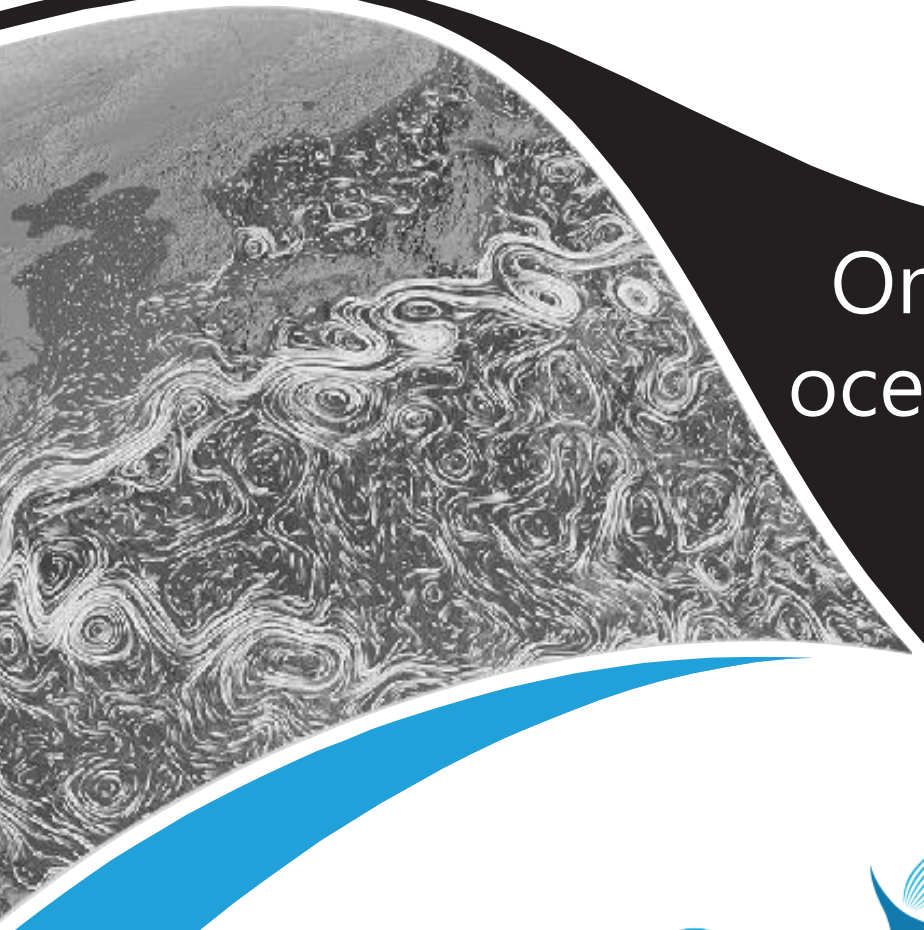
OceanPredict
Advancing the science of ocean prediction

8th OS-Eval TT web meeting
13 UTC, Mar. 16th, 2021



On the activities in KIOST's ocean and climate prediction system development

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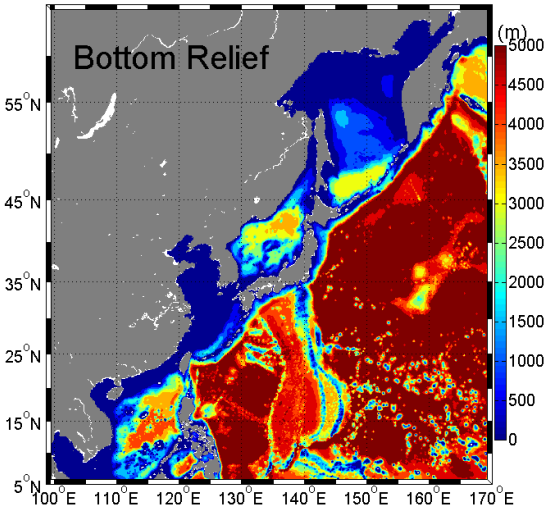
Contents

