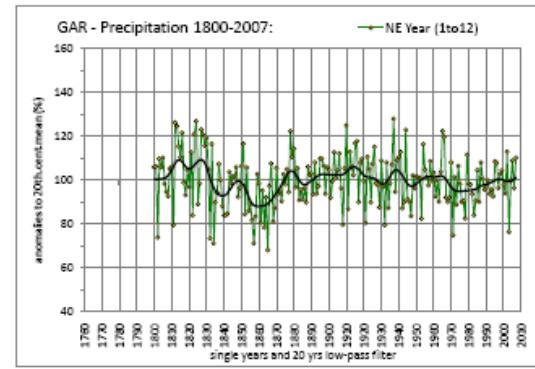
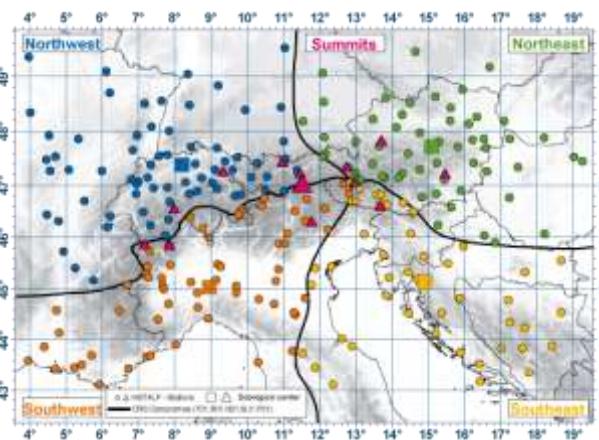
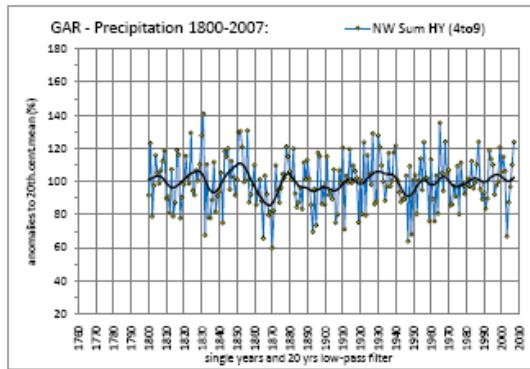


Reference period: 1980 – 2009 vs. 2020–2049, 2045–2074 and 2070–2099

CH2011 (2011), Swiss Climate Change Scenarios CH2011, published by C2SM, MeteoSwiss, ETH, NCCR Climate, and OcCC, Zurich, Switzerland, 88 pp. ISBN: 978-3-033-03065-7



