ISIMIP Biome/Permafrost Meeting Agenda

- status update biomes sector (C. Reyer, all modellers)
- valid variable ranges for biomes models / Evaluation with ilamb (C. Reyer)
- paper presentations:
  - First analysis of ISIMIP3b simulation from VISIT (and presentation of ISIMIP2b paper idea) (A. Ito)
  - Disentangling the impacts of anthropogenic aerosols on terrestrial carbon cycle during 1850-2014 (Y Zhang)
  - Future greenhouse gas balance of northern peatlands: evidence from a multi-model assessment (C Qiu)
- discussion of peatland sector (A. Gädeke, A Galego-Sala, C. Reyer)
- status update permafrost sector (A. Gädeke) and related permafrost activities (E. Burke, J. Kirchner)

Status of 3a/3b simulations

Model	Status	Other Sectors?	Comments	Paper Plans
CARAIB	depending on funding and time	Fire?		
CLM5.0	starts later 2020 or march 2021	Permafrost, Fire, water	needs six-hourly forcing	MSc students works on fire attribution based on ISIMIP2b data
DLEM	have downloaded the driving data	Fire		
JULES	working on JULES ISIMIP 3a runs	Permafrost, Fire, water?	coordination with JULES team from Greece	
LPJ-GUESS	runs are planned	Permafrost, Fire		work on 2b biome shifts using PFT-level output
LPJmL	claifying who will do the runs at PIK, C Müller for agriculture	Permafrost, Fire, water	Fire maybe another version, agriculture by Jonas/Christoph with different model version	
ORCHIDEE	forcing downloaded, aims to provide 3a output in December 2020	Permafrost, Fire, water		dynamics of permafrost soil carbon from a few LSMs (including 3a and hopefully 3b output).
VEGAS	will contribute		needs hourly forcing	
VISIT	finish simulations by end of October 2020	Permafrost?, fire?		climatic impacts on ecosystems in Asia, including that through fires

Please update your model @ https://docs.google.com/spreadsheets/d/1RcgoZMl4KiLPDKB41ZWONSKjR-_LPboLn0vnQmnbPYo/edit?usp=sharing

Recent Papers (June 2020)

IOP Publishing Environ. Res. Lett. 15 (2020) 044006 https://doi.org/10.1088/1748-9326/ab702b

Environmental Research Letters

LETTER

Pronounced and unavoidable impacts of low-end global warming on northern high-latitude land ecosystems

Akihiko Ito[1,2], Christopher P O Reyer[3], Anne Gädeke[3], Philippe Ciais[4], Jinfeng Chang[4], Min Chen[5], Louis François[6], Matthew Forrest[7], Thomas Hickler[7,8], Sebastian Ostberg[3], Hao Shi[9], Wim Thiery[10,11] and Hanqin Tian[9]

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3 October 2019

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25 January 2020

Keywords: biome sector, ISIMIP2b, northern high latitudes, Paris agreement, climatic impacts

Supplementary material for this article is available online

JGR Biogeosciences

RESEARCH ARTICLE
10.1029/2019JG005252

Shufen Pan and Jia Yang, equal contribution

Key Points:
- Impacts of temperature or precipitation extremes on carbon fluxes could be amplified due to their interactive effects
- Hot extremes lead to a larger carbon loss in tropics while ecosystems in the arid and semi-arid zones show the largest sensitivity to precipitation
- Models simulated larger sensitivity of ecosystem productivity to precipitation than satellite product, particularly in tropics

Climate Extreme Versus Carbon Extreme: Responses of Terrestrial Carbon Fluxes to Temperature and Precipitation

Shufen Pan[1], Jia Yang[1,2], Hanqin Tian[1], Hao Shi[1,3], Jinfeng Chang[4], Philippe Ciais[4], Louis Francois[5], Katja Frieler[6], Bojie Fu[3], Thomas Hickler[7,8], Akihiko Ito[9], Kazuya Nishina[9], Sebastian Ostberg[6], Christopher P.O. Reyer[6], Sibyll Schaphoff[6], Jörg Steinkamp[7,10], and Fang Zhao[6]

[1]International Center for Climate and Global Change Research, School of Forestry and Wildlife Sciences, Auburn University, Auburn, AL, USA, [2]Department of Forestry, Mississippi State University, Mississippi State, MS, USA, [3]Research Center for Eco-Environmental Sciences, State Key Laboratory of Urban and Regional Ecology, Chinese Academy of Sciences, Beijing, China, [4]Laboratoire des Sciences du Climat et de l'Environnement, Gif-sur-Yvette, France, [5]UR-SPHERES, Université de Liège, Liège, Belgium, [6]Potsdam Institute for Climate Impact Research, Member of the Leibniz Association, Potsdam, Germany, [7]Senckenberg Biodiversity and Climate Research Centre, Frankfurt am Main, Germany, [8]Department of Physical Geography, Goethe University, Frankfurt am Main, Germany, [9]National Institute for Environmental Studies, Tsukuba, Japan, [10]Johannes Gutenberg-University Mainz, Mainz, Germany