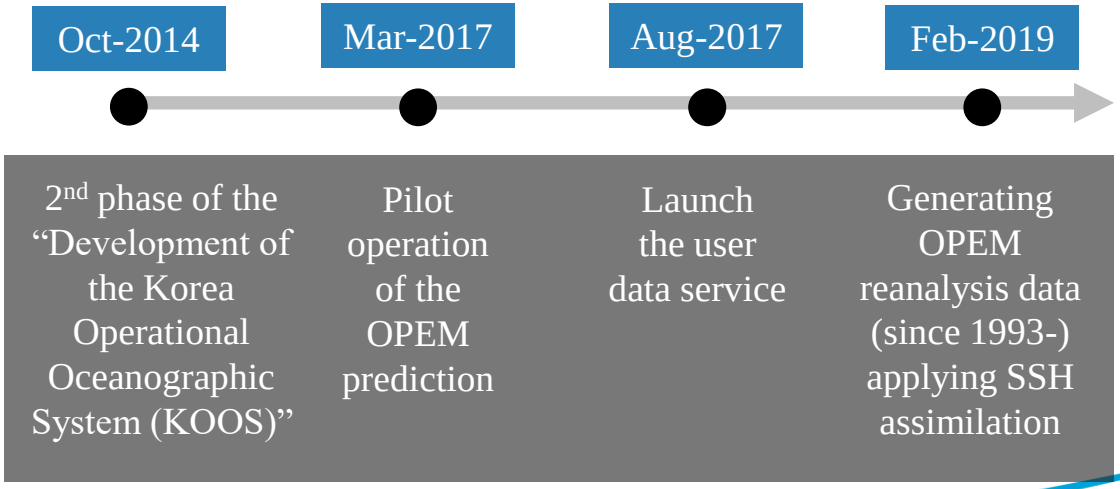
1. Regional Northwest Pacific Prediction System (OPEM)

Numerical Model

- ✓ System title : OPEM (Ocean Predictability Experiment for Marine environment)
- ✓ Based model : GFDL-MOM5
- ✓ Domain : 5-63°N, 99-170°E
- ✓ Resolution : 1/24°×1/24° (Arakawa B-grid) & 51 layers (z-star coordinate system)
- ✓ Data Assimilation : Ensemble Optimal Interpolation