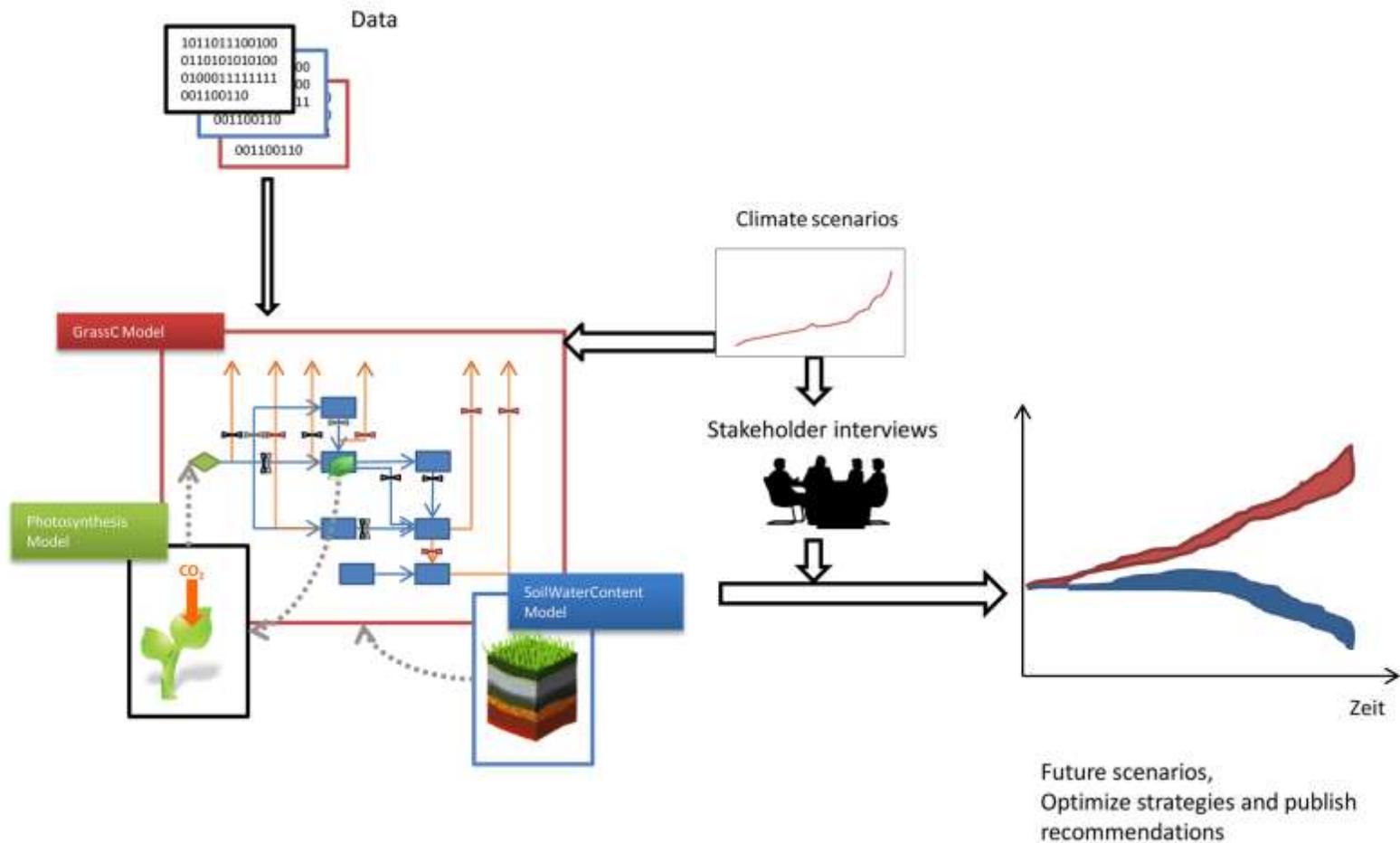
INTRODUCTION | RECENT TRENDS



<http://www.zamg.ac.at/histalp/>

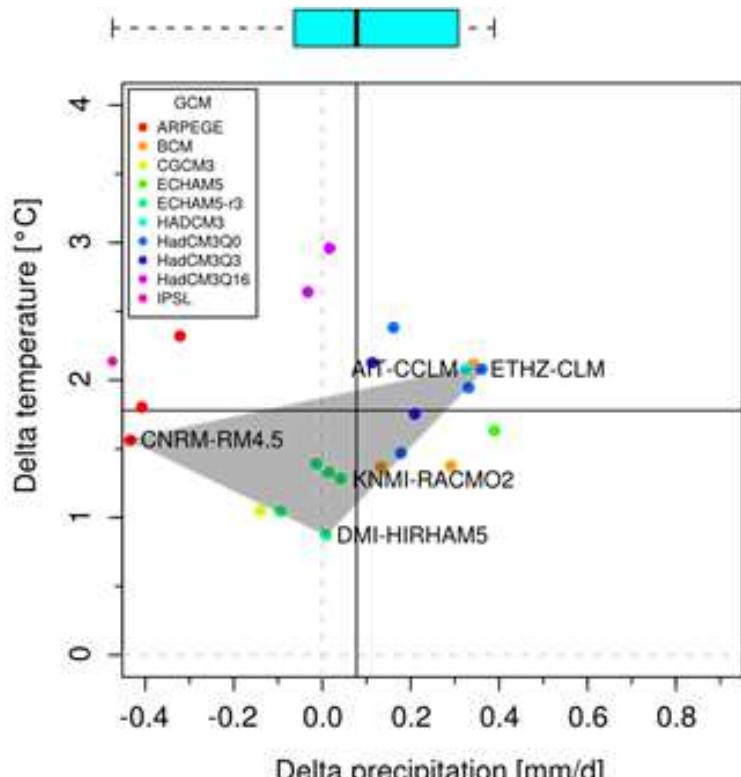


INTRODUCTION | STUDY CONCEPT

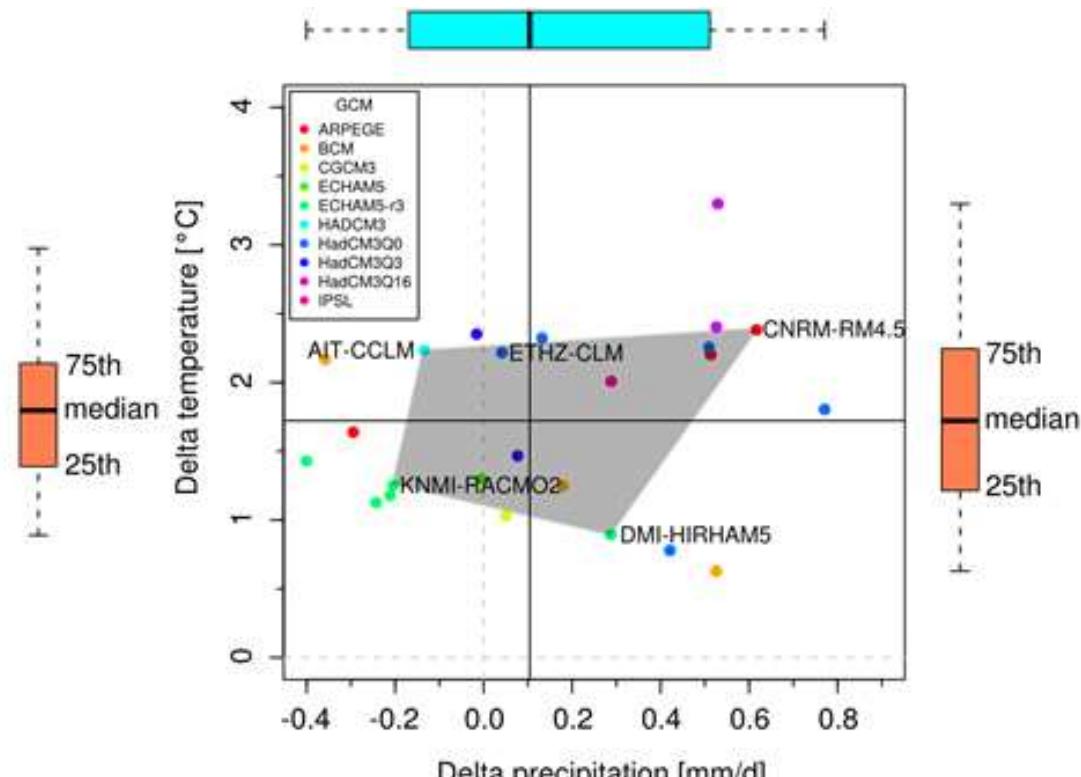




INTRODUCTION | CLIMATE SCENARIOS SELECTED



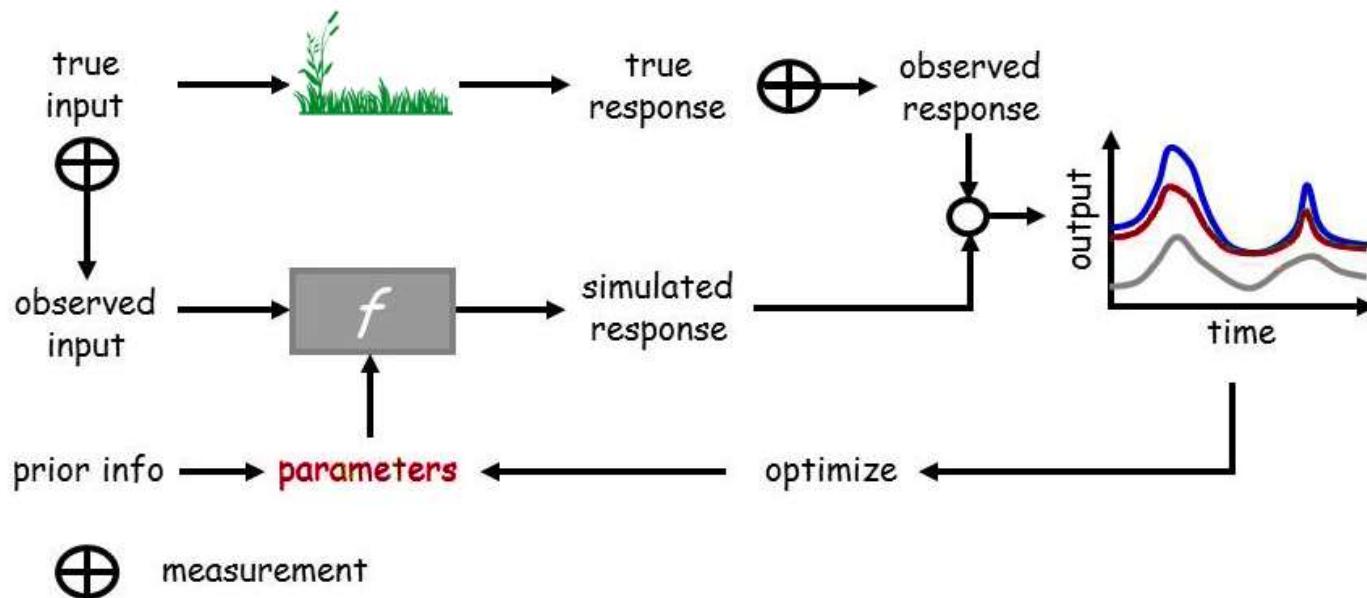
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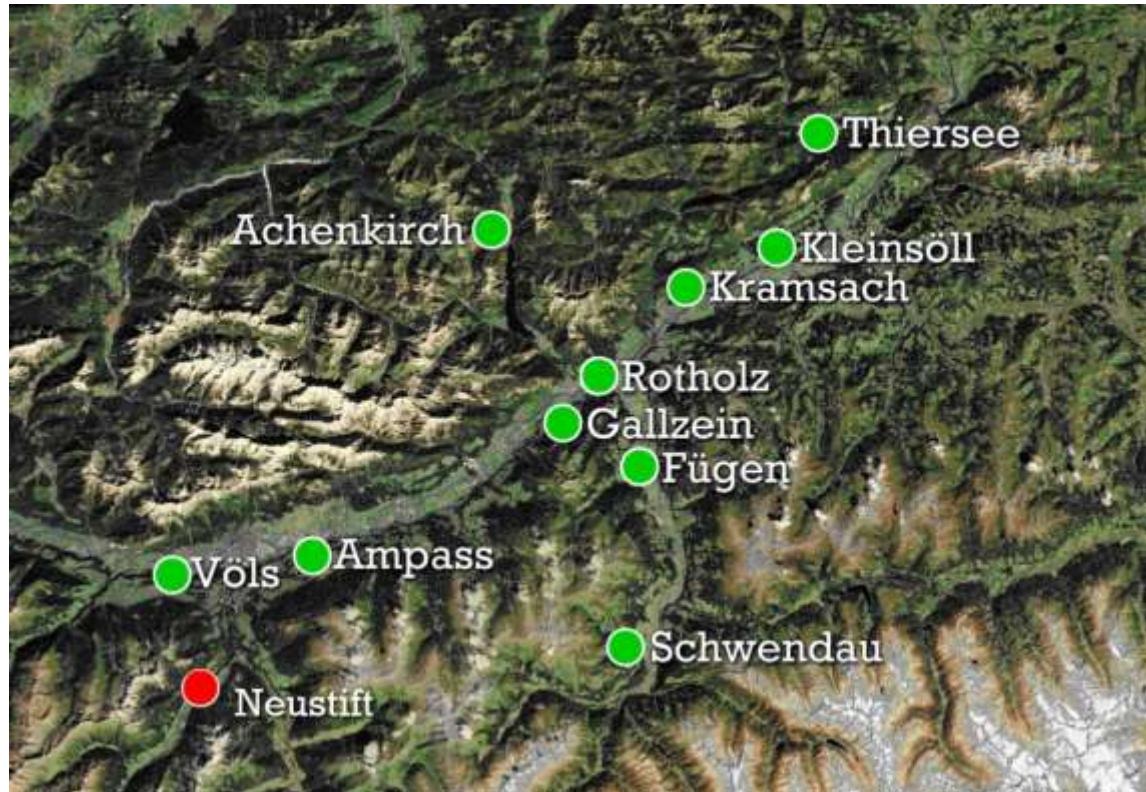
M A M J J A S O N

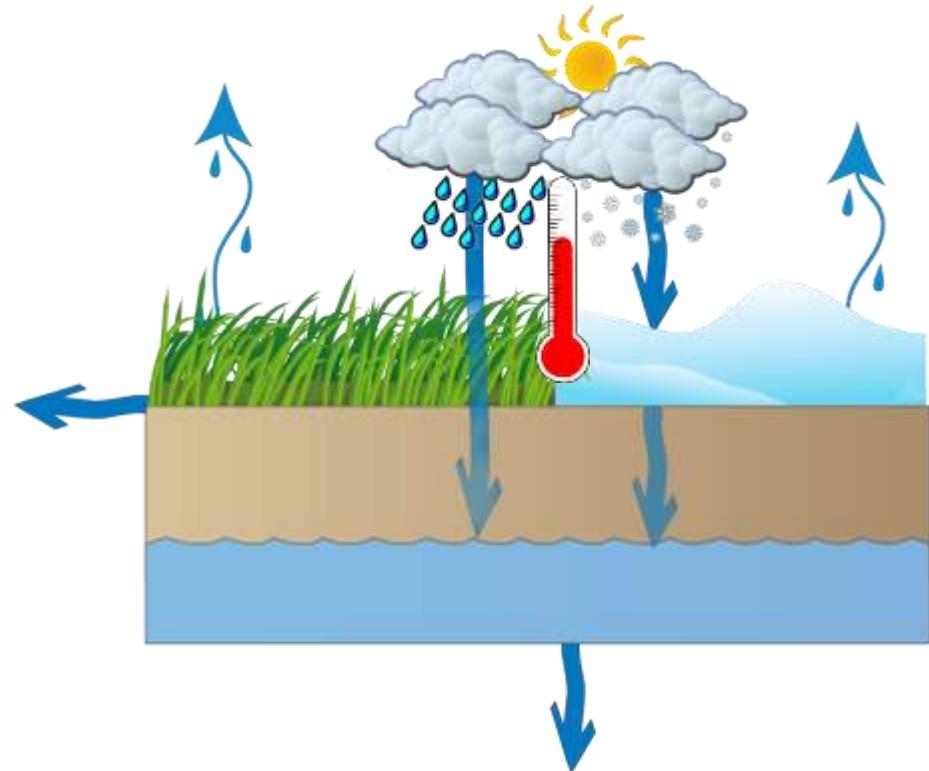
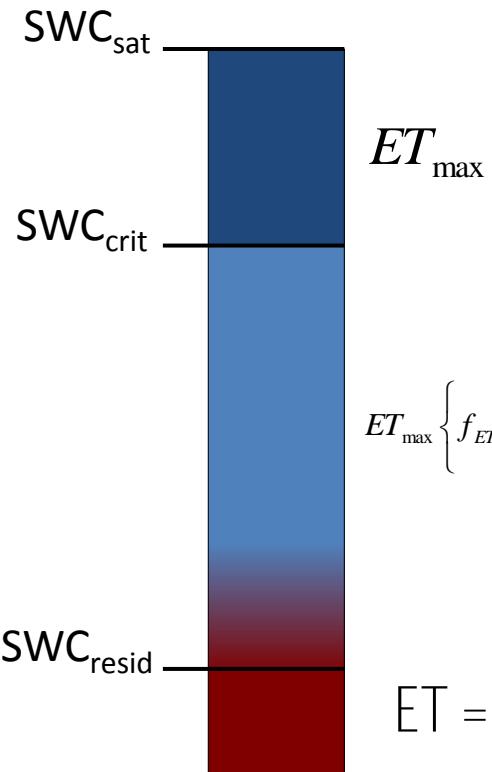


Calibration “Problem”



Vrugt, J. A., ter Braak, C. J. F., Clark, M. P., Hyman, J. M. & Robinson, B. A. Treatment of input uncertainty in hydrologic modeling: Doing hydrology backward with Markov chain Monte Carlo simulation. *Water Resour Res* **44** (2008) (modified)

