Nitta LAB.

[Development of Integrated Land Simulator]

Department of Human and Social Systems

Integrated Land Modeling

Department of Civil Engineering

https://isotope.iis.u-tokyo.ac.jp

Development of a new land simulator

In the global climate system, land includes complex processes in the cryosphere, hydrosphere, and land surface that interact with the climate system. Therefore, modeling land processes is important in climate modeling. Also, accurate hydrological simulations are crucial for flood or drought predictions. Our team is developing a new land simulator called Integrated Land Simulator (ILS). ILS consists of multiple component land models, which are coupled by a general-purpose coupler. This framework makes it easier to couple an atmospheric or oceanic model with different grid systems, as well as models representing different land processes (e.g., vegetation dynamics, human activities, etc.), and to conduct numerical experiments. Currently, ILS includes a physical land model, MATSIRO, and a hydrodynamic model, CaMa-Flood. The inclusion of additional land models is ongoing. By coupling with an atmosphere-ocean general circulation model, we aim to improve the accuracy of the overall climate model.
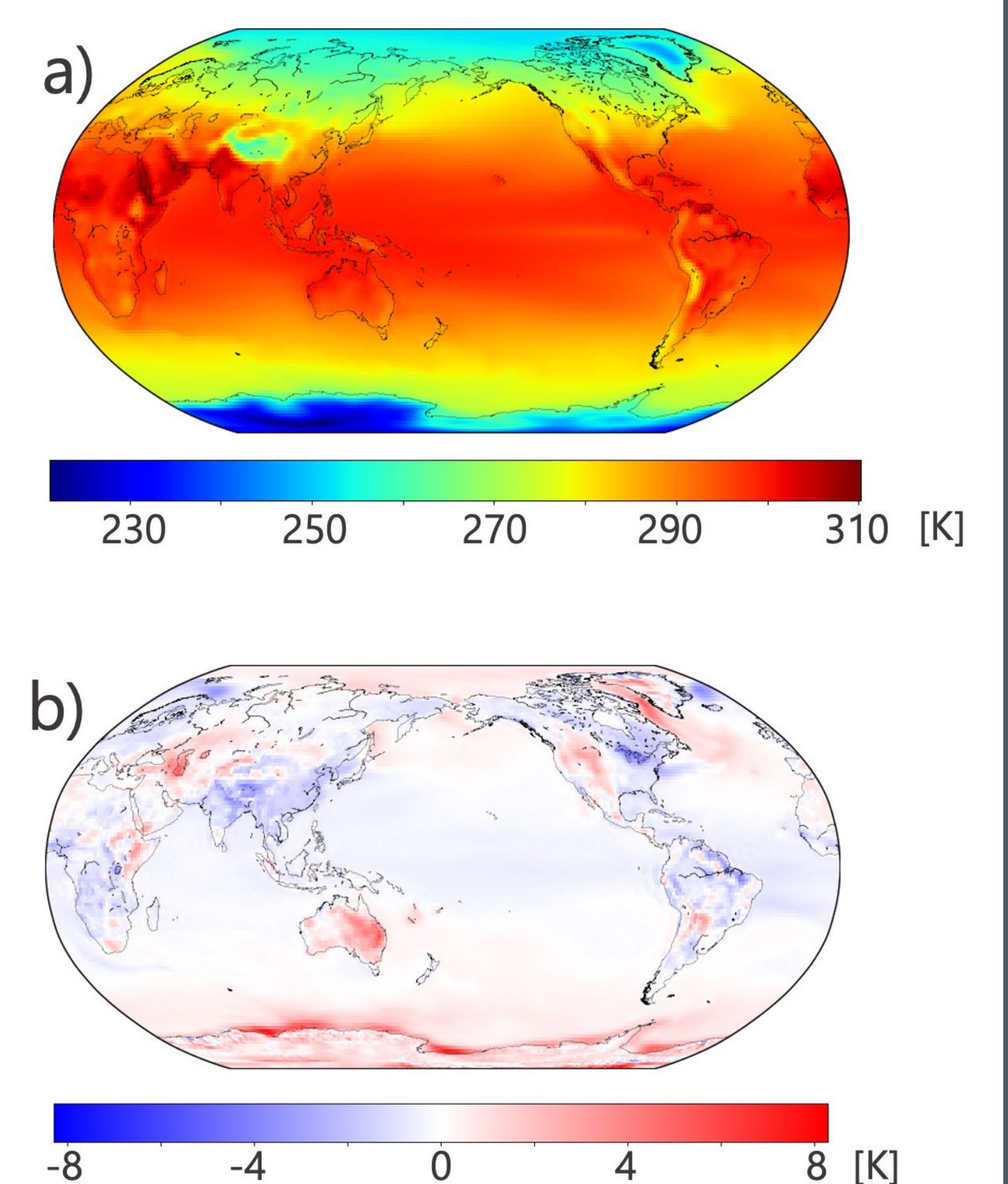

