Projection of water resource in winter under the global warming

--- Case studies in Japan and Turkey ---

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Case of Turkey

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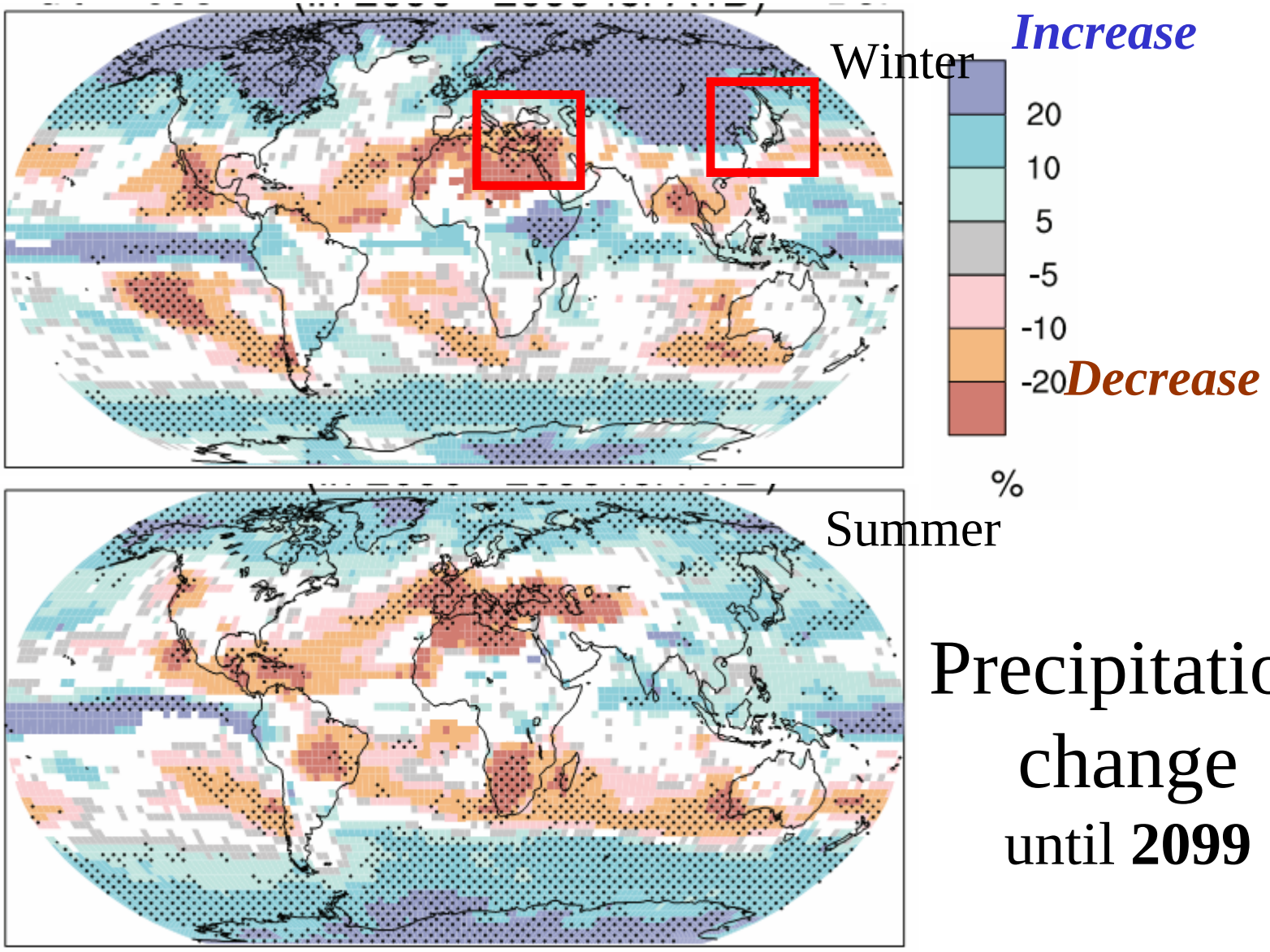
Case of Japan

collaborated with Frontier Research Center for Global Change

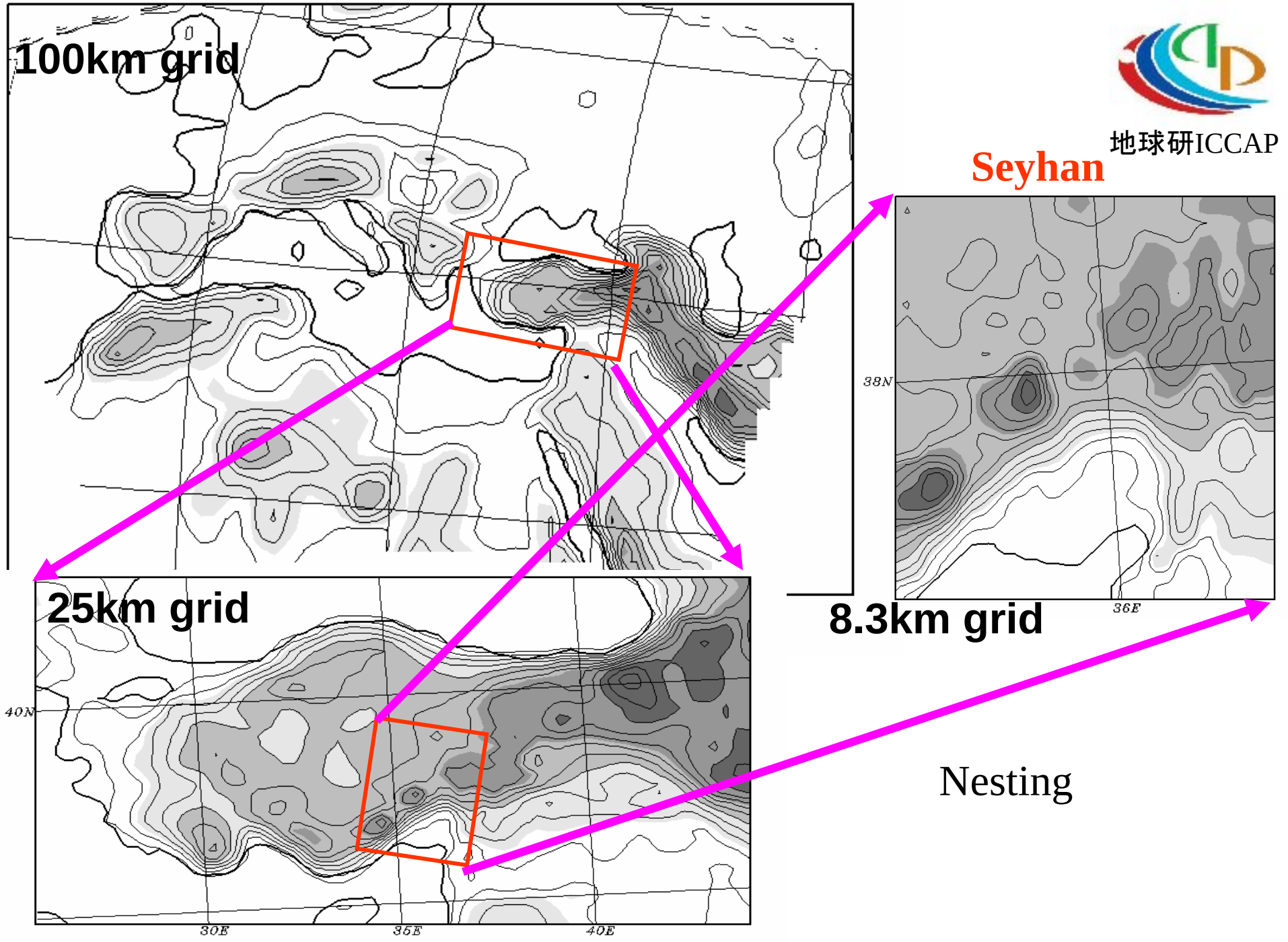
Downscaling of global climate change

- Global warming can be projected by GCM s (General Circulation Models) but with coarse grid interval, which is often coarser than the size of **river basins**.
- To project change in water resource in a specific small area such as river basin, the dynamical downscaling should be useful.
- RCM (Regional Climate Model) estimates weather and climate in a small area based upon the results of GCMs