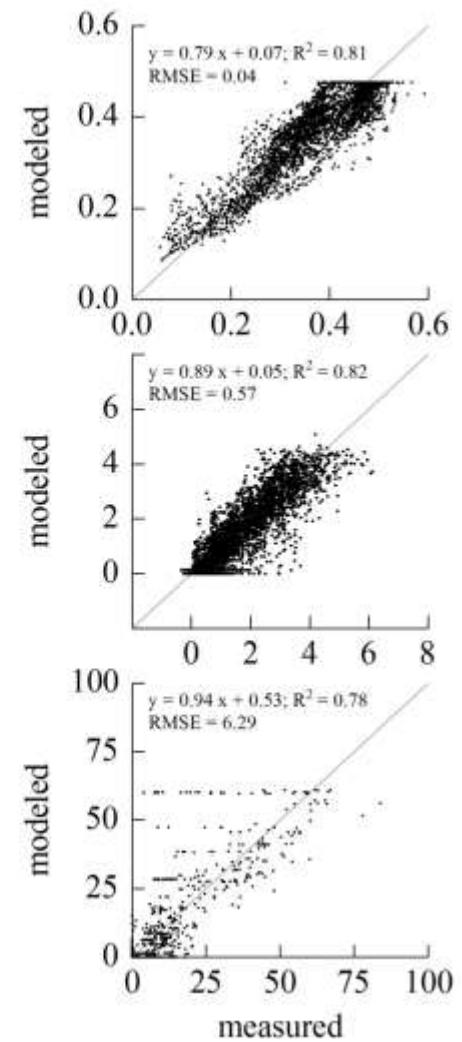
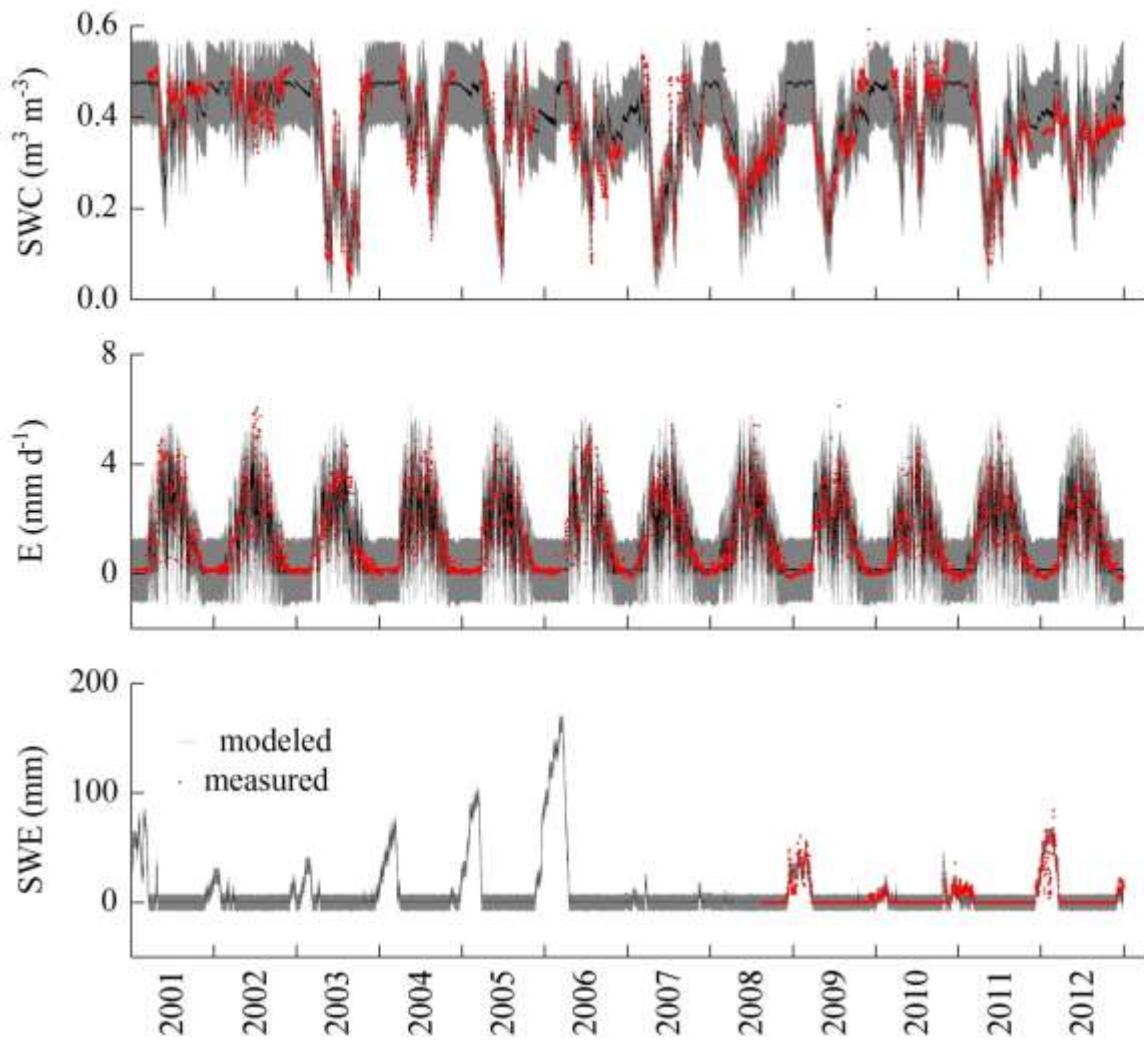




Developed by Pierluigi Calanca, Forschungsanstalt Agroscope Reckenholz-Tänikon ART, Zürich (CH)

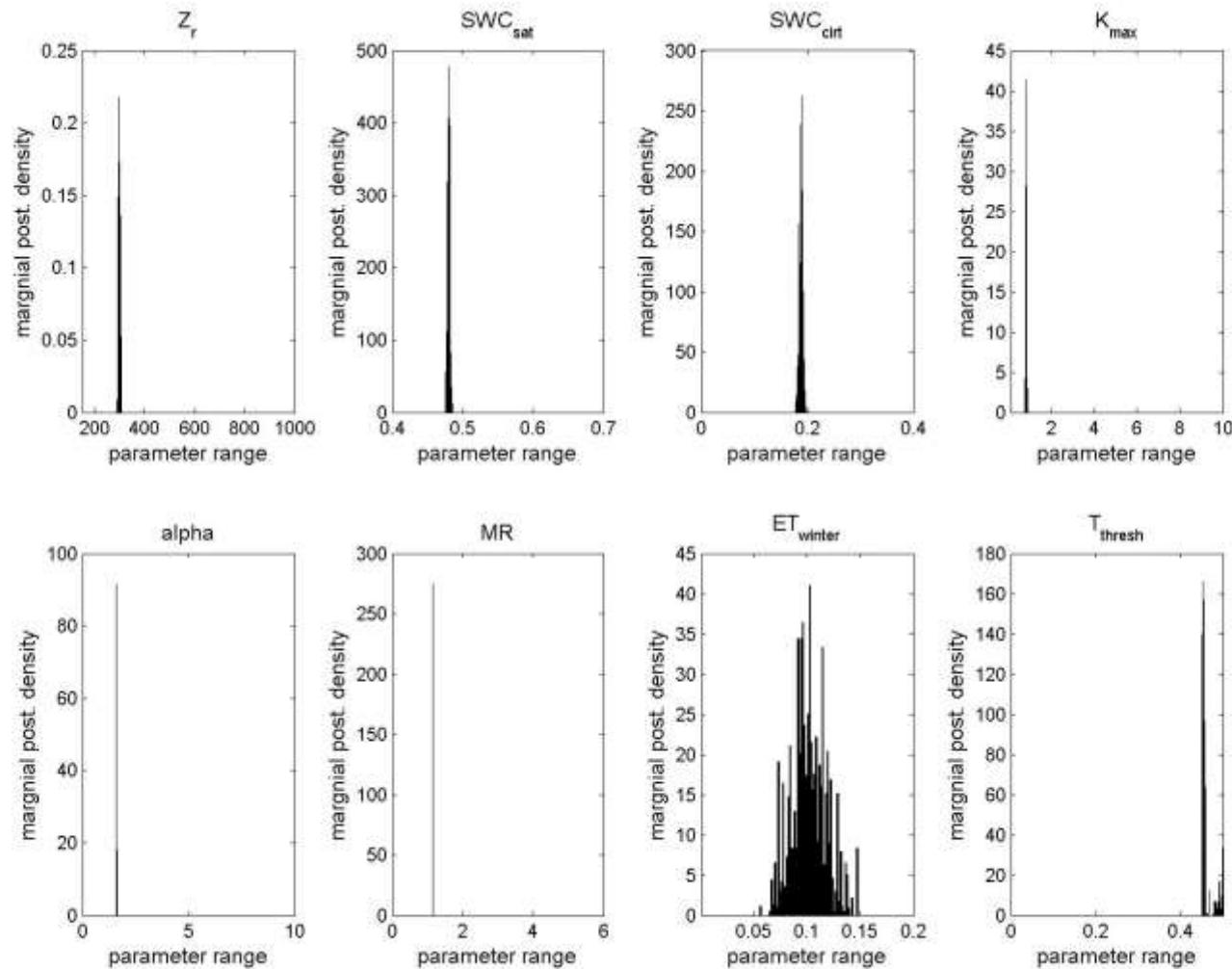


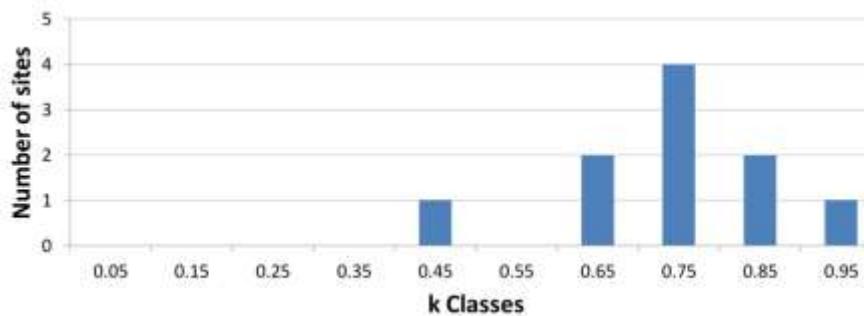
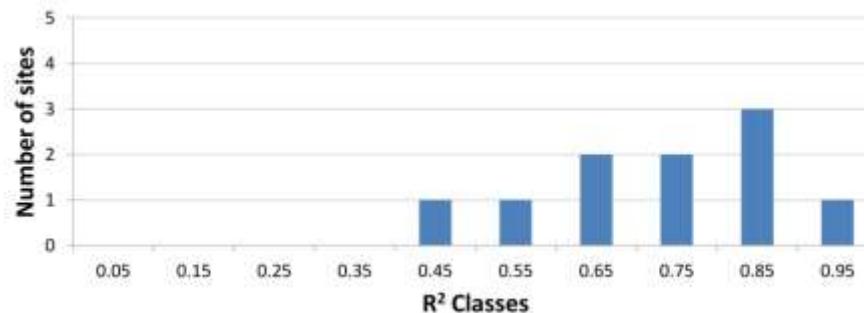
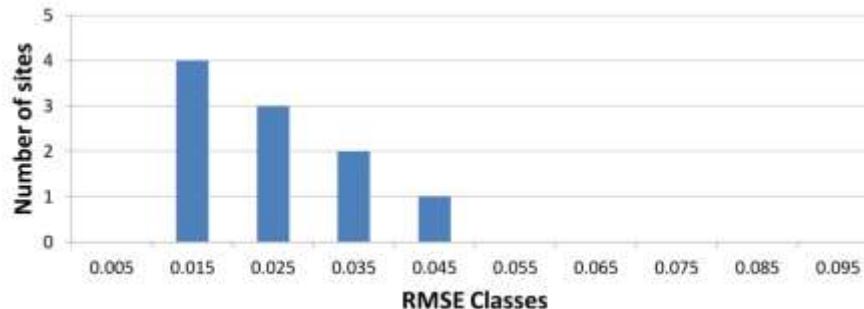
SOIL-BUCKET | PERFORMANCE

