

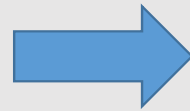
The effects of resolution on the reproducibility of Non-Hydrostatic Regional Climate Model

MRI

Masaya Nosaka

Introduction

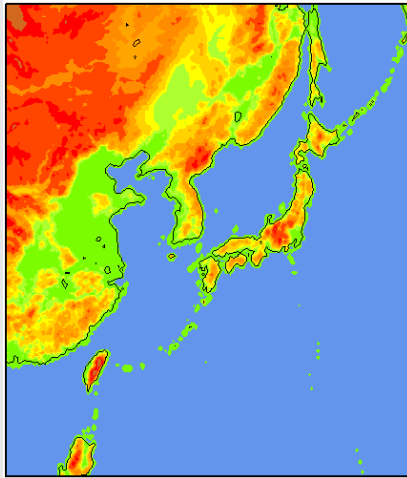
- High attention is focused on the future climate change due to global warming.
- People's actual greatest concern is how the climate changes around Japan.



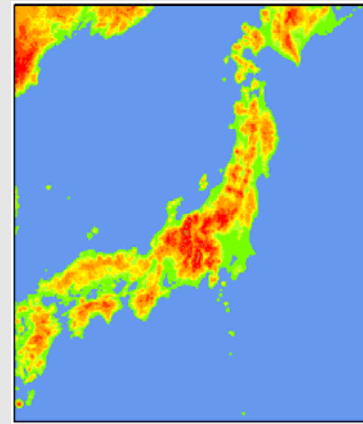
- The necessity of attaining high resolution is increasing.

- The effects of resolution on the reproducibility of NHRCM are investigated in this study.

Experiment conditions



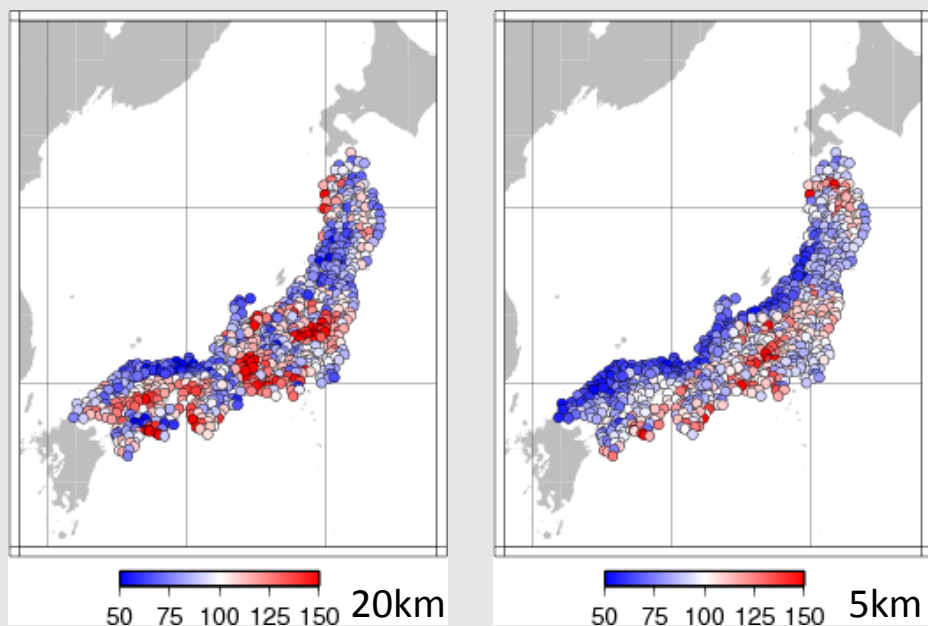
Resolution : 20km
Grid : 200x200
Vertical layer : 50
Time step : 40s
Convection parameterization:
KF scheme
Boundary condition:
JCDAS



Resolution : 5km
Grid : 300x300
Vertical layer : 50
Time step : 20s
Convection parameterization:
KF scheme
Boundary condition:
downscale from 20km