Model domain and bottom relief

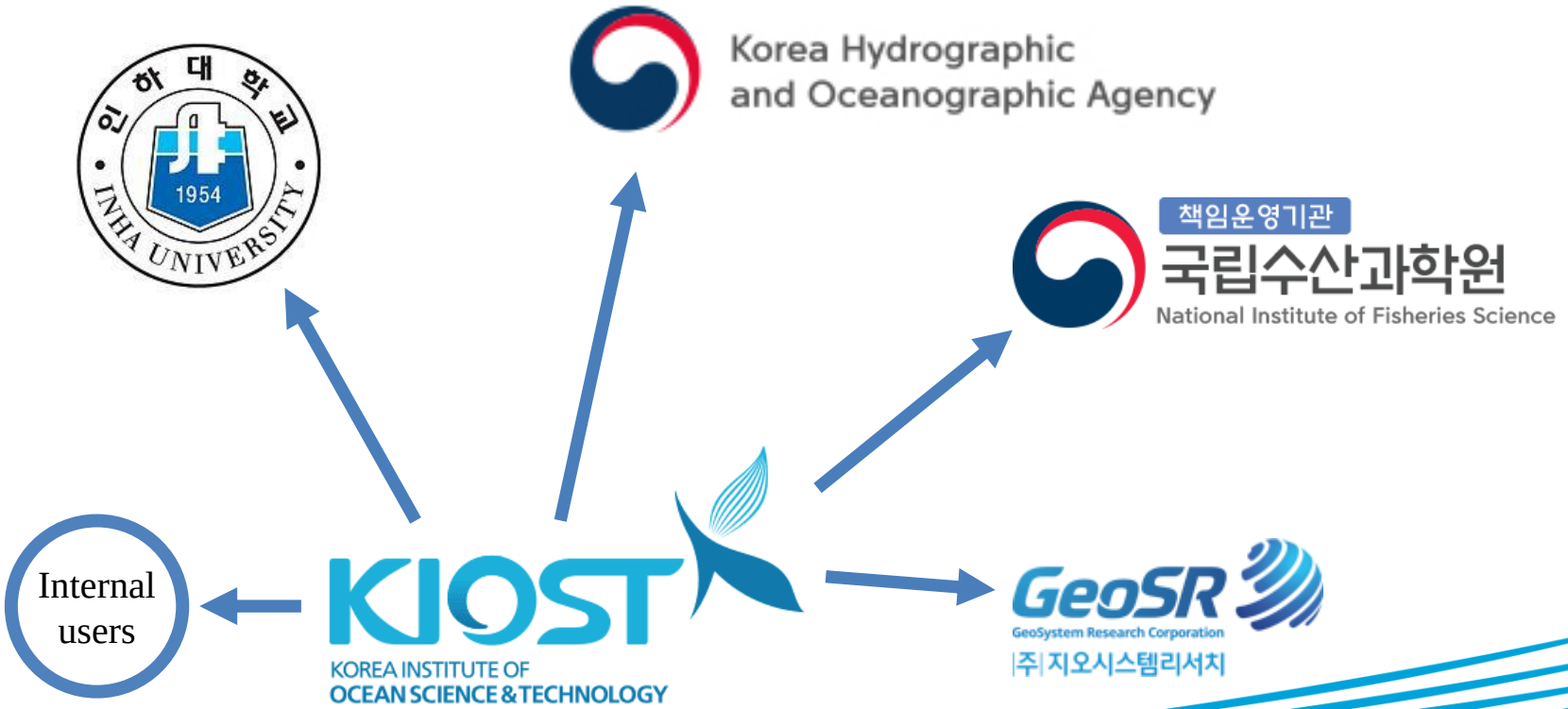


Major history of the OPEM development

1. Regional Northwest Pacific Prediction System (OPEM)

Data Service

- ✓ Data service to internal users, domestic agencies, university and companies.
- ✓ Providing analysis/prediction data through a limited FTP server, not through a website.



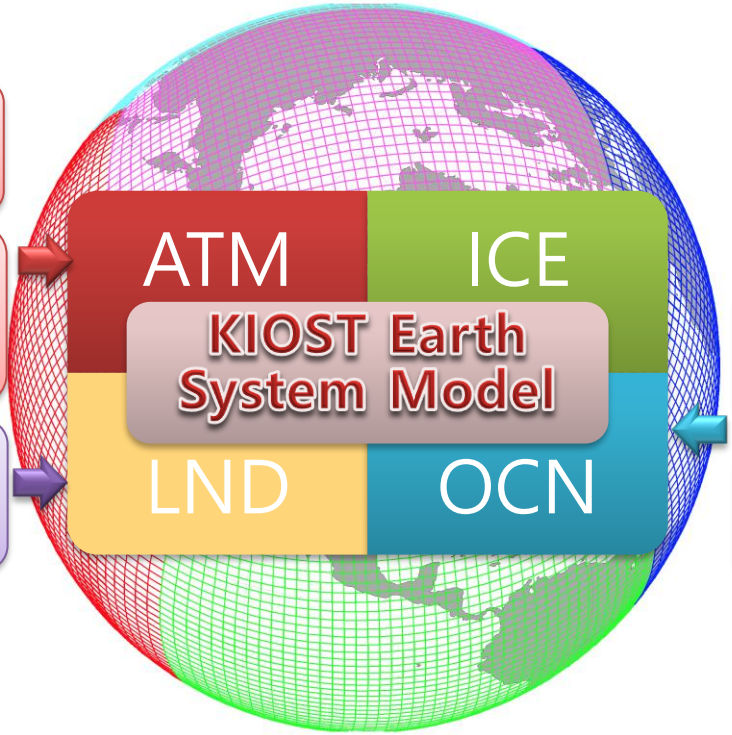
2. Climate Prediction System applying by KIOST-ESM

Framework adopted from GFDL CM2.5 → Applying new physics
Some of them have been newly developed

Convection Scheme
(Park, 2014)

PBL Scheme
(Bretherton and Park, 2009)

Dynamic Vegetation
(Kim et al., 2018)



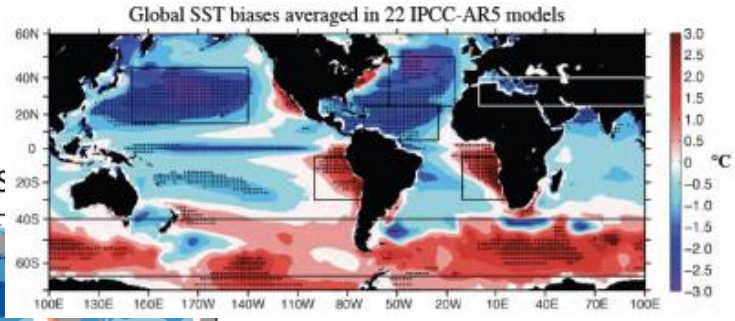
Ocean D. Assim.
(Kim et al.,2015)

MLD scheme
(Noh et al., 2016)

CMIP6 participation (Kim et al., 2020) !!!