Precipitation change until **2099**

Figure TS.30. *Spatial patterns of observed (top row) and multi-model mean (middle row) seasonal mean precipitation rate (mm day⁻¹) for the period 1979 to 1993 and the multi-model mean for changes by the period 2090 to 2099 relative to 1980 to 1999 (% change) based on the SRES A1B scenario (bottom row). December to February means are in the left column, June to August means in the right column. In the bottom panel, changes are plotted only where more than 66% of the models agree on the sign of the change. The stippling indicates areas where more than 90% of the models agree on the sign of the change. {Based on same datasets as shown in Figures 8.5 and 10.9}*


100km grid
Seyhan
38N
36E
8.3km grid
25km grid
40N
30E
35E
40E
Nesting

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An unique

Downscaling assuming Pseudo Global Warming

Sato, Kimura and Kitoh,2006(Journal of Hydrology)

Boundary data assuming in Regional Climate Models

1990s	2070s
NCEP/NCAR reanalysis data	NCEP/NCAR reanalysis data
based upon observation	+ (2070s - 1990s)/monthly
	Differential component

Differential component

(2070s - 1990s)/monthly are obtained from two CGCMs

MIR CGCM2 T42 Scenario A2

CCSR-NIES CGCM T42 Scenario A2

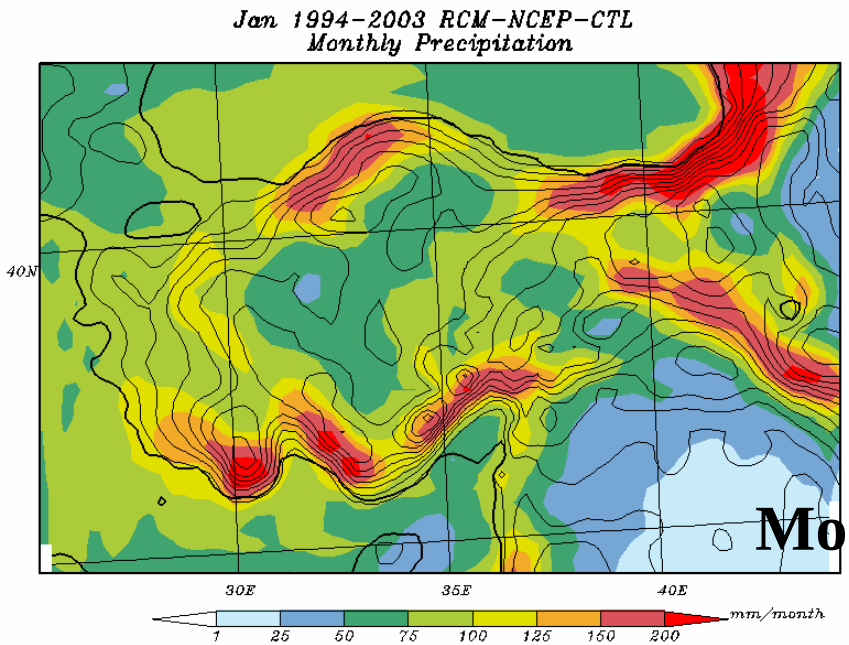
Regional Climate Models

(1) TERC-RAMS (2) WRF

Precipitation

JAN 1994-2003

Difference 2070s-1990s



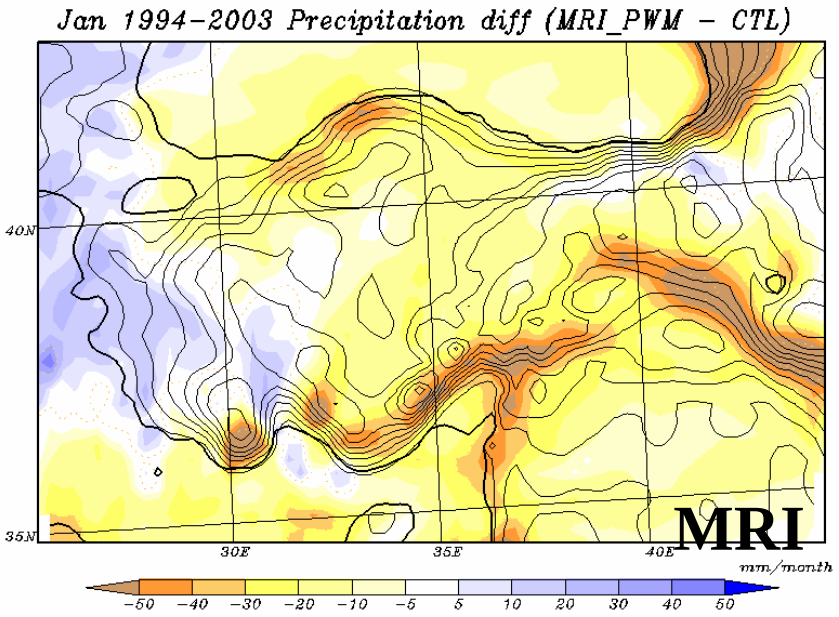
JAN

1990s

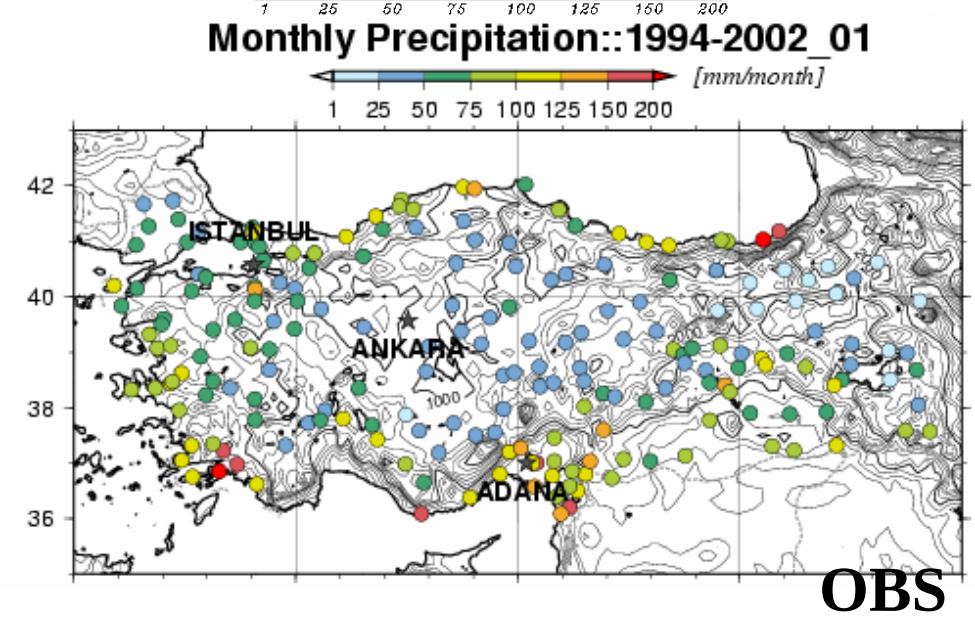
|

2070s

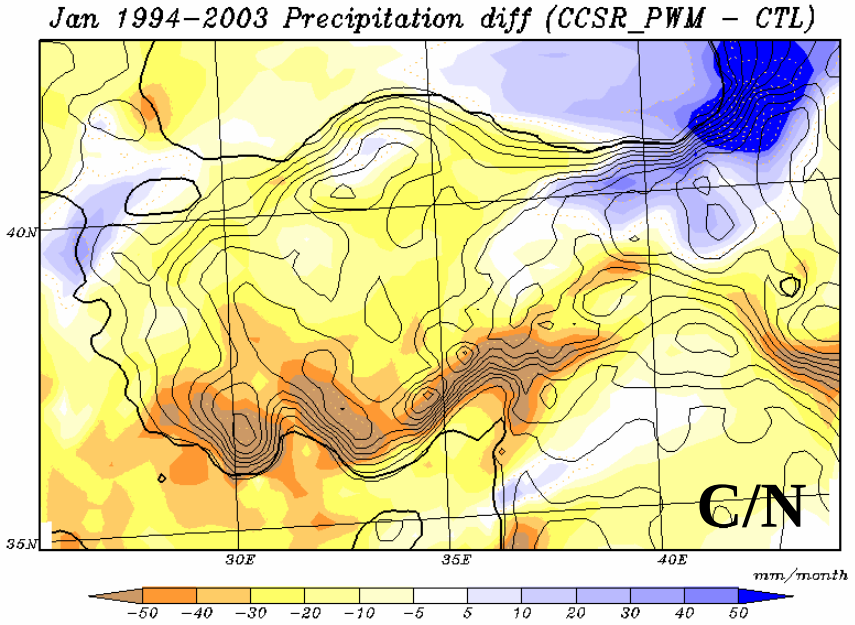
Model



MRI



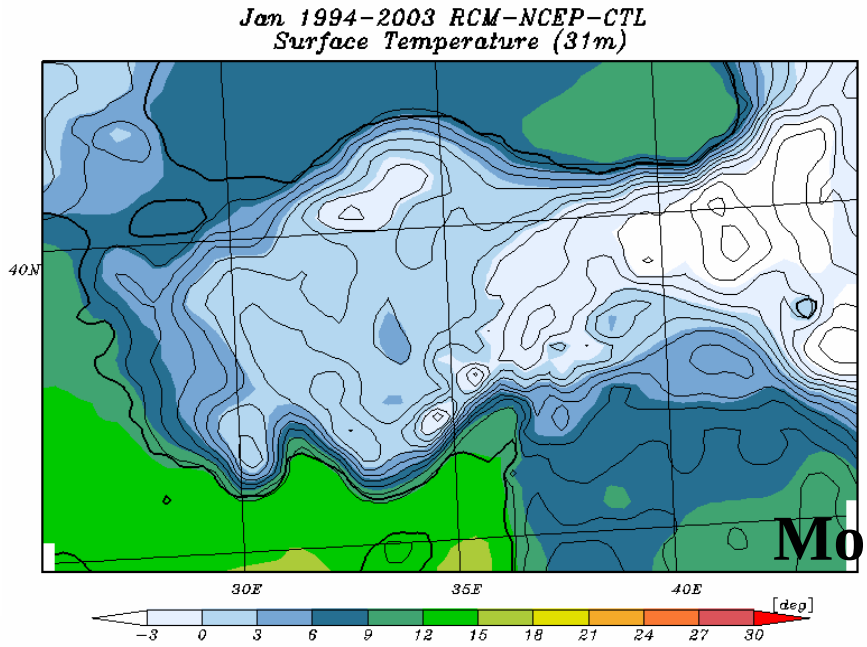
OBS



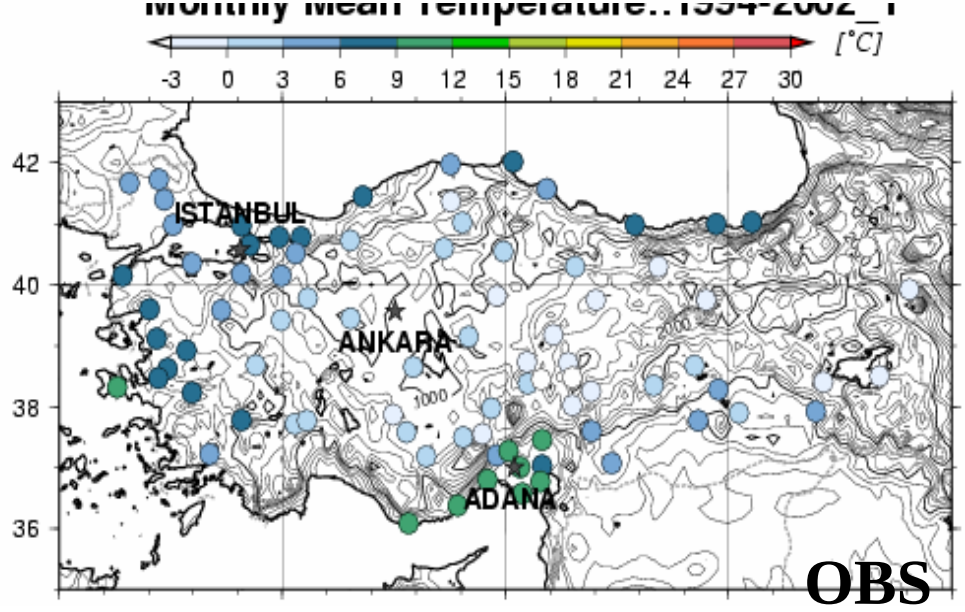
C/N

Temperature

Jan 1994-2003

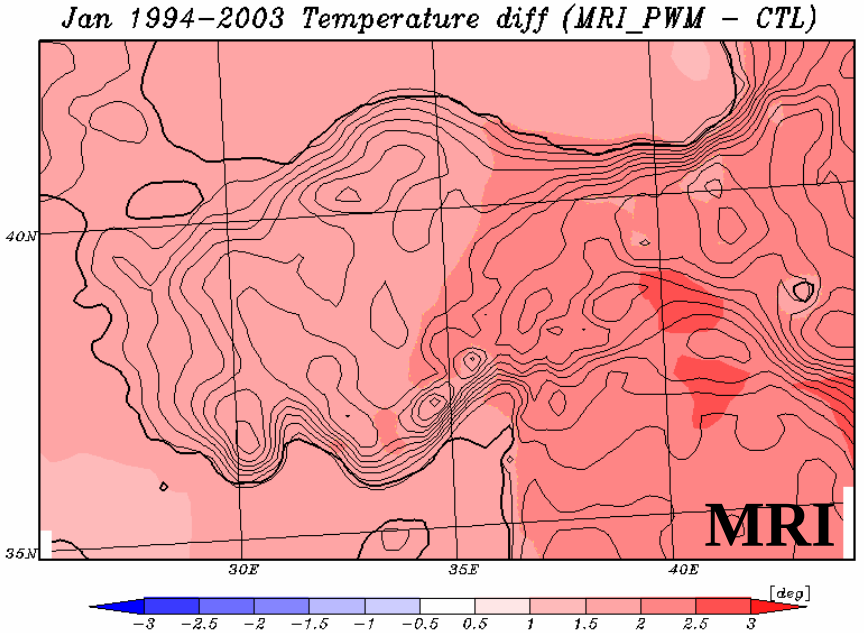


Model