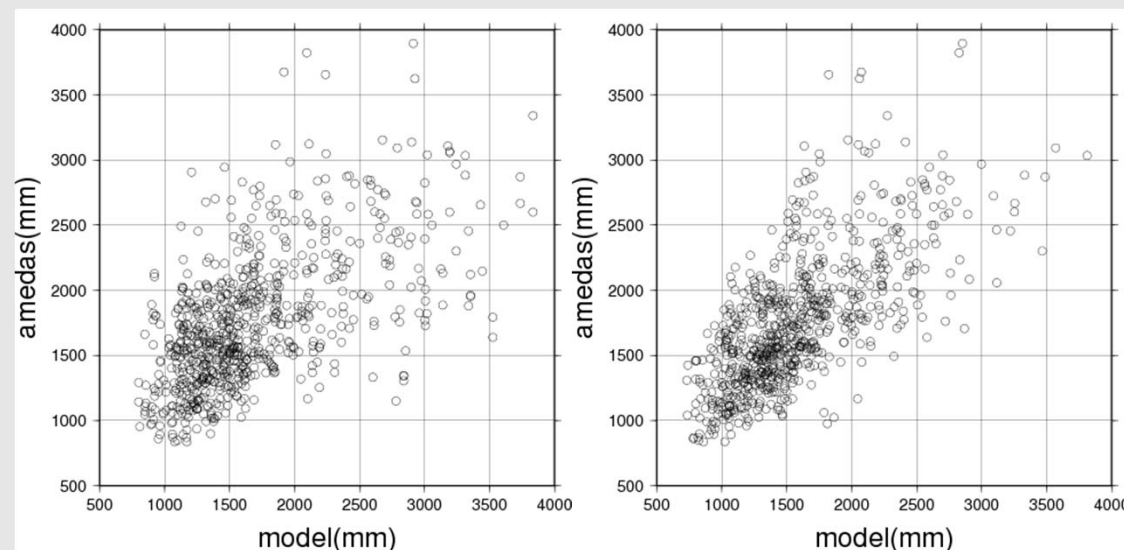
Calculation period 200609 ~ 200708

Annual precipitation



model/AMeDAS(%)

Warm colors indicate overestimation.
Cool colors indicate underestimation.