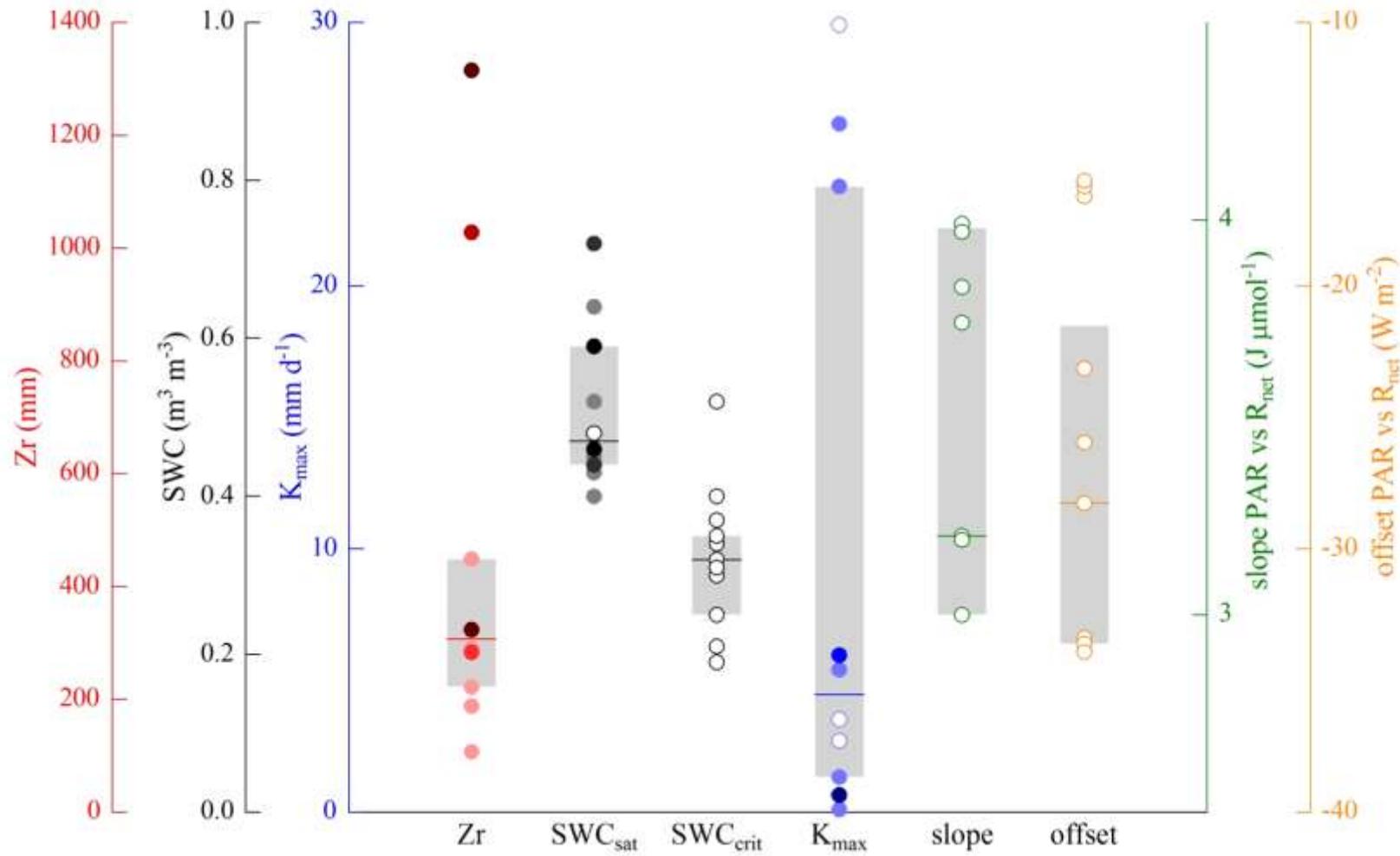




SOIL-BUCKET | PARAMETER ESTIMATES

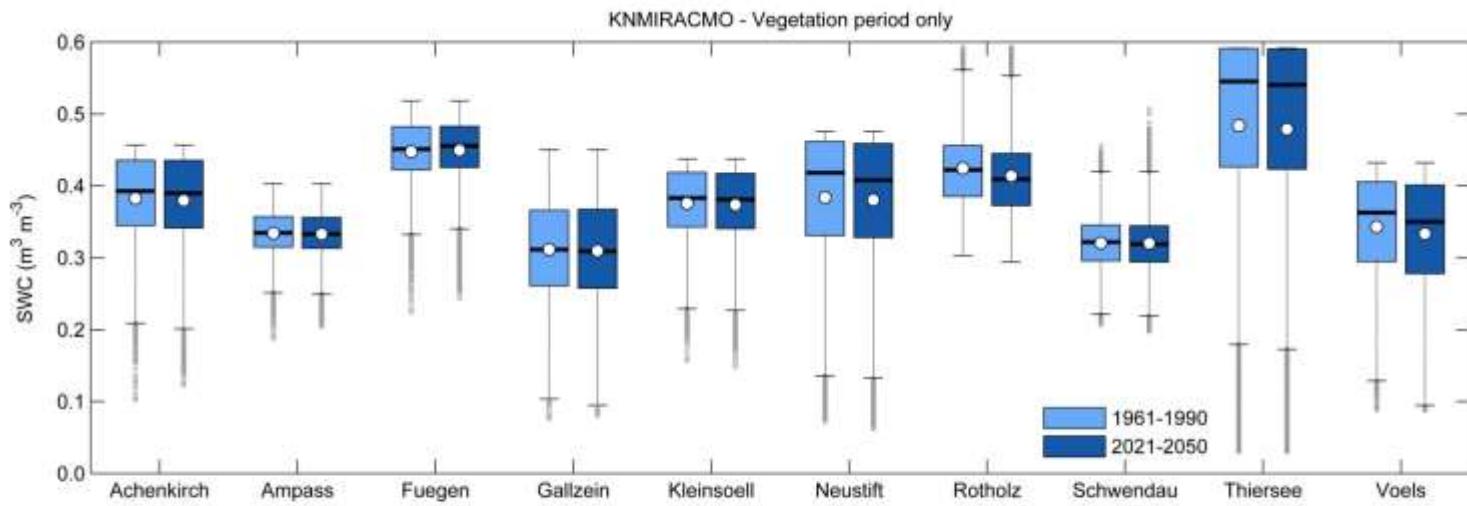
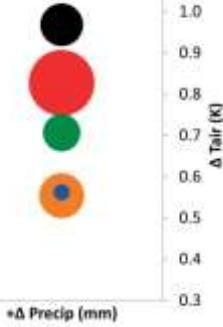