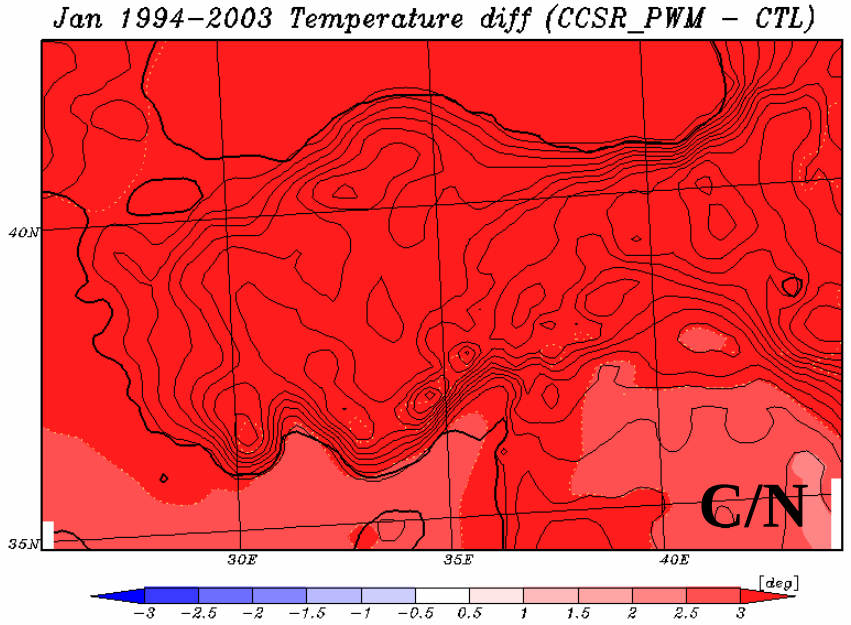


OBS

Difference 2070s-1990s



MRI

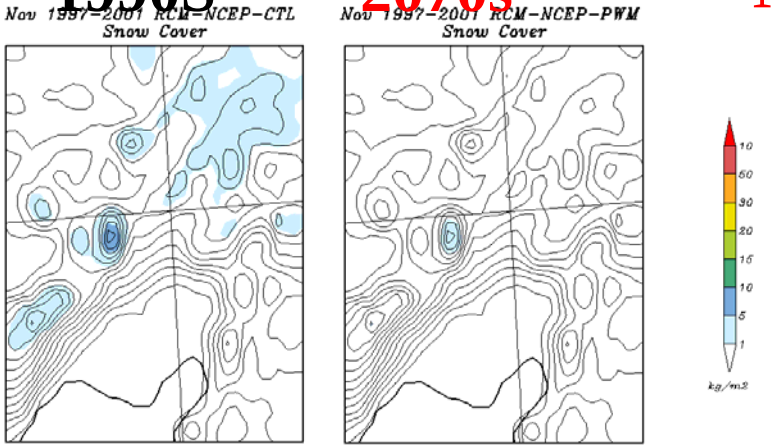


C/N

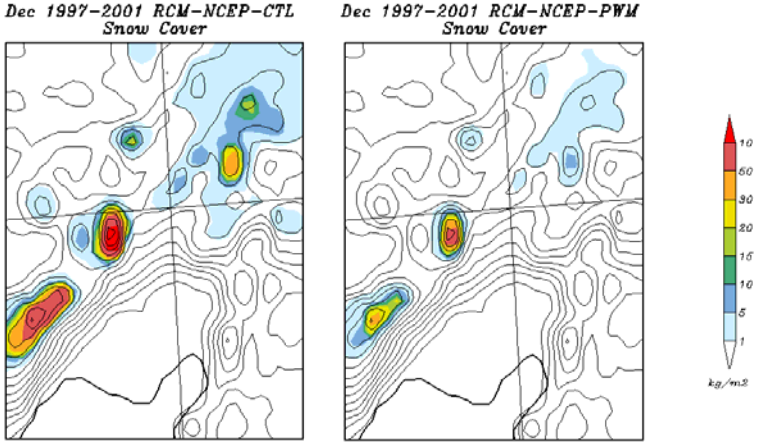
Monthly mean Snow cover

1990S **2070s**

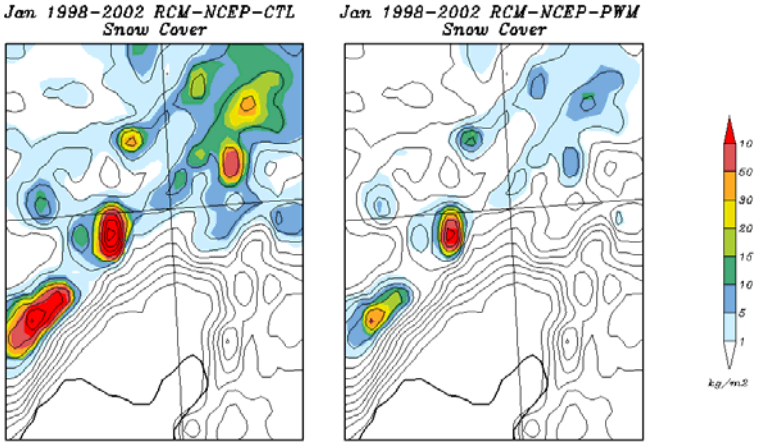
Nov



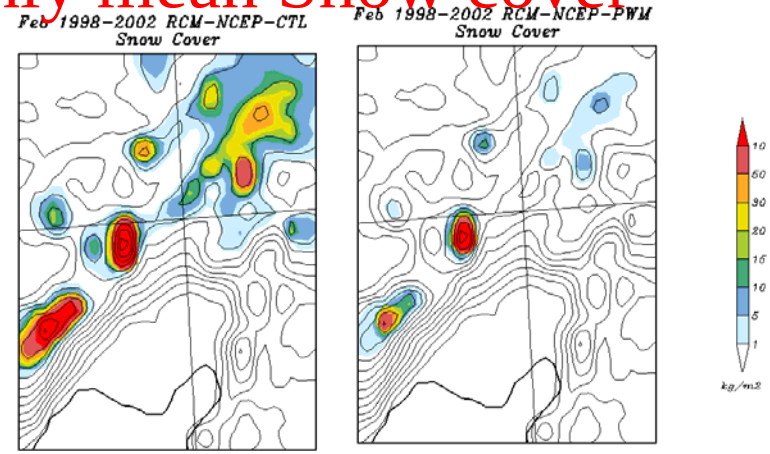
Dec



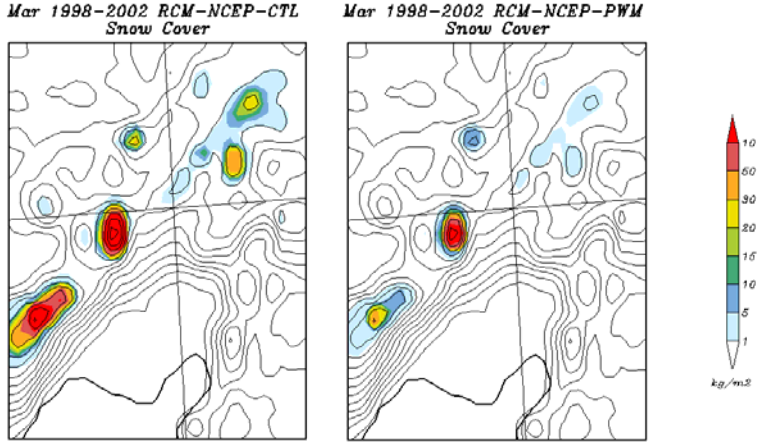
Jan



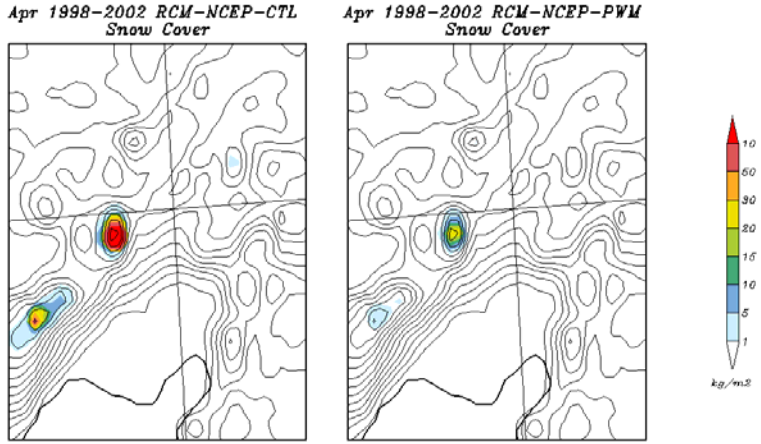
Feb



Mar



Apr



Seyhan Total snow cover water
5 year mean

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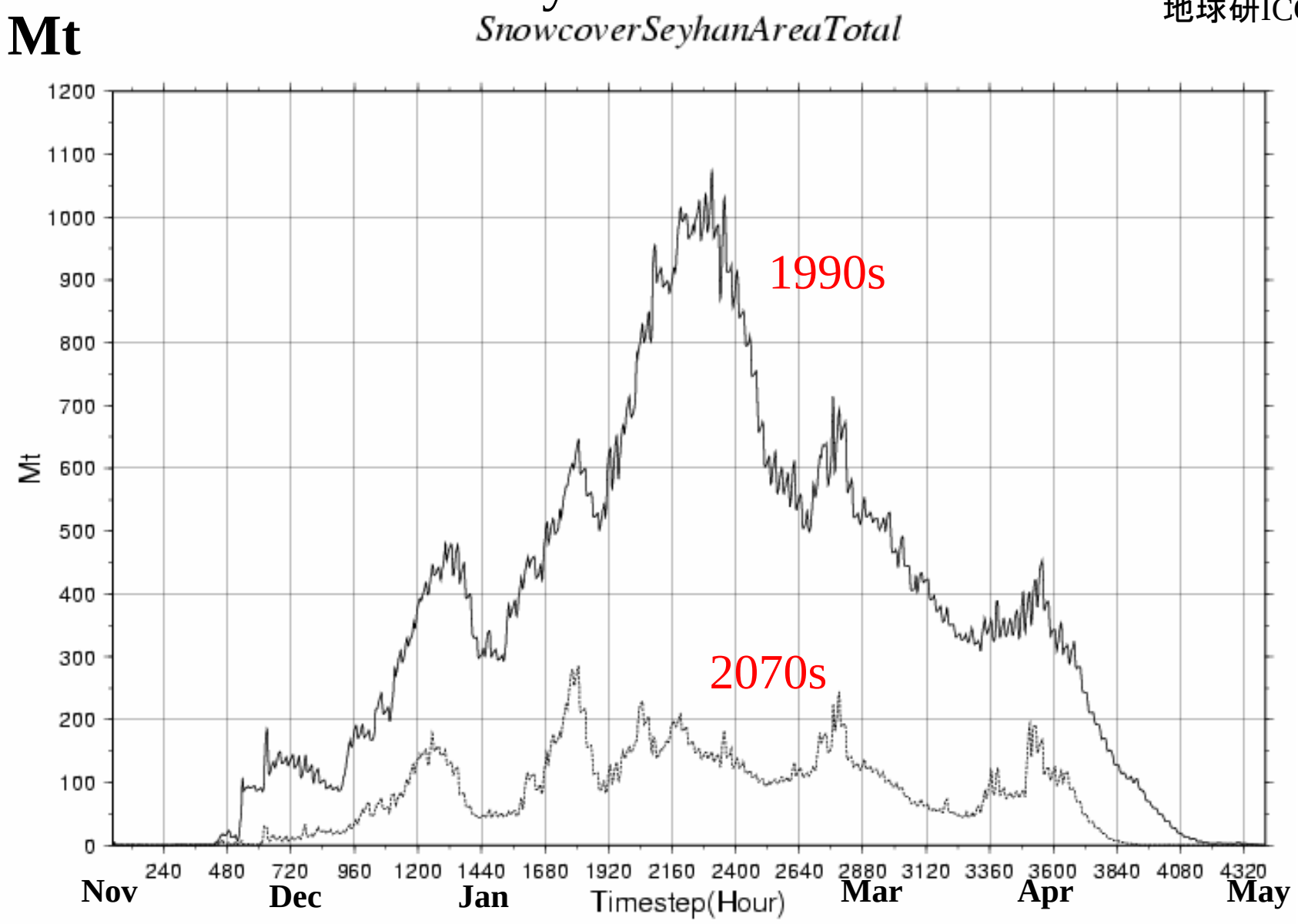
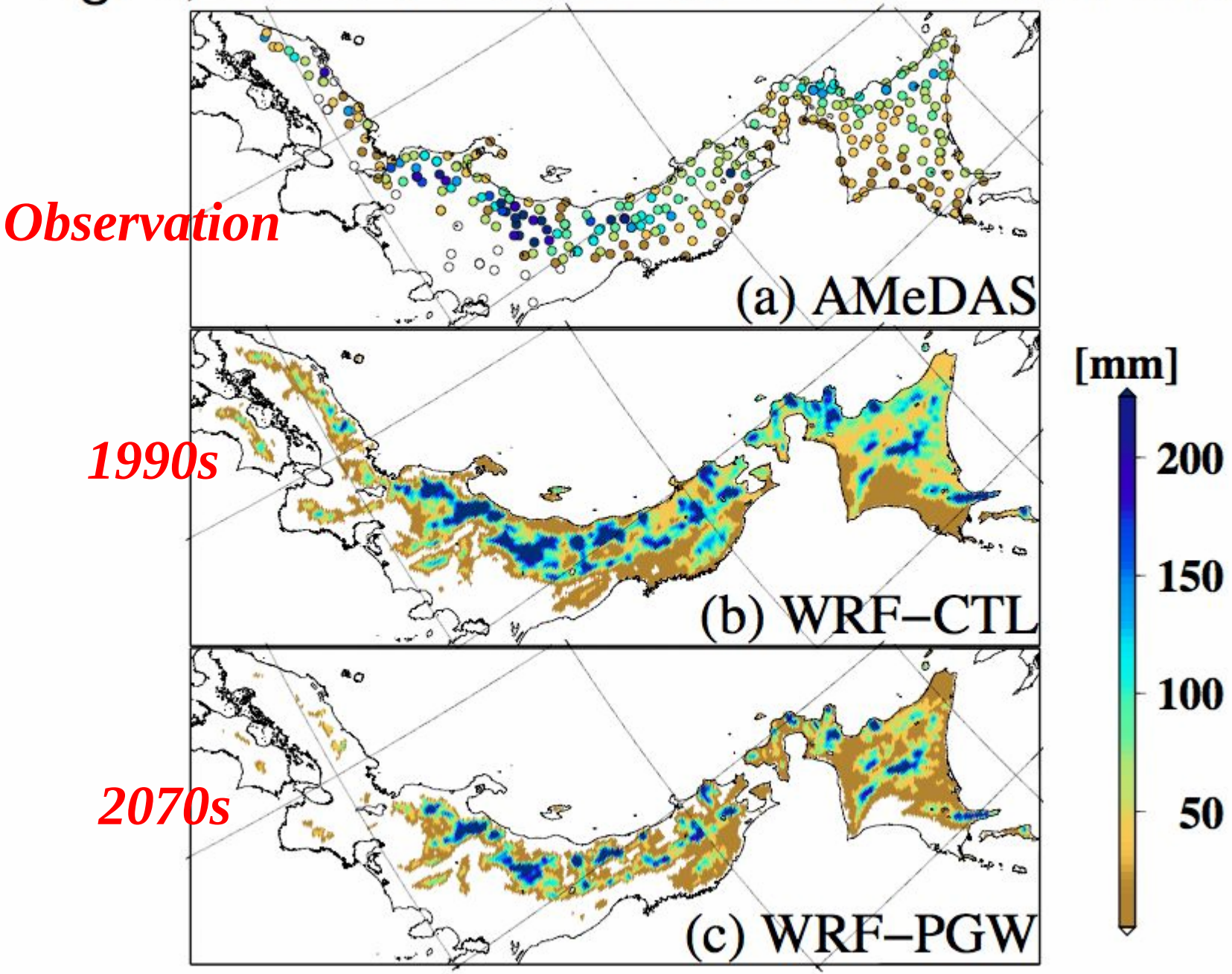