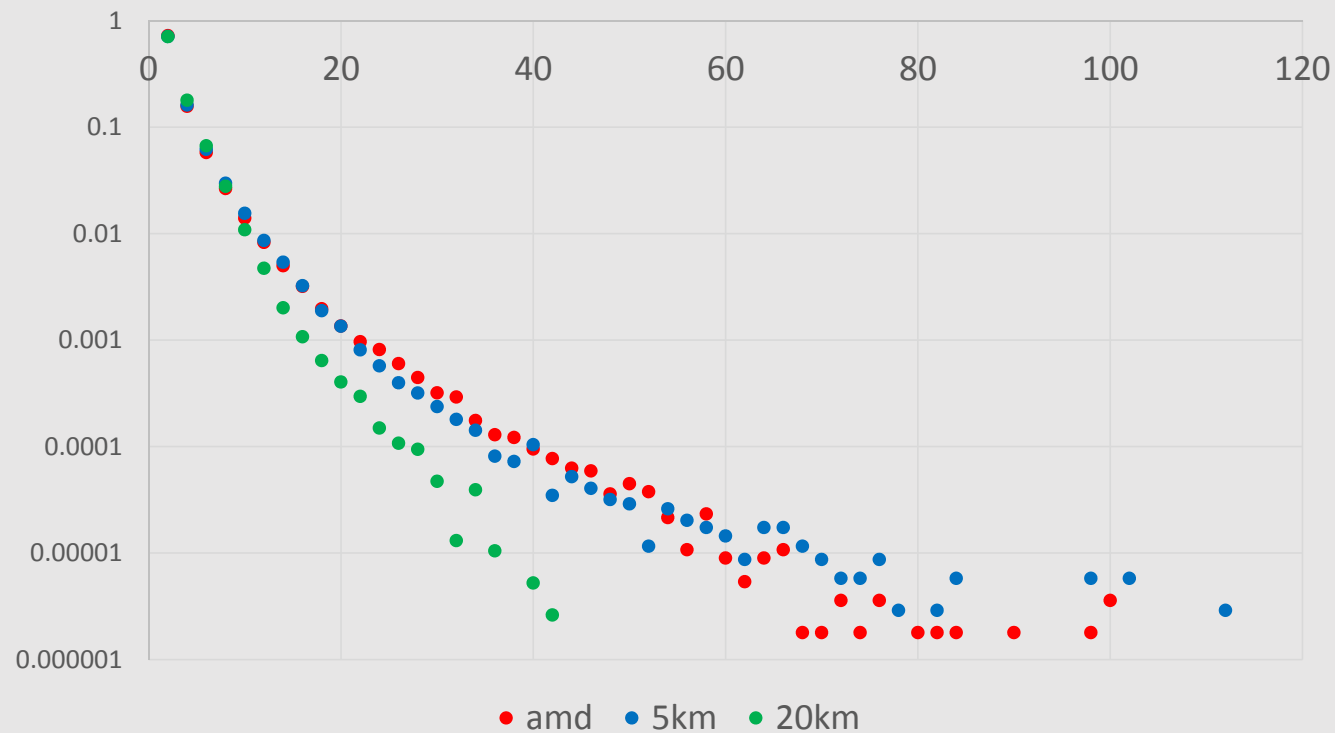


scatter diagram (left:20km right:5km)

Bias , RMSE and correlation of annual precipitation

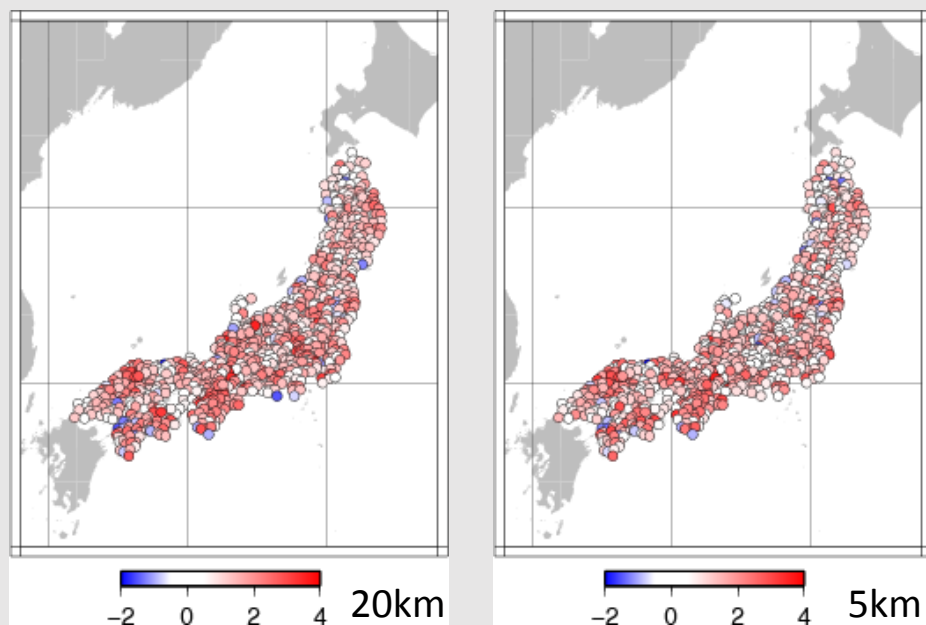
resolution	bias	RMSE	correlation
20km	-69.6	523	0.590
5km	-174	437	0.698

Frequency of hourly precipitation



Frequency of hourly precipitation(logarithmic axis)
red : AMeDAS blue : 5km green : 20km