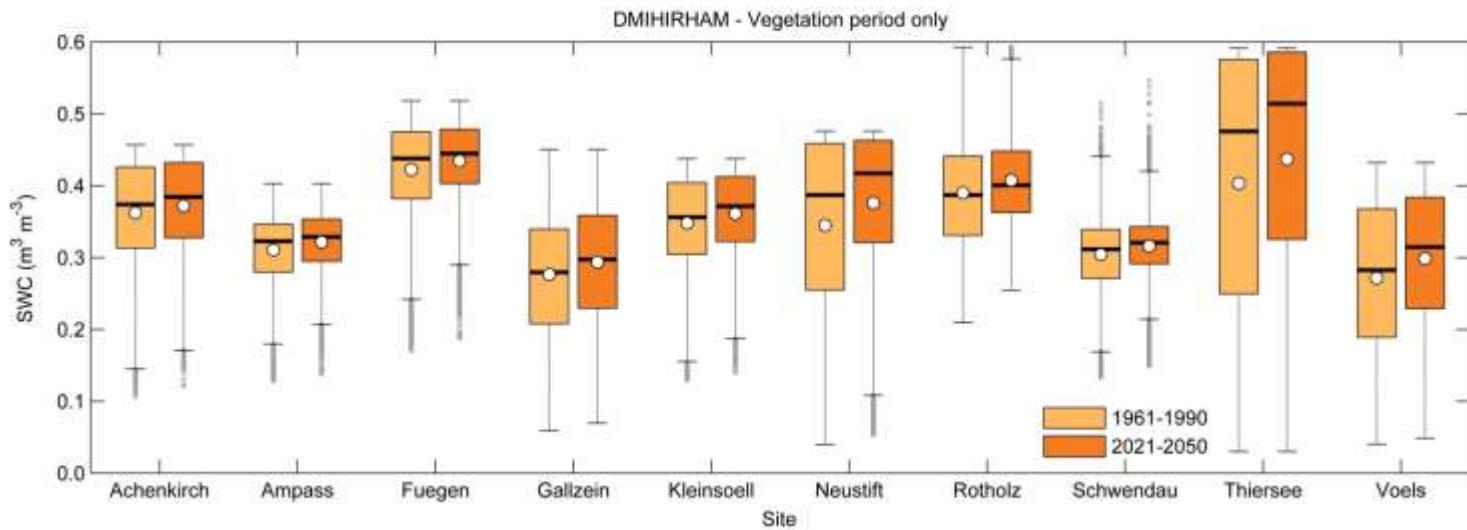




SOIL-BUCKET | SCENARIOS

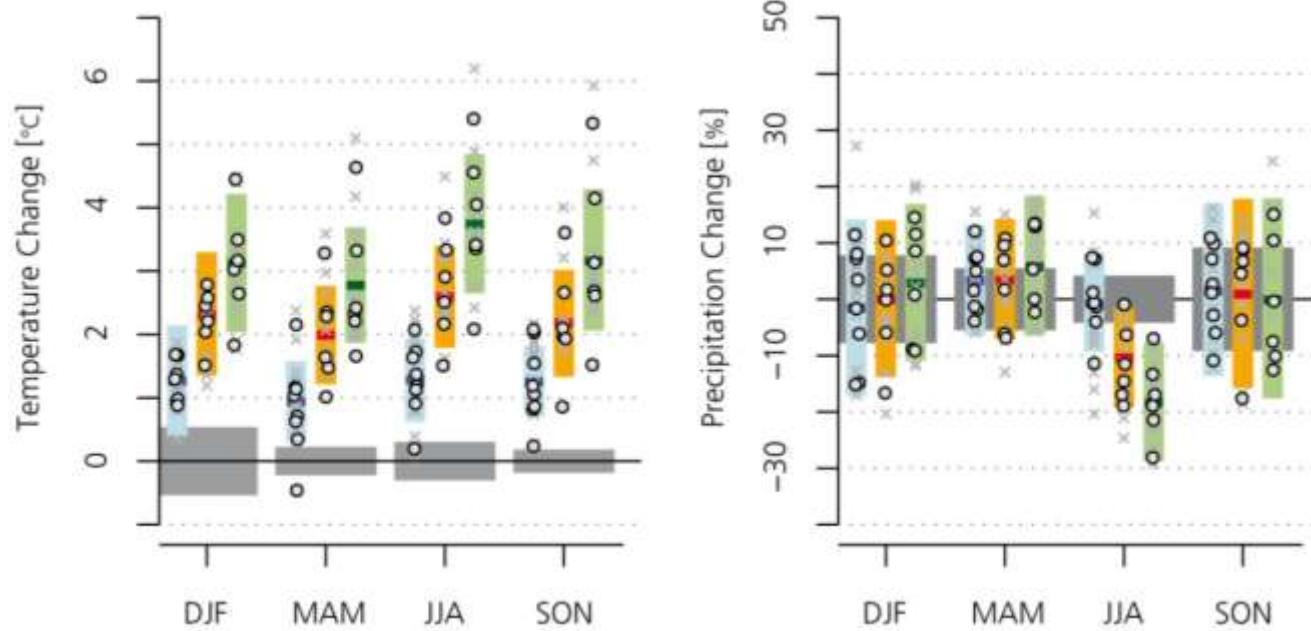


ETHZCLM
CNRMCM4.5
AITCCLM
DMIHIRHAM
KNMIRACMO





Future Climate in the Alps

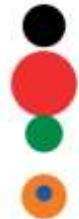


Reference period: 1980 – 2009 vs. 2020–2049, 2045–2074 and 2070–2099

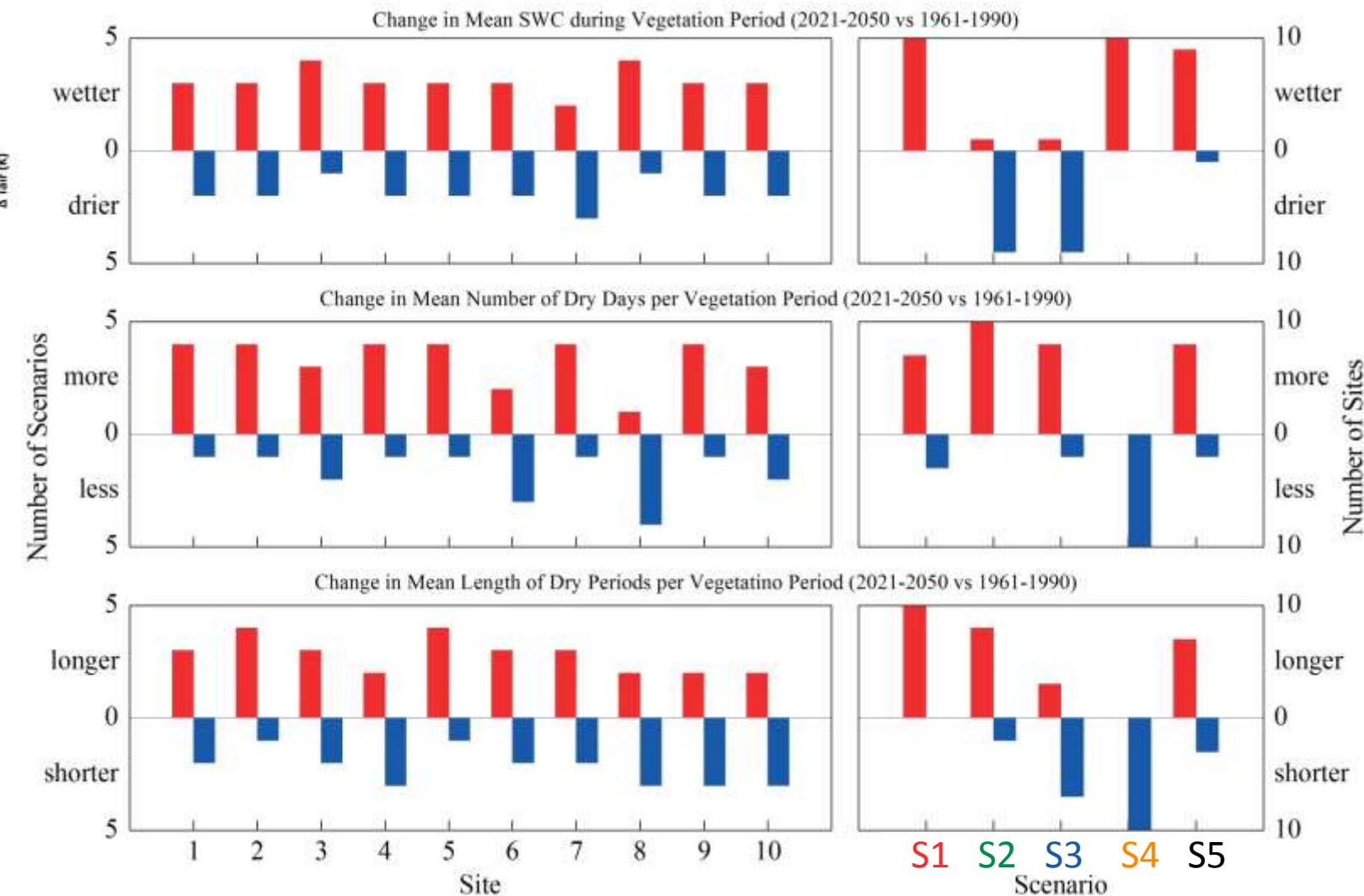
CH2011 (2011), Swiss Climate Change Scenarios CH2011, published by C2SM, MeteoSwiss, ETH, NCCR Climate, and OcCC, Zurich, Switzerland, 88 pp. ISBN: 978-3-033-03065-7