2. Climate Prediction System applying by KIOST-ESM

- Big Improvement in southern warm bias
- More realistic MJO and ENSO



SST Bias in AR5 models
(Wang et al. (2014, Nature CC)

KIOST ESM1 JFM SST bias

KIOST ESM1 JAS

KIOST_ESM-EN4(Obs.)

CM25 JFM SST bias

CM25 JAS SST bias

CM2.5(REF)-EN4(Obs.)

Improvement !

JFM SST

JAS SST

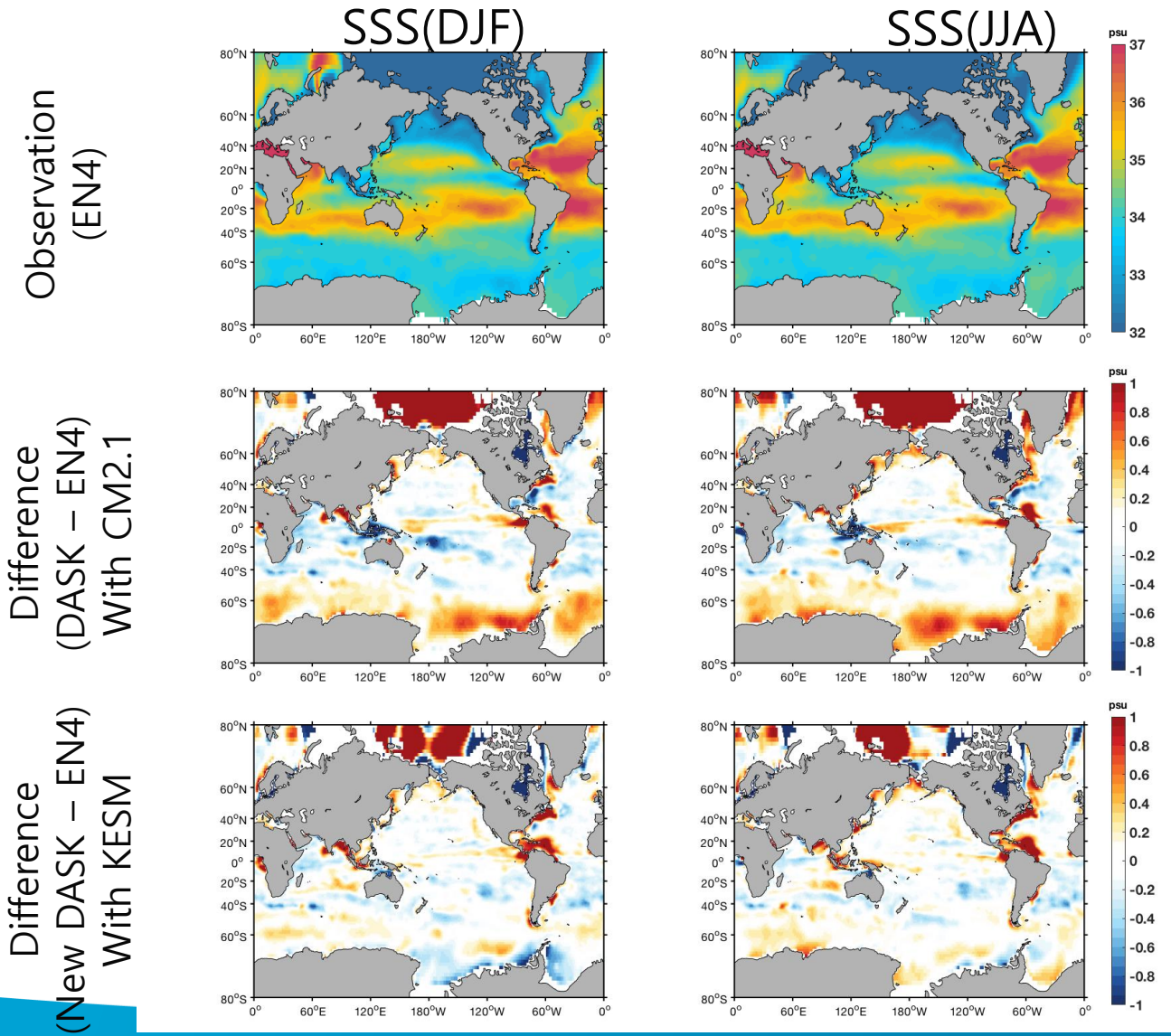
-5.0 -2.0 -1.0 0.0 1.0 2.0 5.0

Pak et al. (2021)