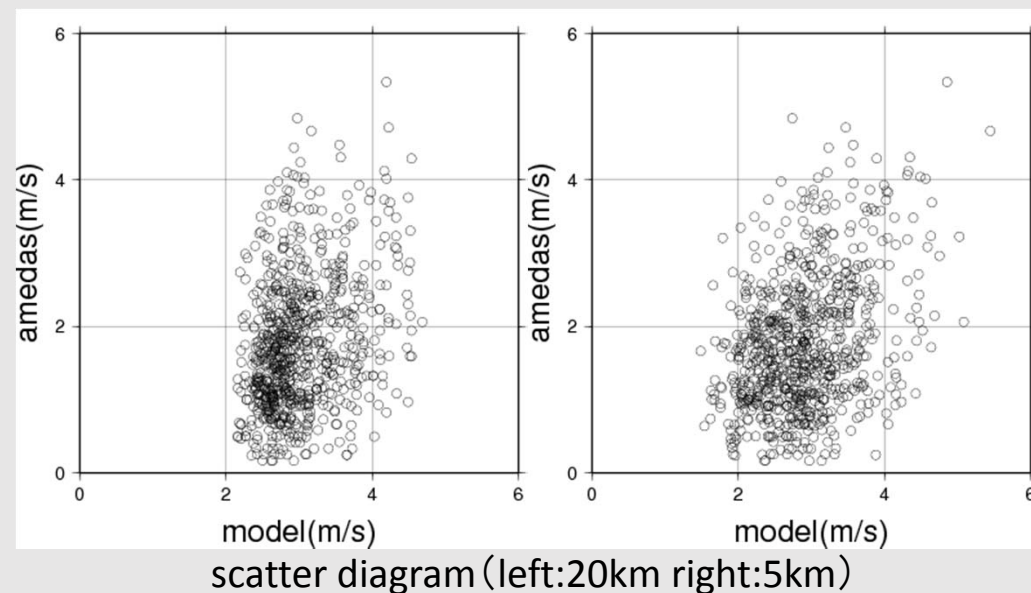
Annual mean wind speed



Model - AMeDAS(m/s)

Warm colors indicate overestimation.

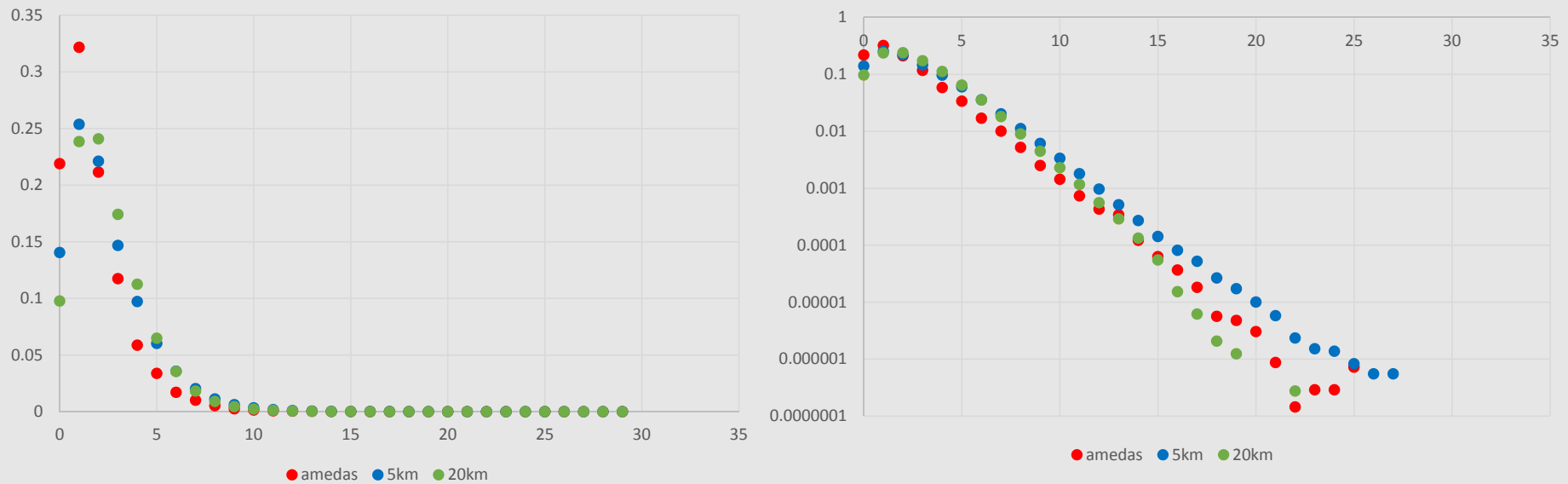
Cool colors indicate underestimation.