Recent Papers (Jan 2021)

Global Biogeochemical Cycles

RESEARCH ARTICLE
10.1029/2020GB006589

Key Points:
- The uncertainty in soil organic carbon (SOC) change is dominated by differences between model structure rather than by climate forcing
- Soil input changes explain most variations in projected SOC change for natural vegetation across models at global and region
- The effective reduction in constrained SOC change depends on climate forcing and region considered

Supporting Information:
- Supporting Information S1

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Reducing Uncertainties of Future Global Soil Carbon Responses to Climate and Land Use Change With Emergent Constraints

Wenfang Xu[1], Jinfeng Chang[1], Philippe Ciais[1], Bertrand Guenet[1], Nicolas Viovy[1], Akihiko Ito[2], Christopher P. O. Reyer[3], Hanqing Tian[4], Hao Shi[4], Katja Frieler[3], Matthew Forrest[5], Sebastian Ostberg[3], Sibyll Schaphoff[3], and Thomas Hickler[5,6]

[1]Laboratoire des Sciences du Climat et de l'Environnement, IPSL-LSCE, CEA-CNRS-UVSQ, Saclay, France, [2]National Institute for Environmental Studies, Tsukuba, Japan, [3]Potsdam Institute for Climate Impact Research (PIK), Member of the Leibniz Association, Potsdam, Germany, [4]International Center for Climate and Global Change Research, School of Forestry and Wildlife Sciences, Auburn University, Auburn, AL, USA, [5]Senckenberg Biodiversity and Climate Research Centre (BiK-F), Frankfurt am Main, Germany, [6]Department of Physical Geography, Goethe University, Frankfurt am Main, Germany

Abstract Soil organic carbon changes (ΔSOC) are regulated by climate and land use change. Here, we analyze regional and global ΔSOC from 1861 to 2099 based on five terrestrial biosphere model (TBM) simulations of the Inter-Sectoral Impact Model Intercomparison Project Phase 2b. The TBMs were driven by harmonized gridded land use change and bias-adjusted climate forcing data from different general circulation models (GCMs) for climate scenarios RCP 2.6 and RCP 6.0. Between 2005 and the end of this

Earth's Future

RESEARCH ARTICLE
10.1029/2020EF001616

Key Points:
- We quantify the pure effect of climate change on the exposure to extreme climate impact events, for both historical and future time periods
- Global warming increases the global population exposure to river floods, tropical cyclones, crop failure, wildfires, droughts, and heatwaves
- The largest increases in exposure are projected for tropical and subtropical regions

Supporting Information:
- Supporting Information S1

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Projecting Exposure to Extreme Climate Impact Events Across Six Event Categories and Three Spatial Scales

Stefan Lange[1], Jan Volkholz[1], Tobias Geiger[1,2], Fang Zhao[3], Iliusi Vega[1], Ted Veldkamp[4,5], Christopher P. O. Reyer[1], Lila Warszawski[1], Veronika Huber[6], Jonas Jägermeyr[1,7,8], Jacob Schewe[1], David N. Bresch[9,10], Matthias Büchner[1], Jinfeng Chang[5,11], Philippe Ciais[11], Marie Dury[12], Kerry Emanuel[13], Christian Folberth[5], Dieter Gerten[1,14], Simon N. Gosling[15], Manolis Grillakis[16], Naota Hanasaki[17], Alexandra-Jane Henrot[12], Thomas Hickler[18,19], Yasushi Honda[20], Akihiko Ito[17], Nikolay Khabarov[5], Aristeidis Koutroulis[21], Wenfeng Liu[11,22], Christoph Müller[1], Kazuya Nishina[17], Sebastian Ostberg[1], Hannes Müller Schmied[18,19], Sonia I. Seneviratne[23], Tobias Stacke[24], Jörg Steinkamp[19,25], Wim Thiery[23,26], Yoshihide Wada[5], Sven Willner[1], Hong Yang[22,27], Minoru Yoshikawa[28], Chao Yue[11,29], and Katja Frieler[1]

[1]Potsdam Institute for Climate Impact Research (PIK), Member of the Leibniz Association, Potsdam, Germany, [2]Climate and Environment Consultancy, Deutscher Wetterdienst (DWD), Stahnsdorf, Germany, [3]School of Geographic Sciences, East China Normal University, Shanghai, China, [4]Institute for Environmental Studies, Vrije Universiteit Amsterdam, Amsterdam, Netherlands, [5]International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria, [6]Department of Physical, Chemical, and Natural Systems, Universidad Pablo de Olavide, Sevilla, Spain, [7]NASA Goddard Institute for Space Studies, New York, NY, USA, [8]Department of Computer Science, University of Chicago, Chicago, IL, USA, [9]Institute for Environmental Decisions, ETH Zurich, Zurich, Switzerland, [10]Federal Office of Meteorology and Climatology MeteoSwiss, Zurich, Switzerland, [11]Laboratoire des Sciences du Climat et de

Submitted papers / drafts/ ideas (2b data)