2. Climate Prediction System applying by KIOST-ESM

Ocean Physical Prediction Lab
PUKYONG NATIONAL UNIVERSITY

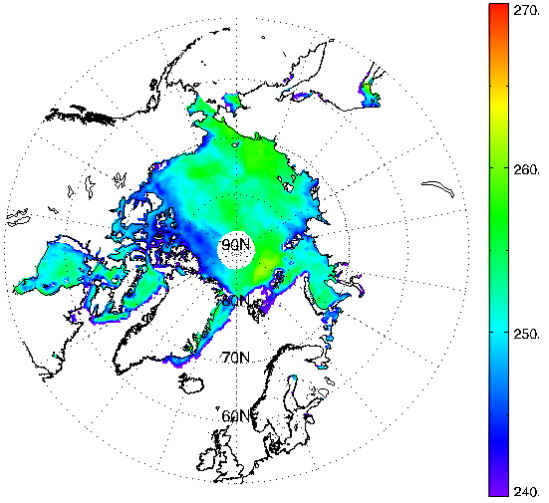
New climate reanalysis by KIOST-ESM !!!



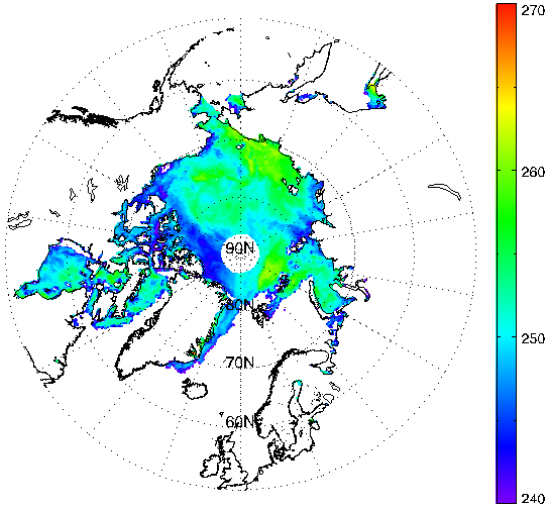
3. SIIT Assimilation to KIOST-ESM (Plan)

Arctic Sea Ice Interface Temperature retrieved from Satellite data !!!

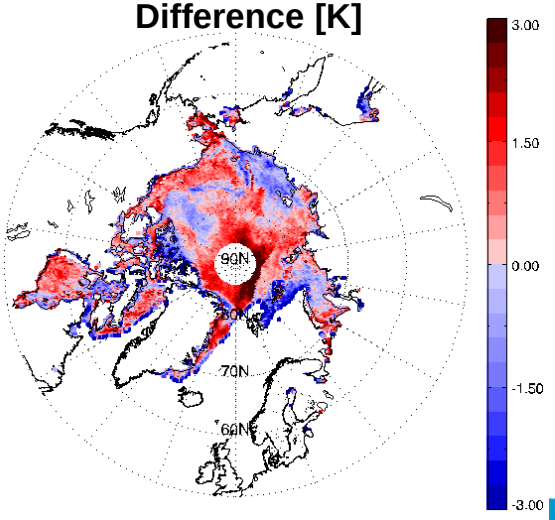
AMSR-E 6.9 GHz-retrieved ice temperature [K]



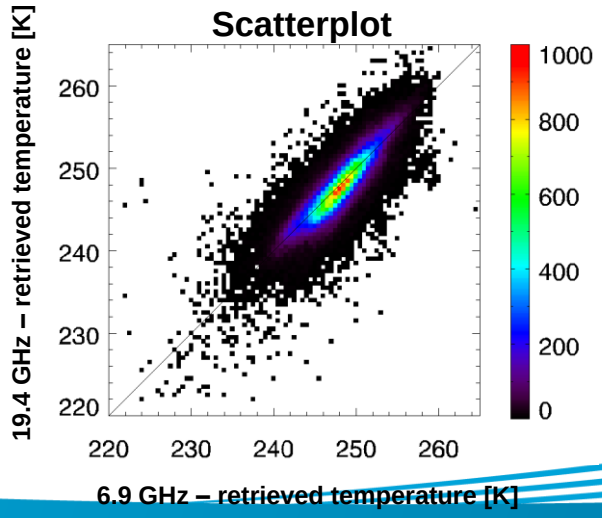
SSM/I 19.4 GHz-retrieved ice temperature [K]