Bias , RMSE and correlation of annual mean wind speed

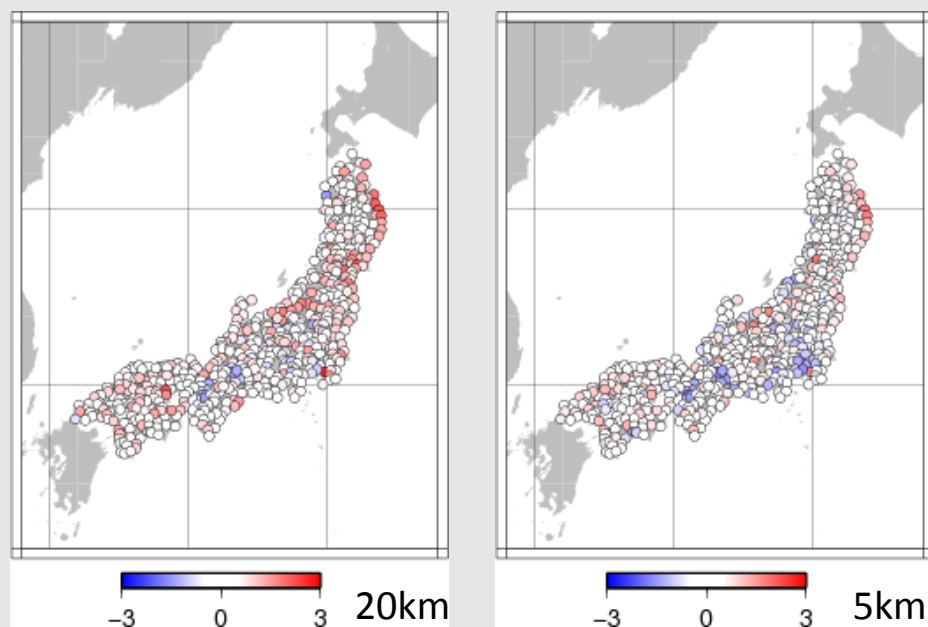
resolution	Bias	RMSE	correlation
20km	1.25	1.54	0.310
5km	1.13	1.45	0.362

Frequency of hourly wind speed



Frequency of hourly wind speed(right : logarithmic axis)
red : AMeDAS blue : 5km green : 20km

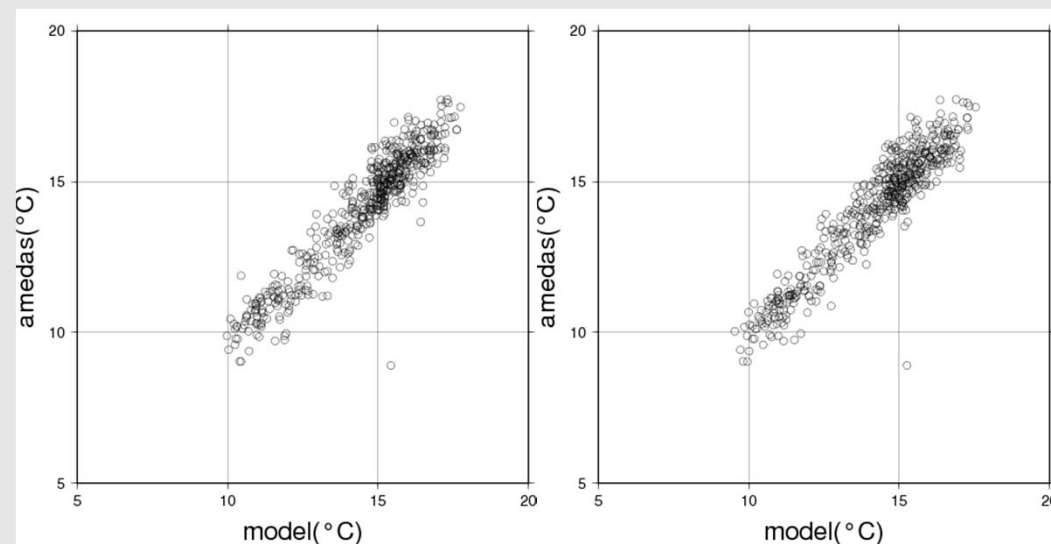
Annual mean temperature



Model - AMeDAS(°C)

Warm colors indicate overestimation.

Cool colors indicate underestimation.