Hyper resolution hydrological simulations
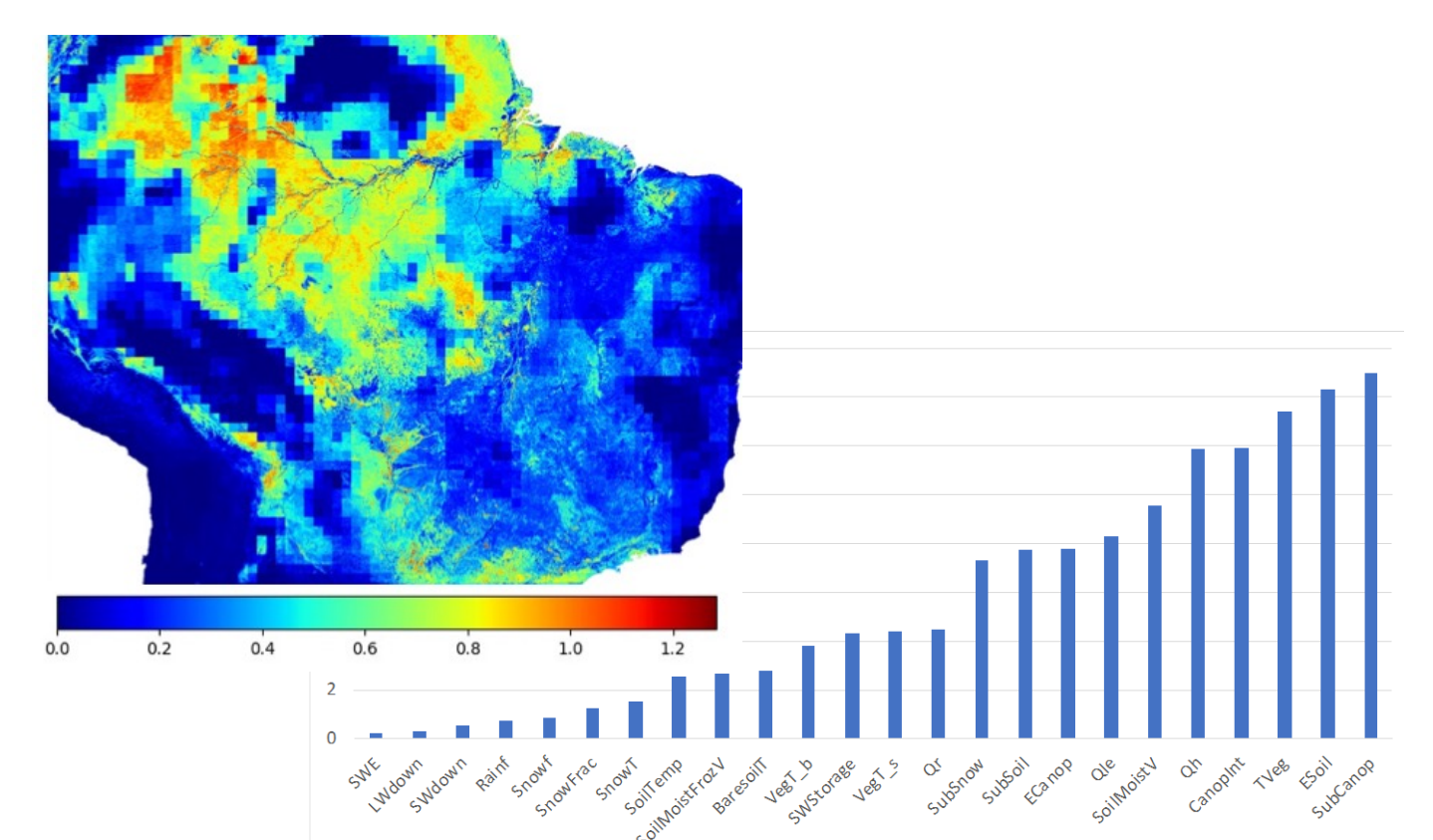
Test simualtion results: global 1 km hydrological simulation

Climate simulation with ILS

a)

b)

Surface air temperature from a MIROC-ILS coupling experiment

Integrated Land Simulator

MATSIRO
Physical model
Takata et al. (2003), Nitta et al. (2014)

CaMa-Flood
River model
Yamazaki et al. (2011)

IO

- NetCDF, binary
- Multiple grid systems
- Parallel execution

Jcup Arakawa et al. (2020) **+ ICI** (ILS coupling interface)

General coupler for data exchange and interpolation

Atmospheric general circulation models

Oceanic general circulation models

Framework of Integrated Land Simulator

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