SOIL-BUCKET | CHANGES IN SWC

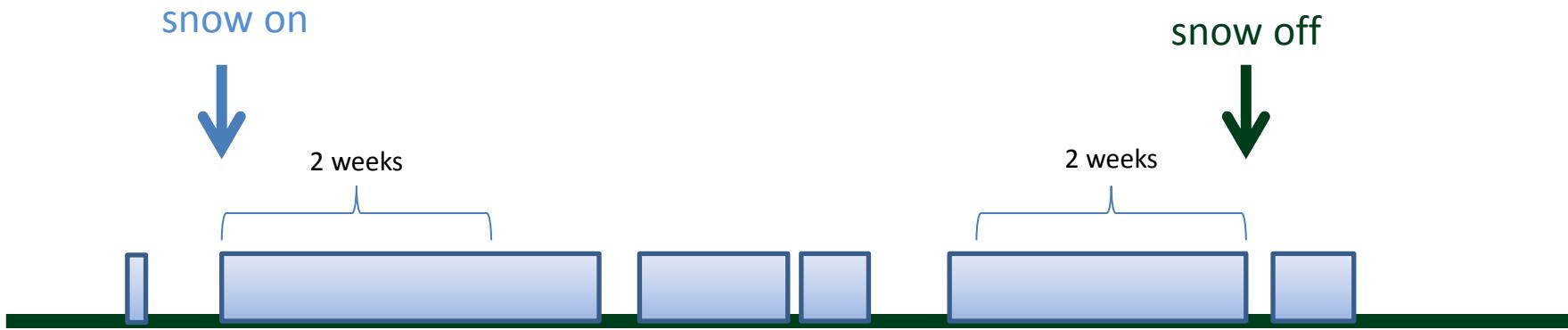


+Δ Precip (mm)
ETHZCLM
CNRMCM4.5
AITCCLM
DMIHIRHAM
KNMIRACMO



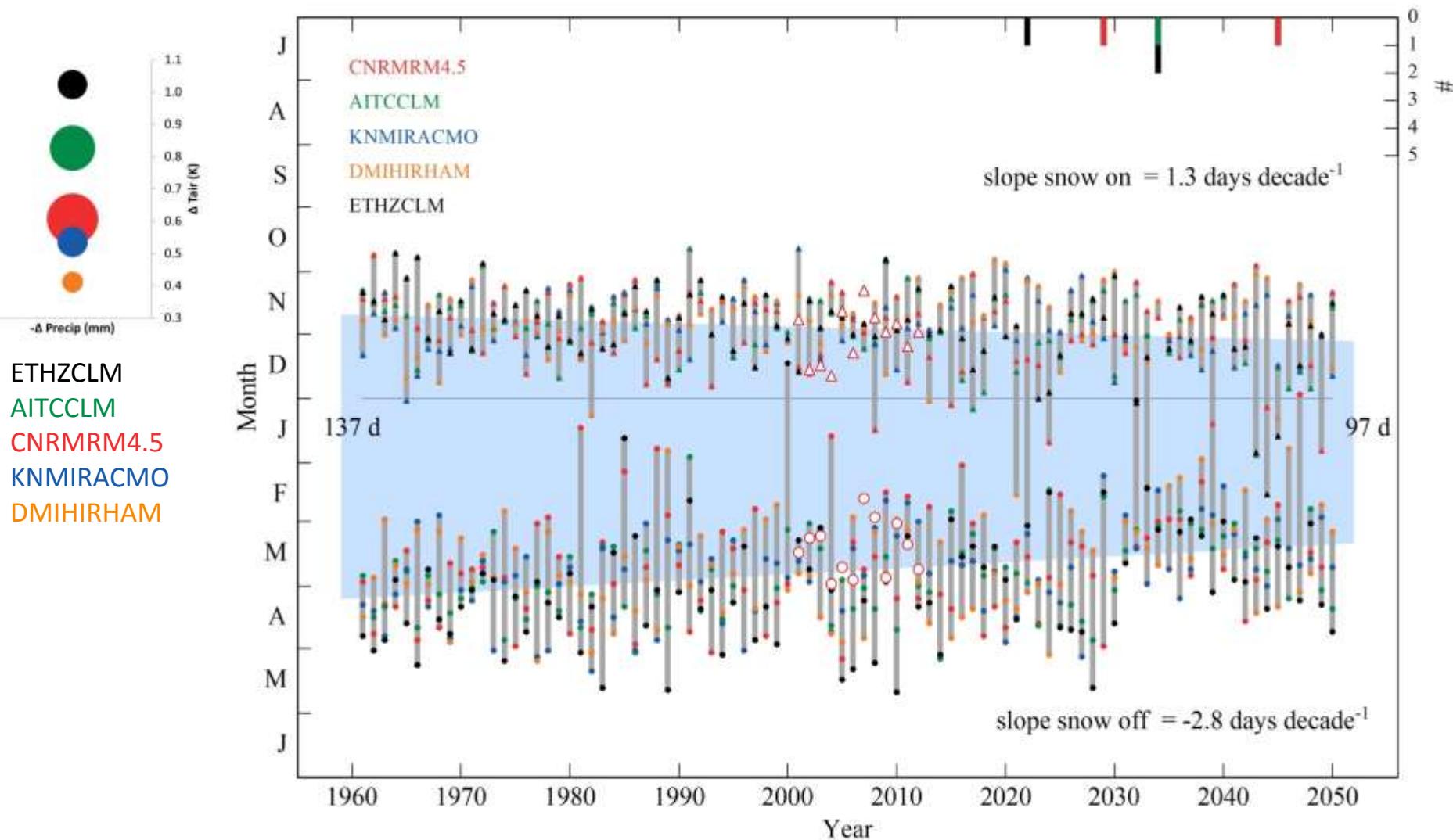


SOIL-BUCKET | SNOW COVER DURATION



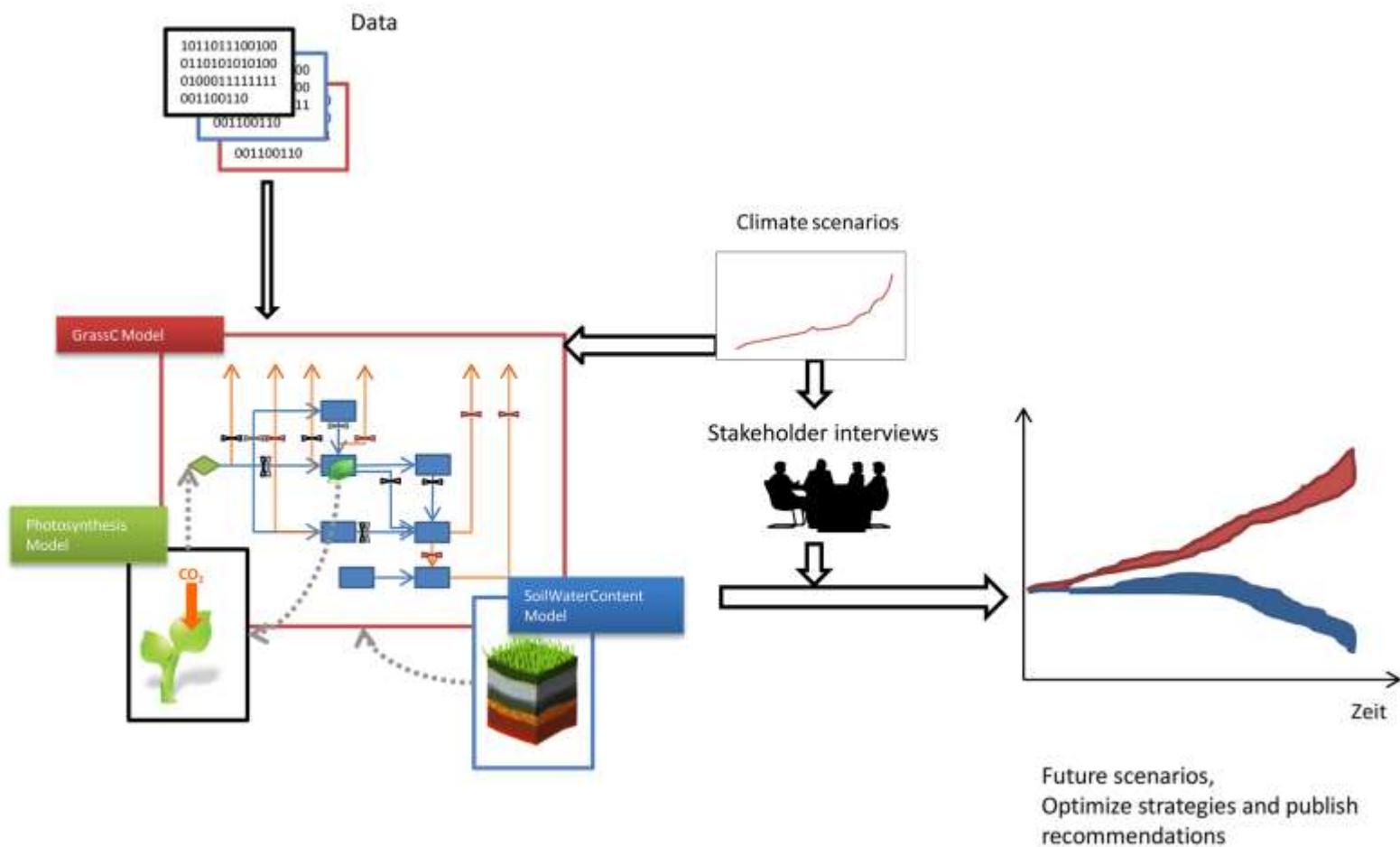


SOIL-BUCKET | SNOW COVER DURATION



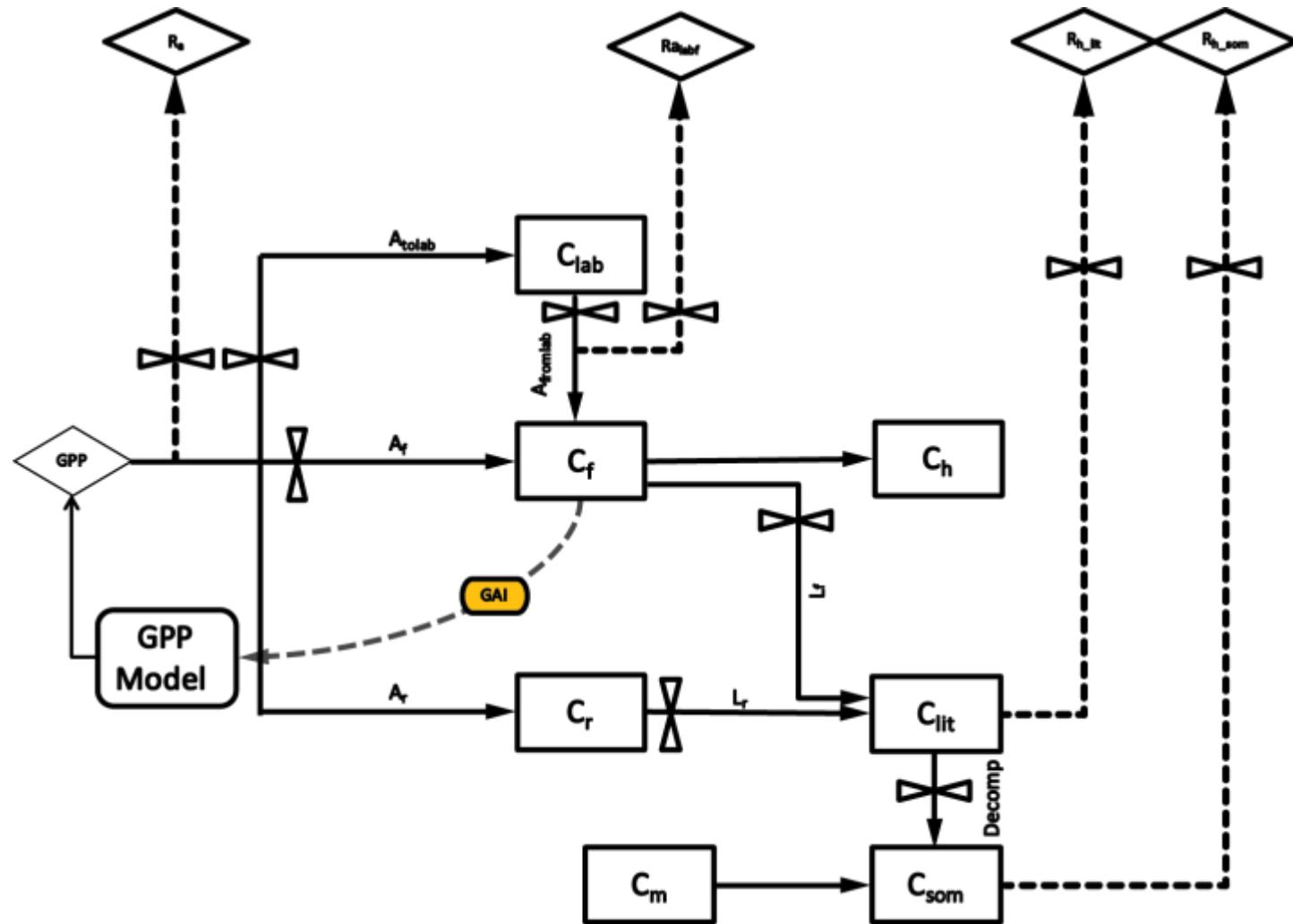


GRASS-C MODEL



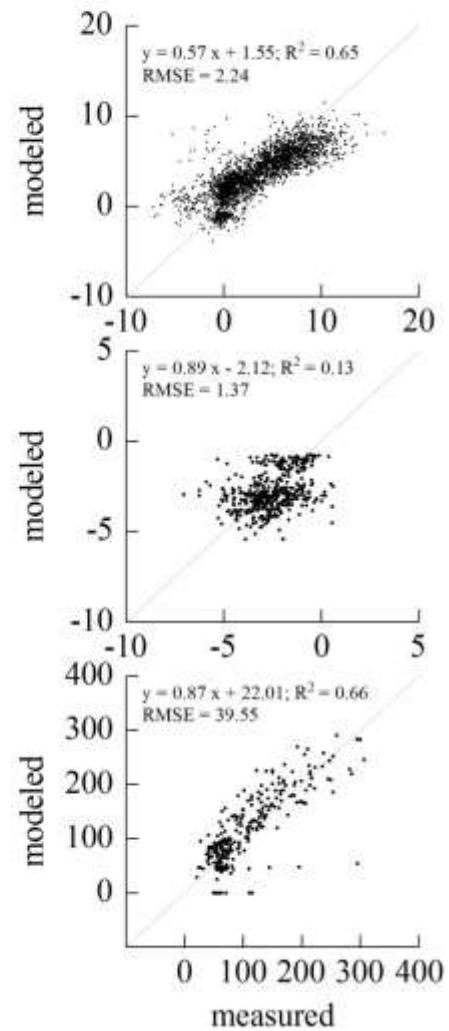
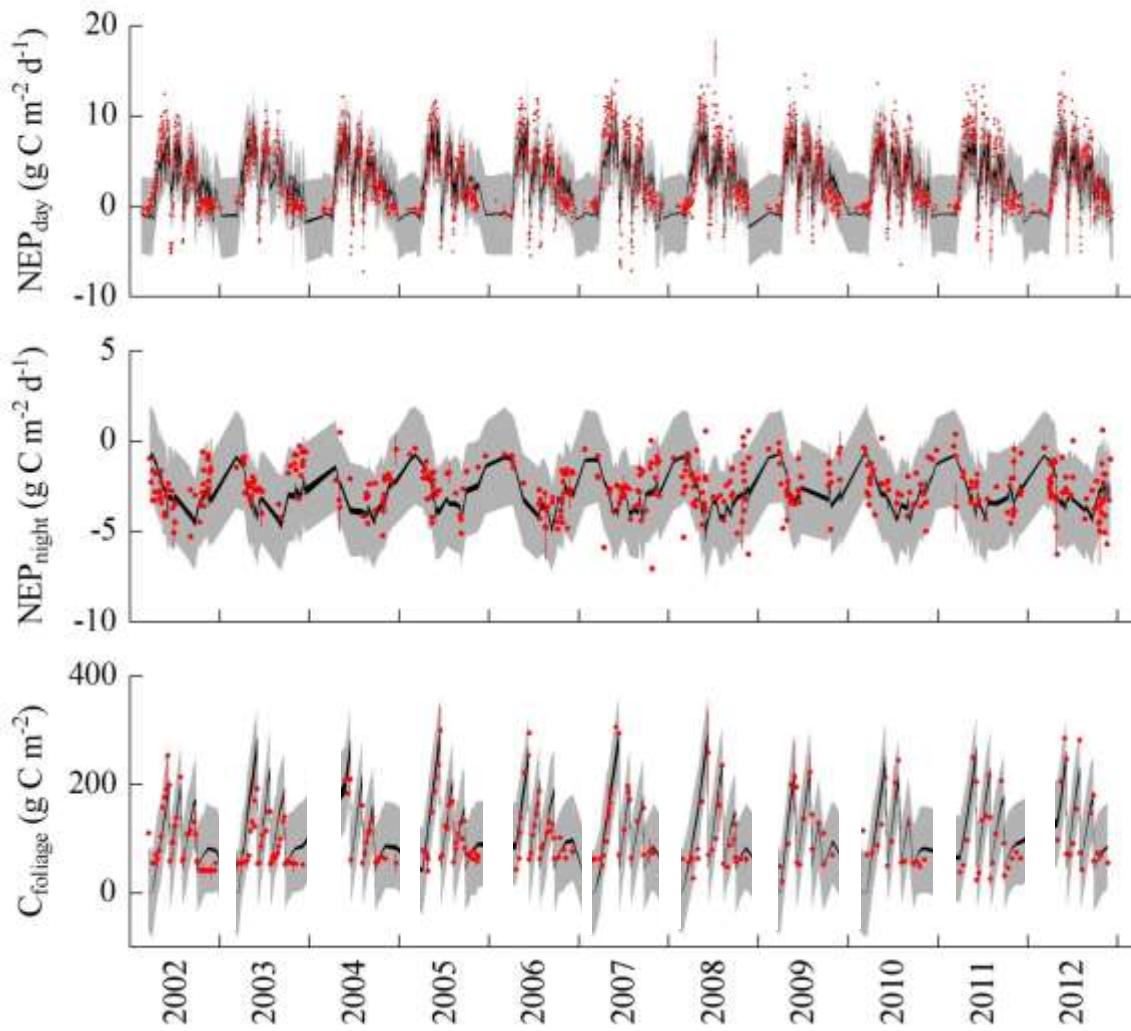