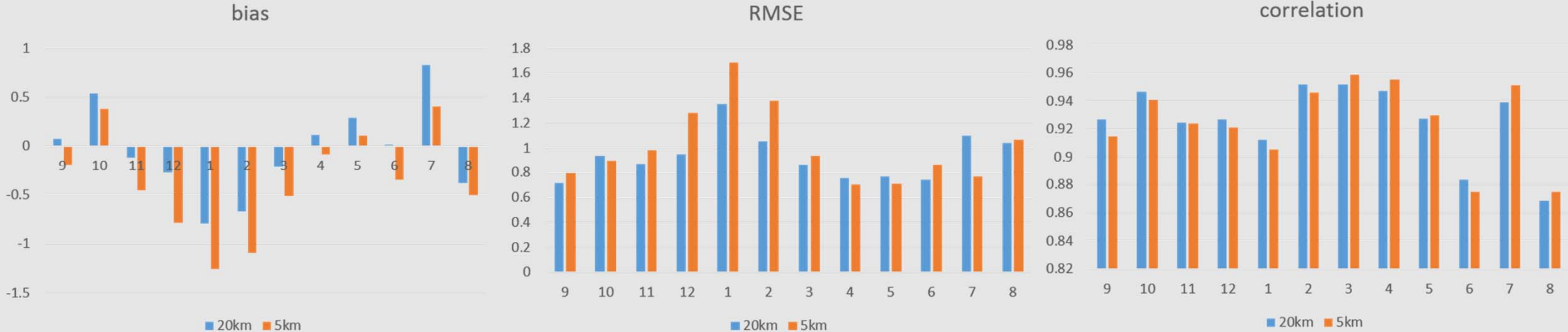


scatter diagram (left:20km right:5km)

Bias , RMSE and correlation of annual mean temperature

resolution	bias	RMSE	correlation
20km	0.386	0.794	0.944
5km	0.0766	0.699	0.943

Monthly temperature



Bias , RMSE and correlation of monthly temperature
blue : 20km orange : 5km

Summary

The effects of using high resolution NHRCM on reproducibility .

◆ Greatly improved elements :

- Annual precipitation
- Frequency of hourly precipitation

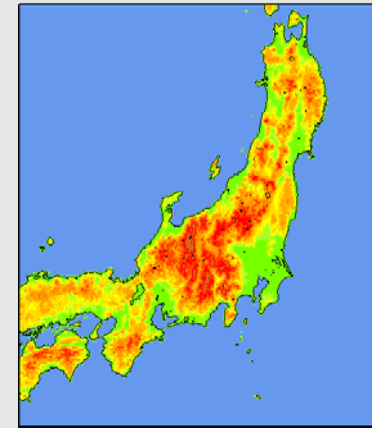
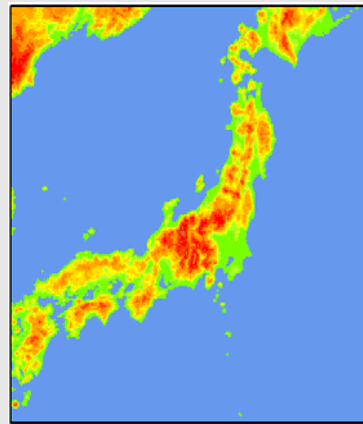
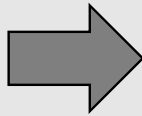
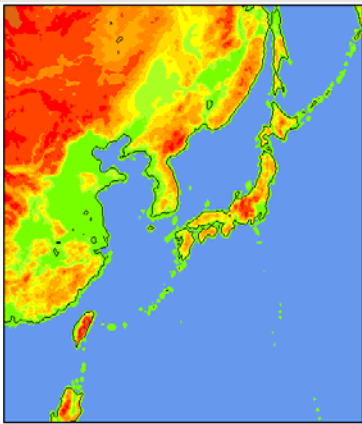
◆ A little improved elements :

- Wind speed
- Temperature

◆ Future topics of discussion :

- Precipitation in coast of Japan Sea
- Surface temperature in winter

The plan



Resolution : 20km
Grid : 200x200
Vertical layer : 50
Time step : 40s
Convection parameterization:
KF scheme
Boundary condition:
JCDAS

Resolution : 5km
Grid : 300x300
Vertical layer : 50
Time step : 20s
Convection parameterization:
KF scheme
Boundary condition:
downscale from 20km

Resolution : 2km
Grid : 500x500
Vertical layer : 50
Time step : 12s
Convection parameterization:
none
Boundary condition:
Downscale from 5km

Resolution : 2km
Grid : 500x500
Vertical layer : 80
Time step : 12s
Convection parameterization:
none
Boundary condition:
Downscale from 5km

Thank you