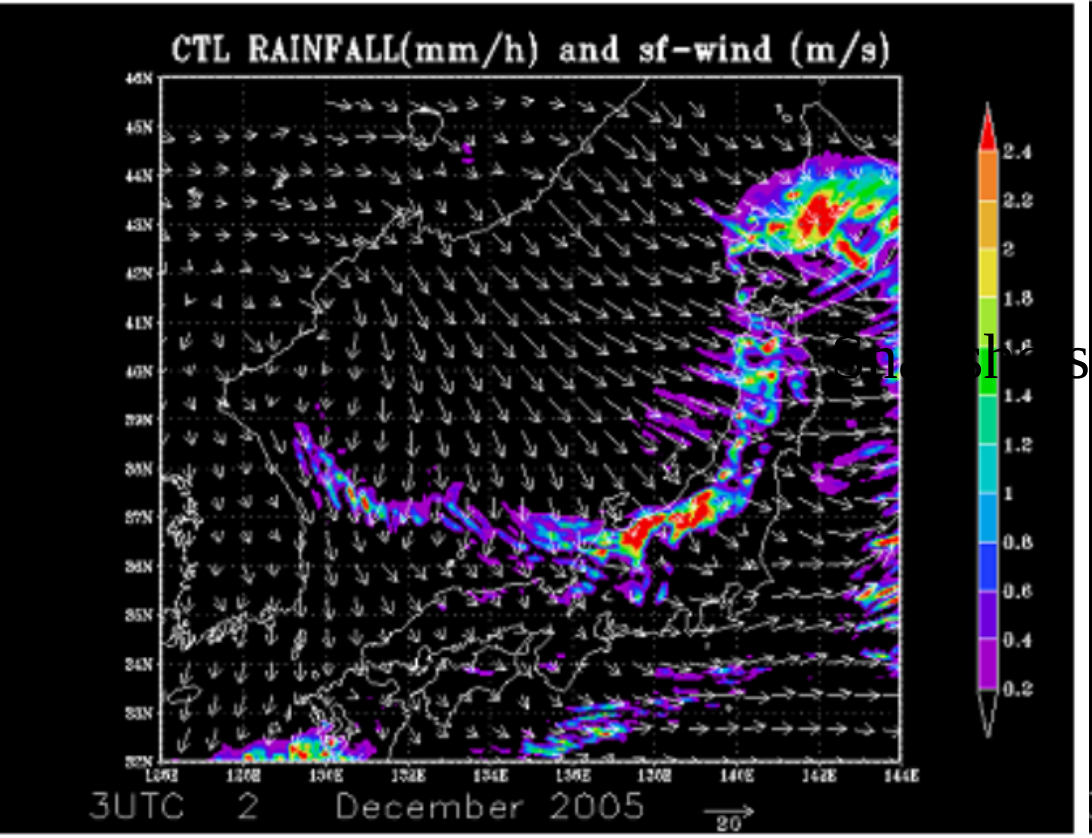
Fig. 1, Snow depth at the end of December



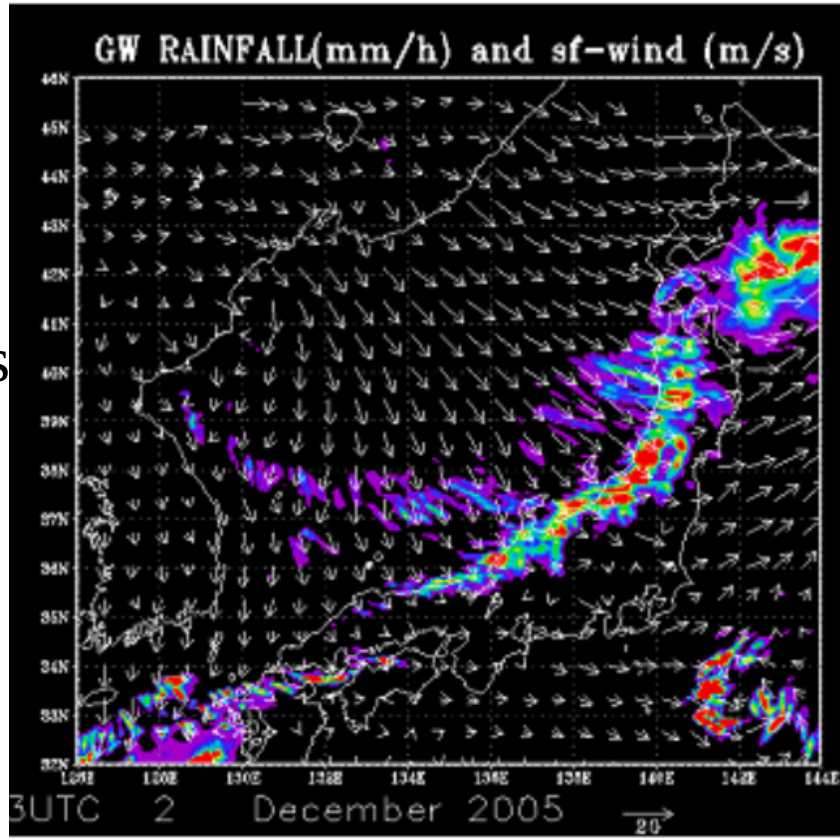
Snapshots

Precipitation (mm)