GRASS-C MODEL



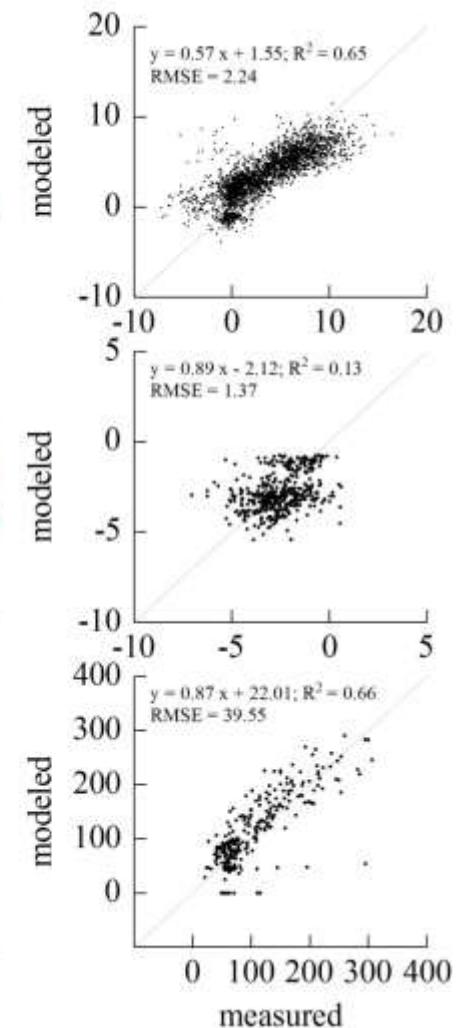
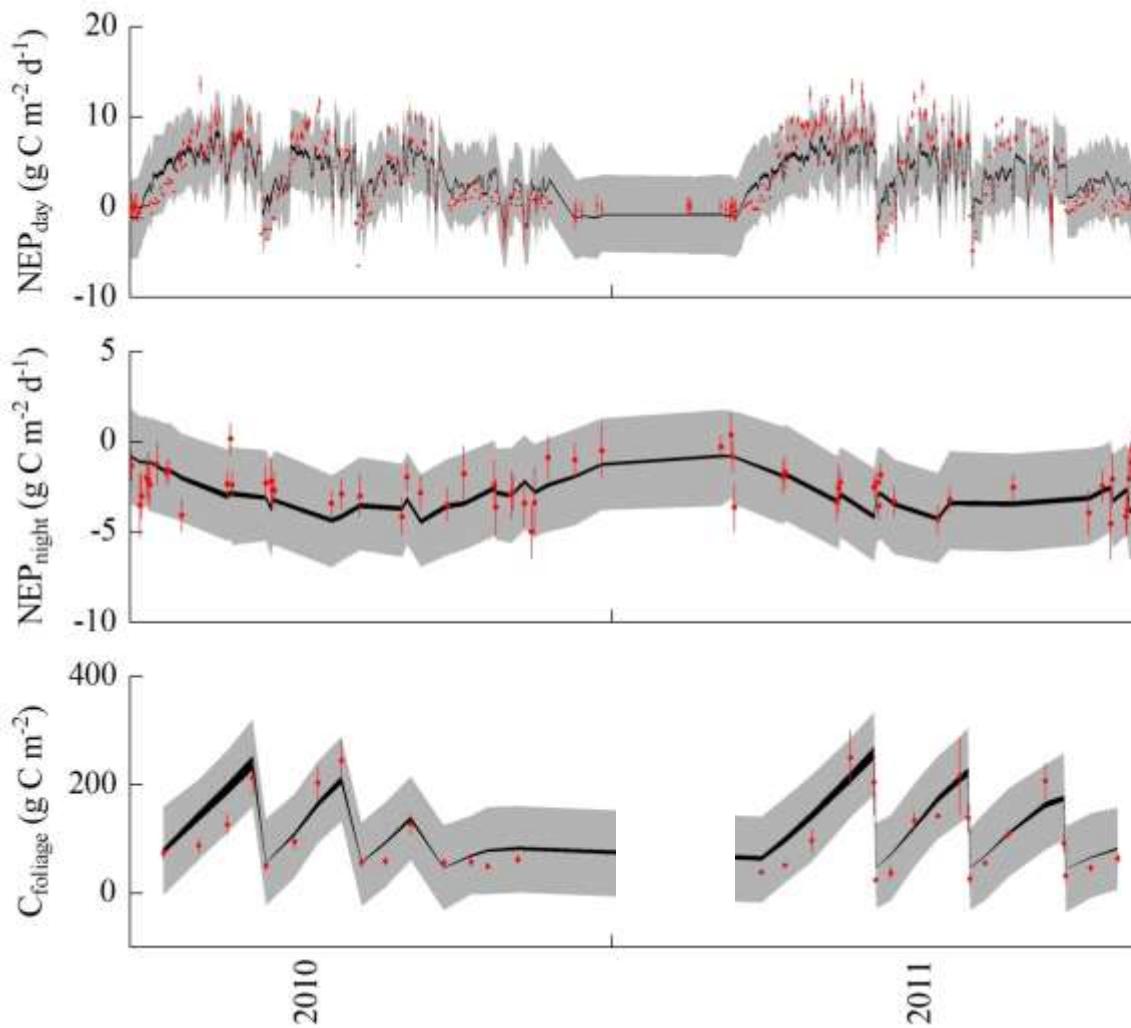