Difference [K]



Scatterplot



Correction factor (CF)

↓

Emissivities (ε_V, ε_H)

↓

Ice temperature (T_s)

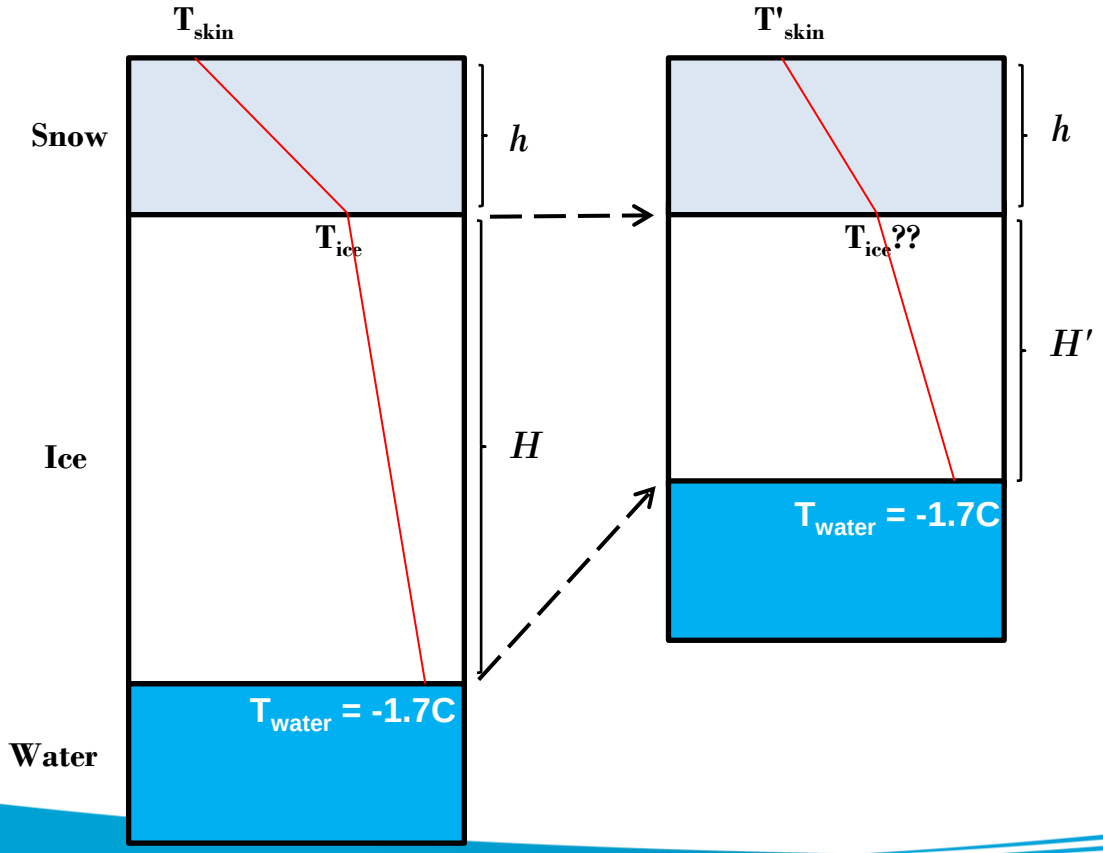
R = 0.9545
Bias = -0.27 K
RMSE = 1.72 K

Lee et al., 2018 (RS)

3. SIIT Assimilation to KIOST-ESM (Plan)

- The SIIT can be calculated by the function of ice thickness, snow depth, surface snow temperature.
- Observation operator for SIIT is given by applying themal conduction equation !!!

• The SIIT equation conserved heat transfer



$$k_{ice}\frac{\partial T_{ice}}{\partial z} = k_{snow}\frac{\partial T_{snow}}{\partial z}$$

Where k is thermal conductivity

$$T_{ice} = \frac{k_{snow}HT_{surface} + k_{ice}hT_{water}}{k_{snow}H + k_{ice}h}$$


Thank You