3UTC 2/Dec/2005

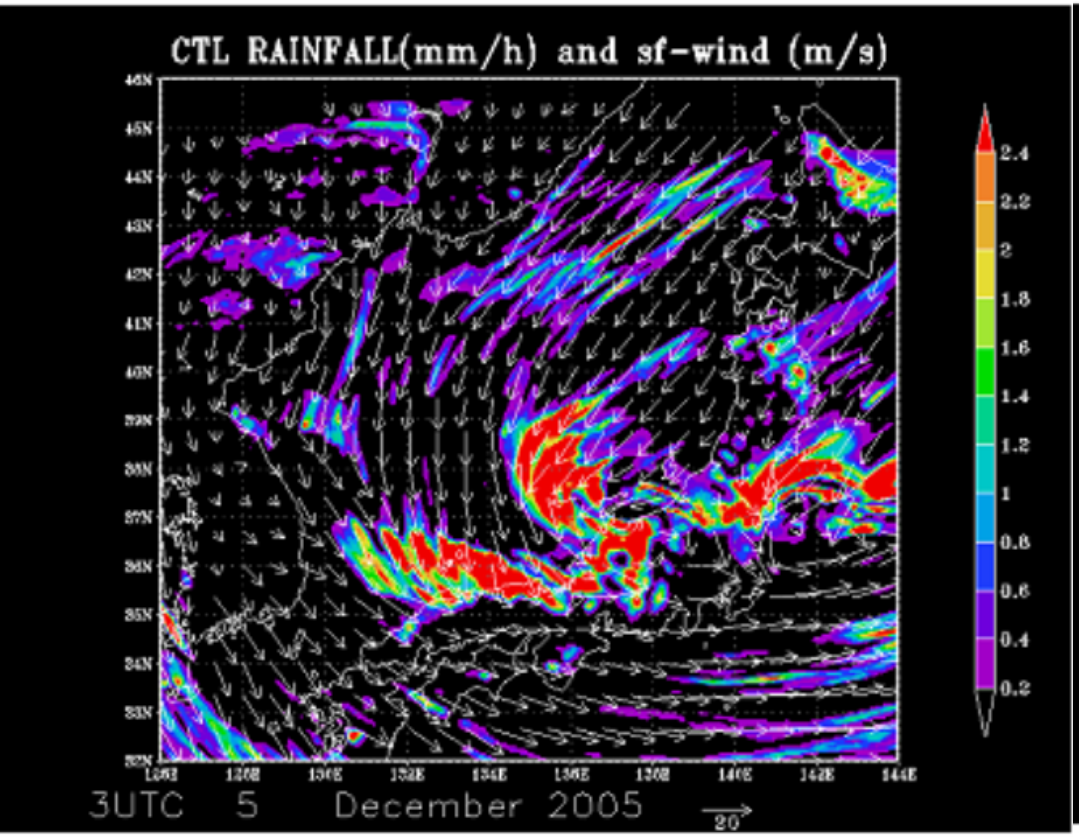


/Dec/2070s

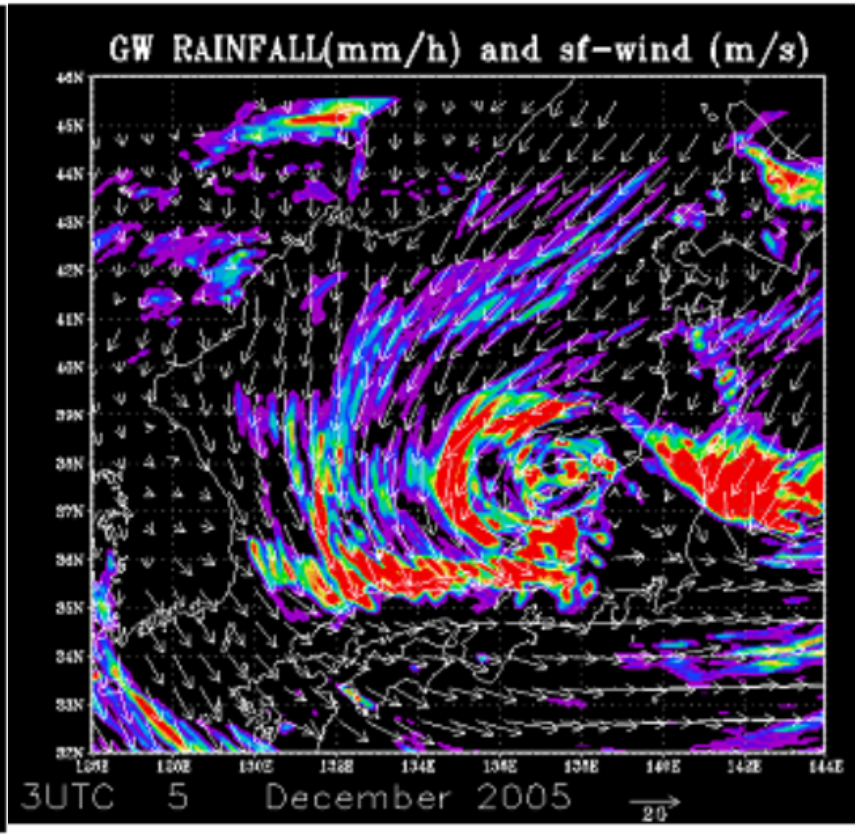


Precipitation (mm)

3UTC 5/Dec/2005



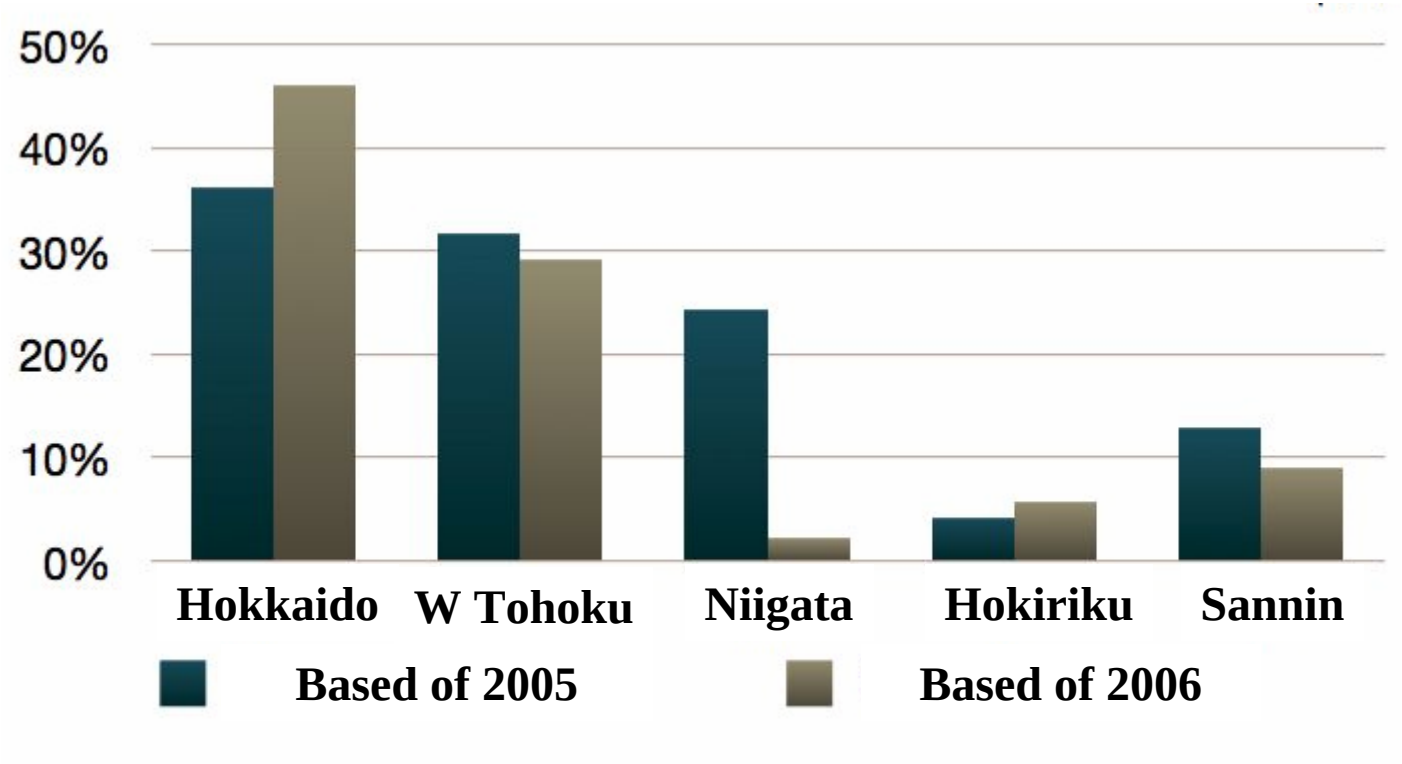
/Dec/2070s



Ratio of snow depth

2070s/2000s

average in AMeDAS stations



Summary

Turkey

(1)Precipitation will decrease 10-40mm/month during cold season

(2)Precipitation change has good similarity between both GCMs

(3)Surface temperature increase by 2.0K(MRI) to 3.5K(C/N)

(4)Snow and snow cover will prominently decrease around Seyhan

Japan

(1)Precipitation will not significantly change in winter

(2) Snow and snow cover will prominently decrease particularly at the AMeDAS observation stations, which are located in the low altitude