GRASS-C MODEL | PERFORMANCE



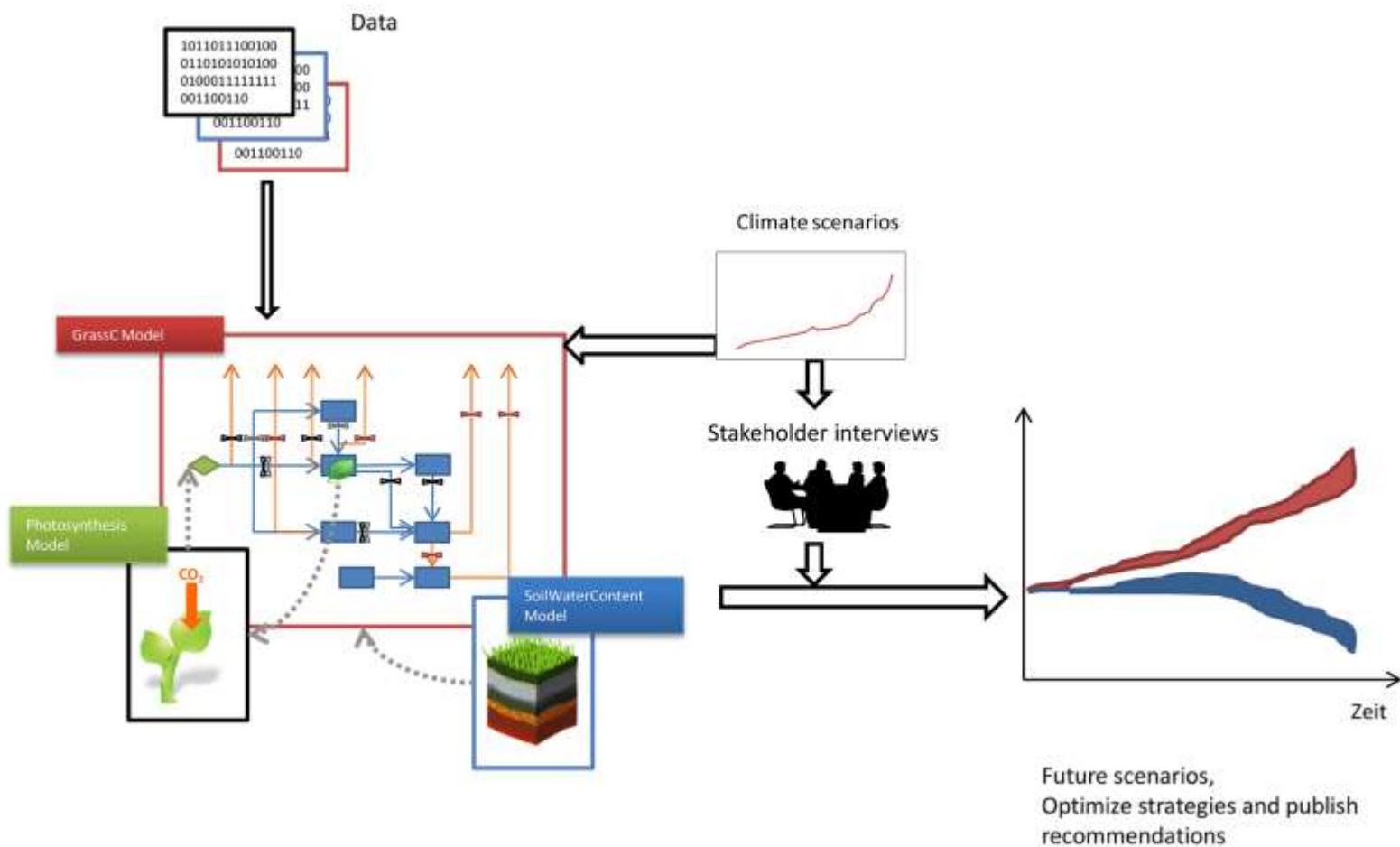


GRASS-C MODEL | PERFORMANCE



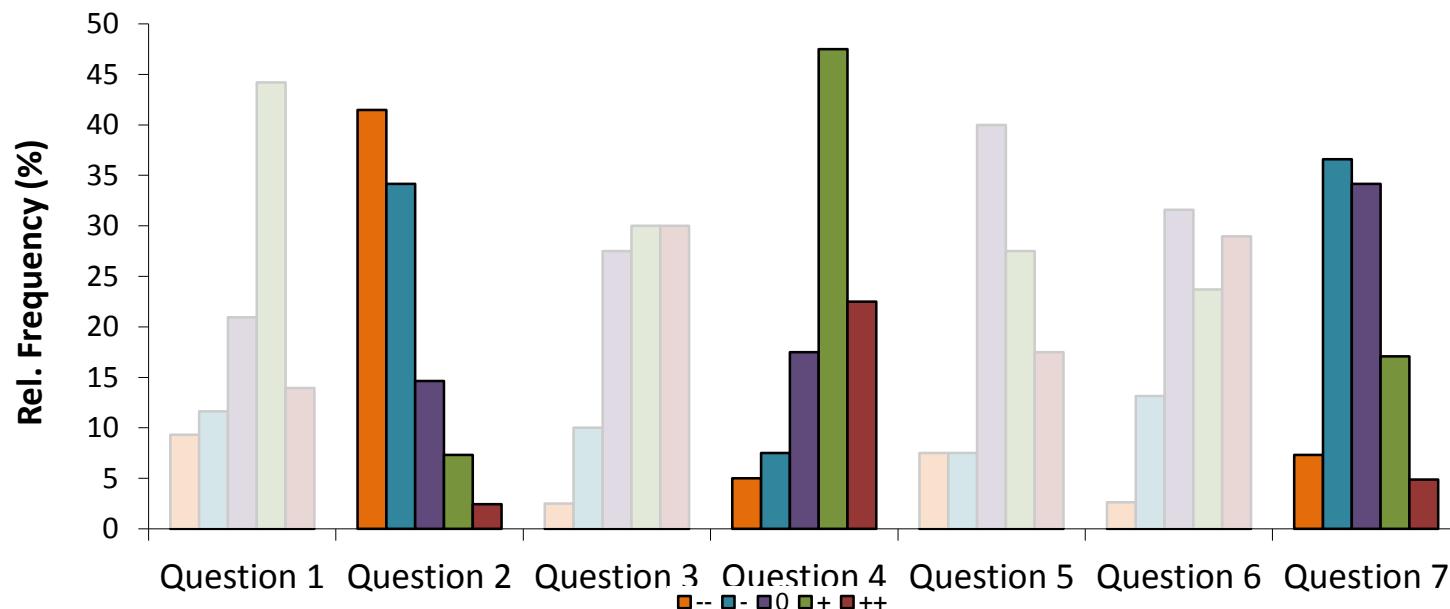


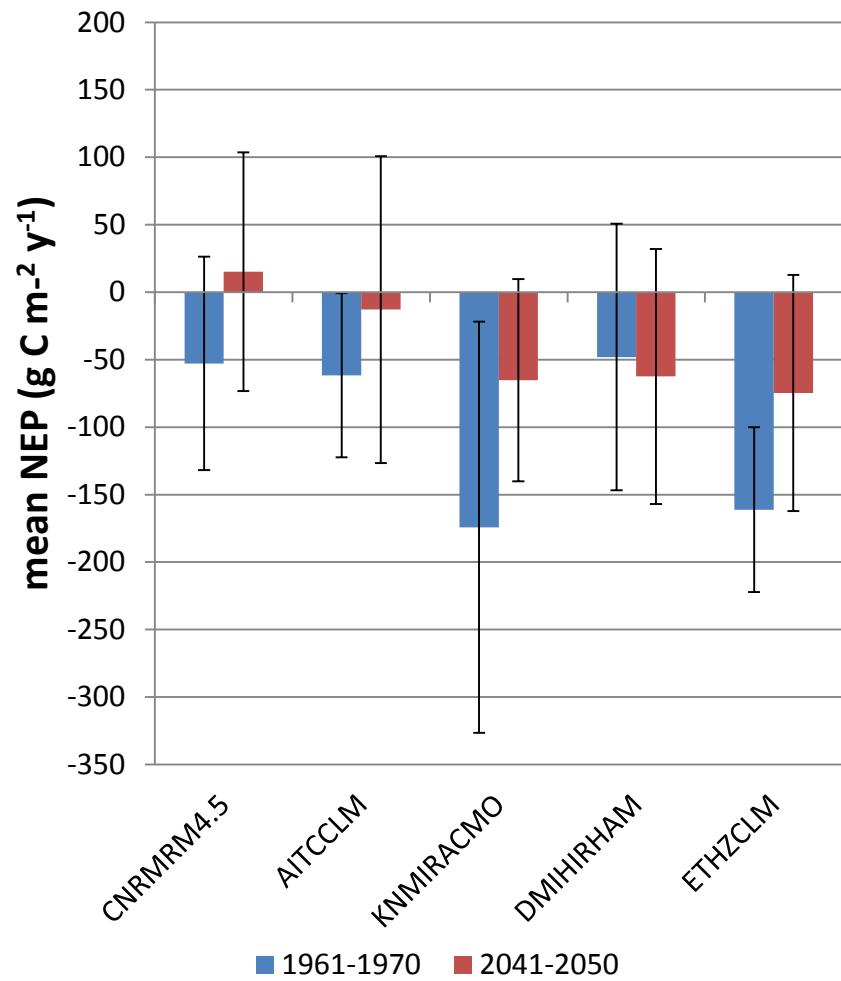
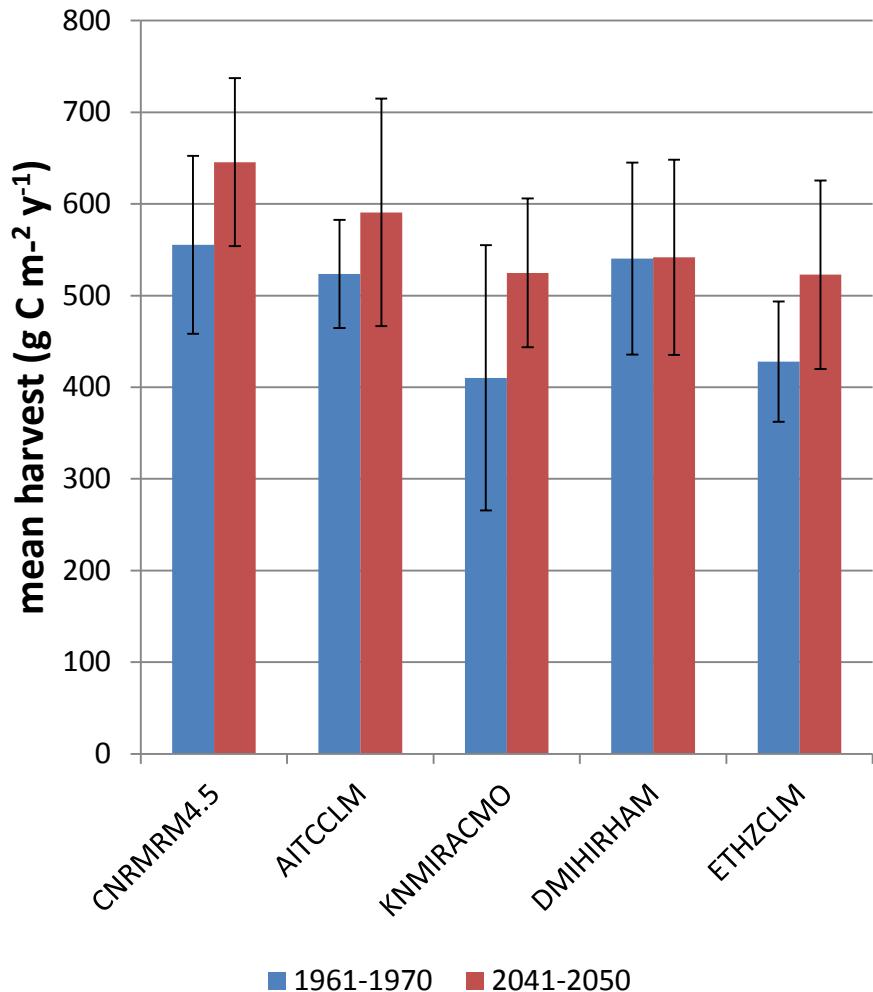
GRASS-C MODEL

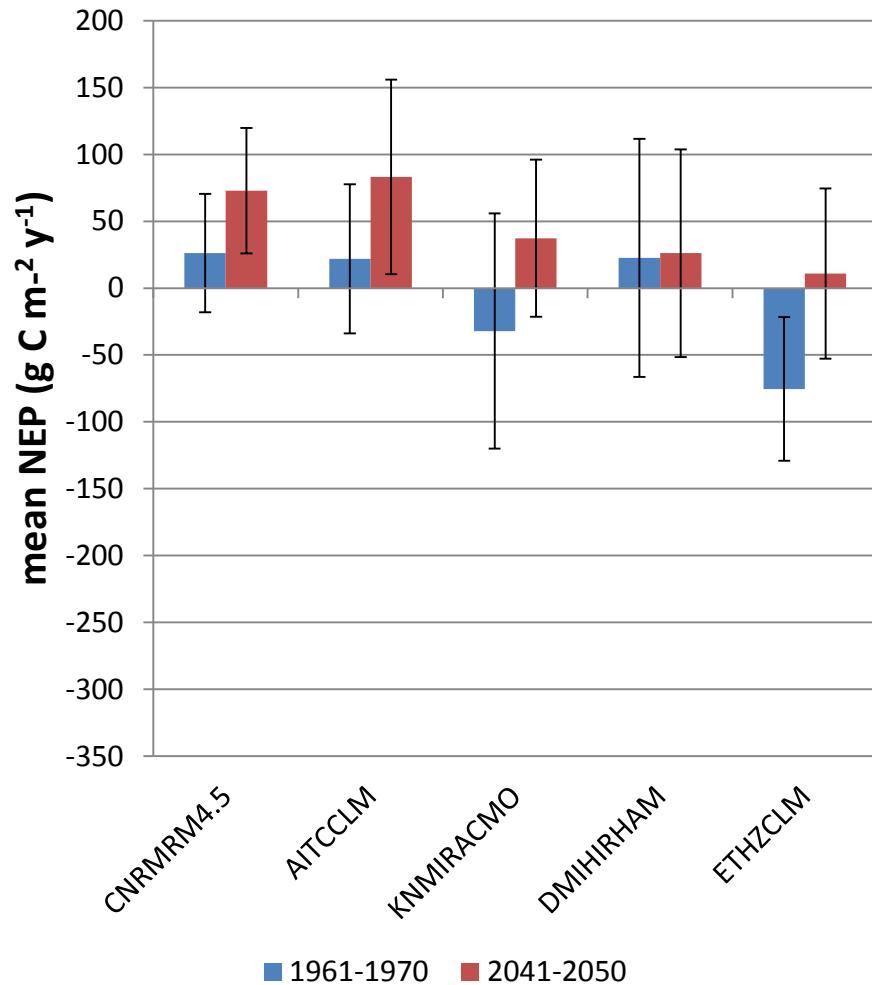
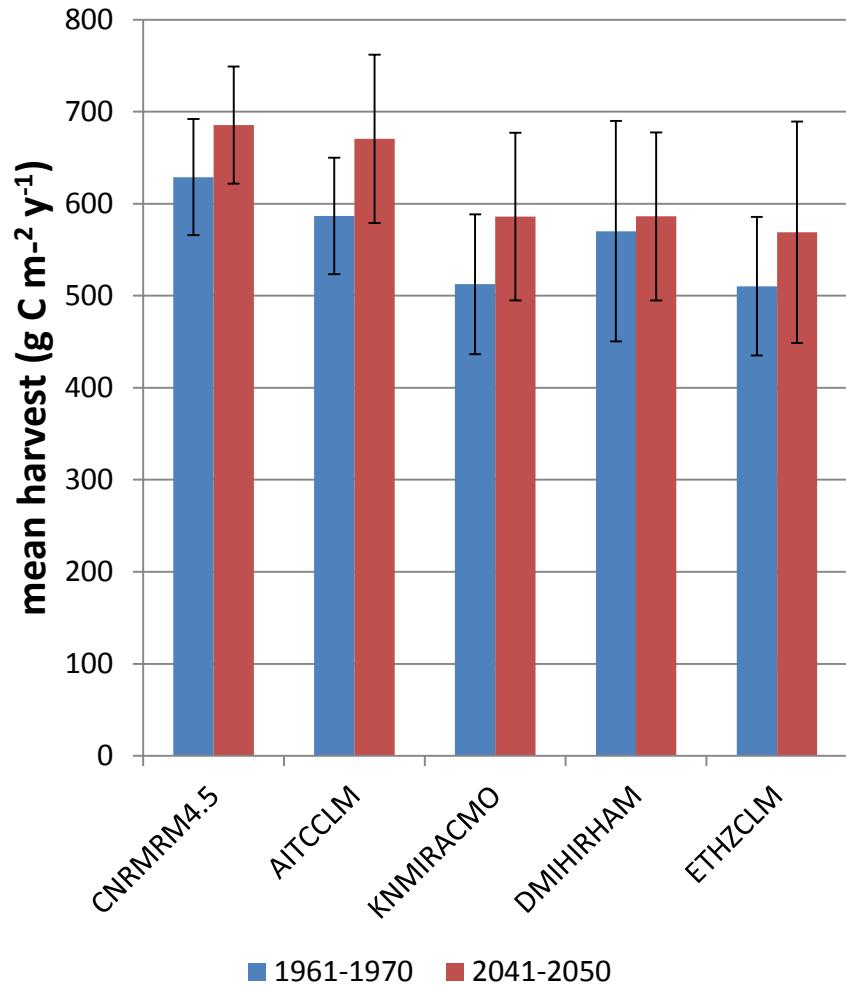




1. Siehst du die Notwendigkeit einer Anpassung an den Klimawandel?
2. Siehst du den Bedarf einer Umstellung von Grünland auf Ackerland?
3. Glaubst du dass ein Temperaturanstieg zu einer Verlängerung der Vegetationsperiode führen wird?
4. Würdest du auf eine längere Vegetationsperiode mit einer Anpassung der Schnitthäufigkeit reagieren?
5. Würdest du auf eine Abnahme des Niederschlags in Kombination mit einem Temperaturanstieg mit Beregnung reagieren?
6. Glaubst du dass in Zukunft andere/mehr Schädlinge auftreten werden?
7. Glaubst du dass mit dem Klimawandel der landwirtschaftliche Ertrag steigen wird?









„SoilBucket“

- (i) Efficient
- (ii) Good performance
- (iii) Broad range of application

SWC-trends

- (i) no clear trend among the different scenarios concerning average SWC
- (ii) majority of scenarios leads to wetter conditions on average
- (iii) number of dry days per vegetation period is likely to increase
- (iv) length of dry periods is more likely to increase than not

Snow cover

- (i) less days with snow cover – increase in vegetation period length



„Grass C“

- (i) available datasets allow for good parameter constraint
- (ii) reasonable performance – still to be optimized

Future trends: status quo in management (preliminary)

- (i) increase in harvest is very likely
- (ii) increase in NEP is likely

Future trends: adapted management (preliminary)

- (i) further increase in NEP
- (ii) further increase comparable to increase caused by climate change

TakeHome

- (i) Future conditions (until 2050) could lead to a win-win-situation

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University of Innsbruck

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