1. Shi H, H Tian, N Pan, CPO Reyer, P Ciais, J Chang, M Forrest, K Frieler, B Fu, A Gädeke, T Hickler, A Ito, S Ostberg, S Pan, M Stevanovic, J Yang (submitted) *Saturation of global terrestrial carbon sink under two contrasting warming scenarios.* Global Biogeochemical Cycles
2. Thiery W, St Lange, J Rogelj, C-F Schleussner, L Gudmundsson, SI Seneviratne, K Frieler, K Emanuel, T Geiger, DN Bresch, F Zhao, S Willner, M Büchner, J Volkholz, N Bauer, J Chang, P Ciais, M Dury, SN Gosling, N Hanasaki, A Henrot, T Hickler, V Huber, A Ito, J Jägermeyr, N Khabarov, W Liu, M Mengel, C Müller, H Müller Schmied, S Ostberg, CPO Reyer, T Stacke, Y Wada (submitted) Age-dependent extreme event exposure. Science
3. Shi/Tian et al. Carbon and Water Cycle China: first analyses ongoing
4. Papers/M.Sc. Thesis ongoing with Thomas Hickler/Matt Forrest, Wim Thiery

Valid variable ranges for biomes models

- Valid ranges for output variables: *"based on scientific experience and thorough judgement of modellers as well as extremes known from observations. Since those ranges will be applied to check the output of historical simulations as well as future projections, please also consider the potential impact of future climate and socioeconomic change on the ranges."*

Contributions can be made via a cloud spreadsheet [1] or per pull request to our GitHub protocol repository [2].

[1] Google Spreadsheet for valid ranges
[2] https://github.com/ISI-MIP/isimip-protocol-3 in definitions/variable.json, e.g. https://github.com/ISI-MIP/isimip-protocol-3/blob/f63d76036c4cbced3678a9ca6ff115afef8d2cde/definitions/variable.json#L33

Valid variable ranges for biomes models

Variable	Long Name	Unit	valid_min	valid_max	Comment (please indicate source of comment)
anthday	Anthesis Date	day of year of anthesis	?	?	
biom	Total Above Ground Biomass Dry Matter Yields	t ha-1 per growing season	0	?	
burntarea	Burnt Area Fraction	%	0	100	
ccwd	Carbon Mass in Coarse Woody Debris	kg m-2	?	?	
cleaf	Carbon Mass in Leaves	kg m-2	?	?	
clitterag	Carbon Mass in Above Ground Litter Pool	kg m-2	?	?	
clitterbg	Carbon Mass in Below Ground Litter Pool	kg m-2	?	?	
cproduct	Carbon in Products of Land Use Change	kg m-2	?	?	
croot	Carbon Mass in Roots	kg m-2	?	?	
csoil	Carbon Mass in Soil Pool	kg m-2	?	?	
cveg	Carbon Mass in Vegetation	kg m-2	?	?	

- Ilamb?

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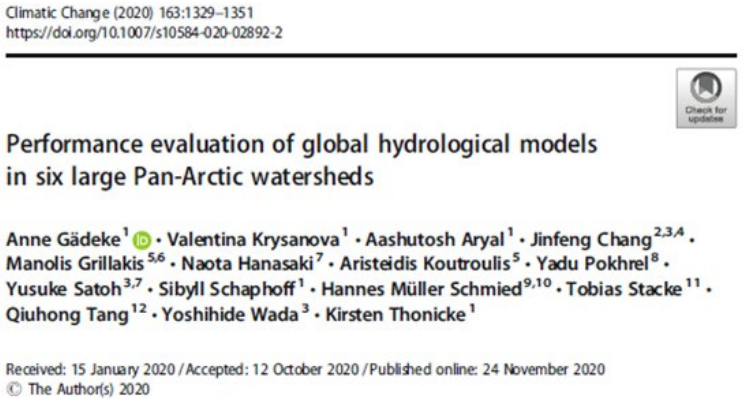
Permafrost sector update

- Published paper in collaboration with global/regional water sector
- Master thesis finalized (J.Kirchner)
- One paper under review in ERL “Climate change reduces winter overland travel across the Pan-Arctic even under low-end global warming scenarios” (presentation tomorrow, 12.01., 12-13:30)
- Model contributing to the permafrost sector in ISIMIP3: CLM5.0, ORCHIDEE, JULES, MATSIRO, LPJmL (?), LPJ-GUESS (?)



Climatic Change (2020) 163:1329–1351
https://doi.org/10.1007/s10584-020-02892-2

Performance evaluation of global hydrological models in six large Pan-Arctic watersheds

Anne Gädeke[1] · Valentina Krysanova[1] · Aashutosh Aryal[1] · Jinfeng Chang[2,3,4] · Manolis Grillakis[5,6] · Naota Hanasaki[7] · Aristeidis Koutroulis[5] · Yadu Pokhrel[8] · Yusuke Satoh[3,7] · Sibyll Schaphoff[1] · Hannes Müller Schmied[9,10] · Tobias Stacke[11] · Qiuhong Tang[12] · Yoshihide Wada[3] · Kirsten Thonicke[1]

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