Thank you

Entire Turkey

1990s and 2070s

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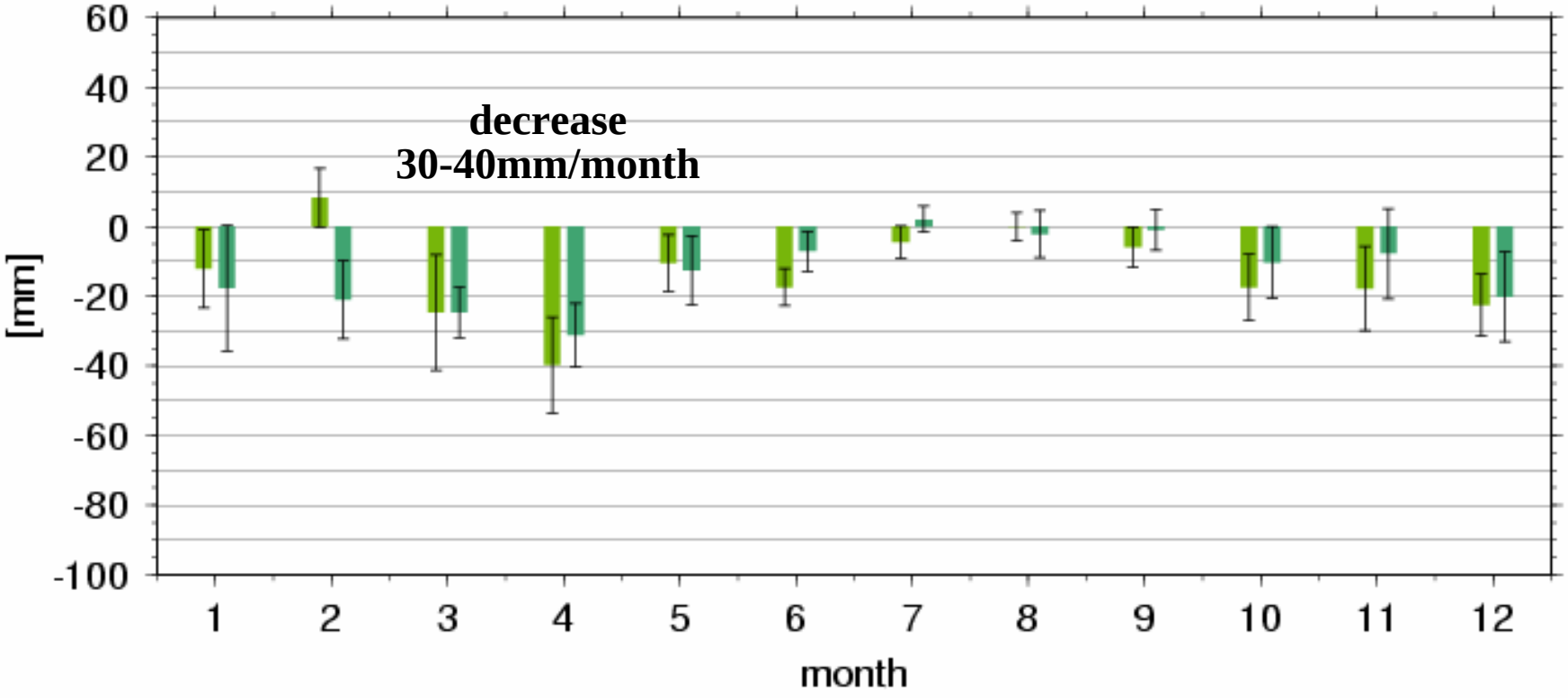
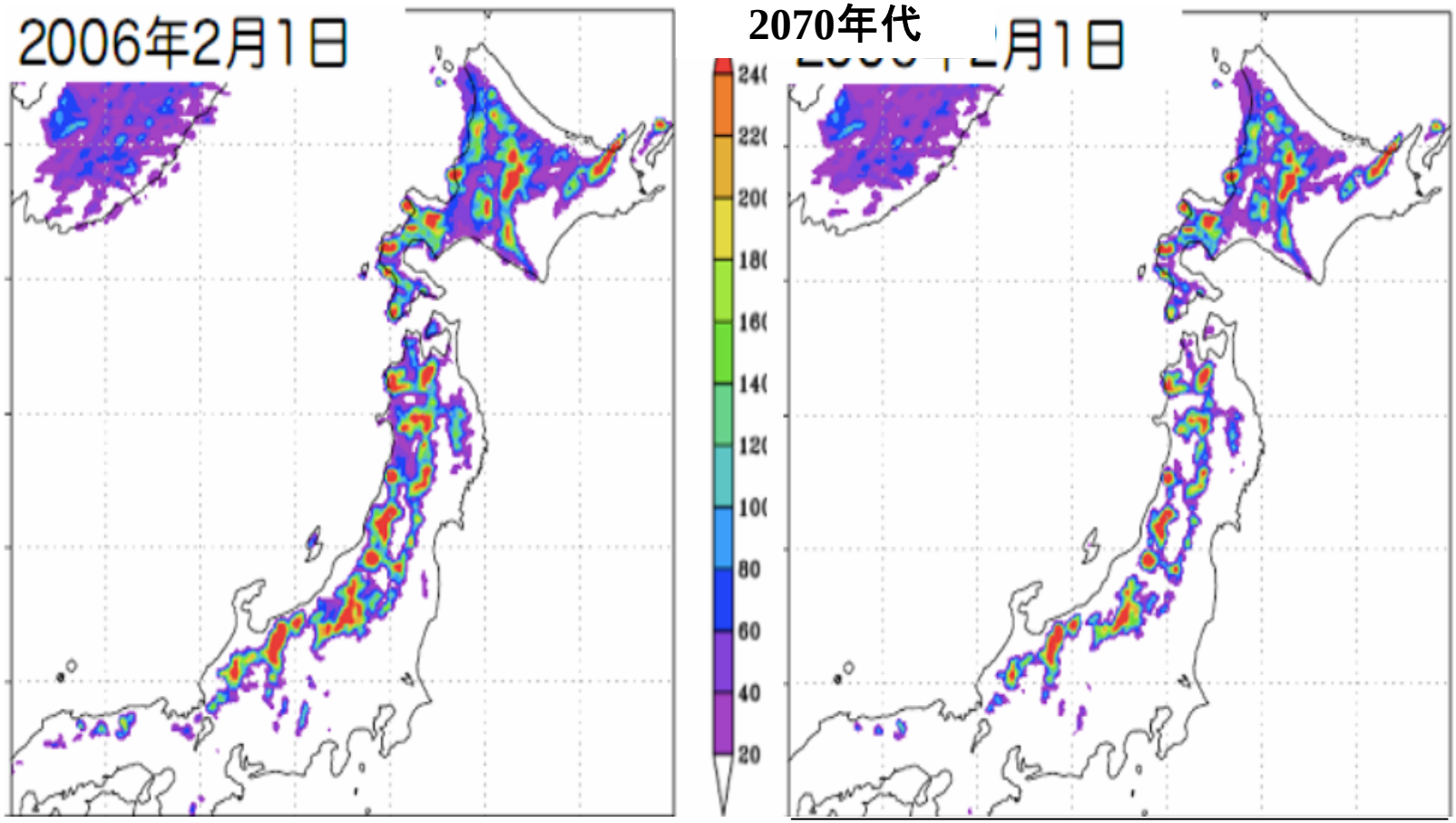
Difference in Precipitation and S/D of years




2006年2月1日
2070年代
240
220
200
180
160
140
120
100
80
60
40
20

Downscaling from different GCMs