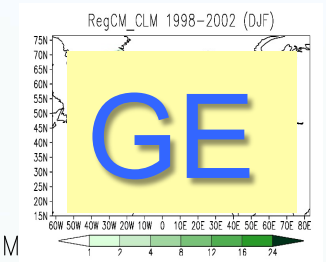
RegCM over different domain: an evergreen old story of a long tuning

by Erika Coppola, Laura Mariotti, Ramon Fuentes Franco, Emanuela Pichelli, Csaba Torma, Graziano Giuliani



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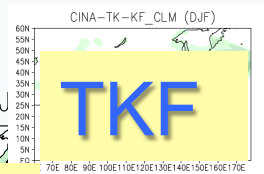

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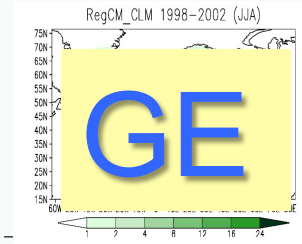

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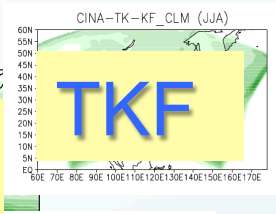

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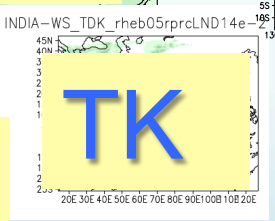

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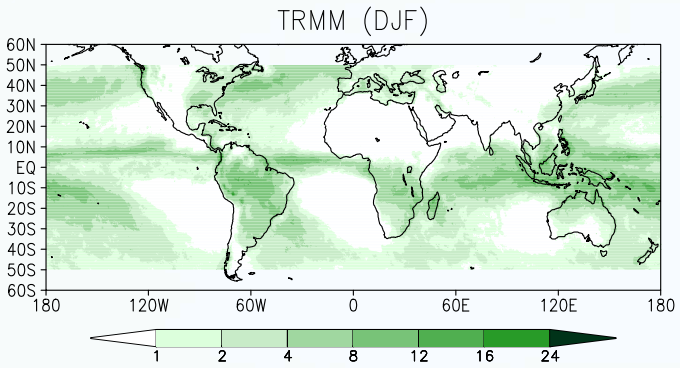
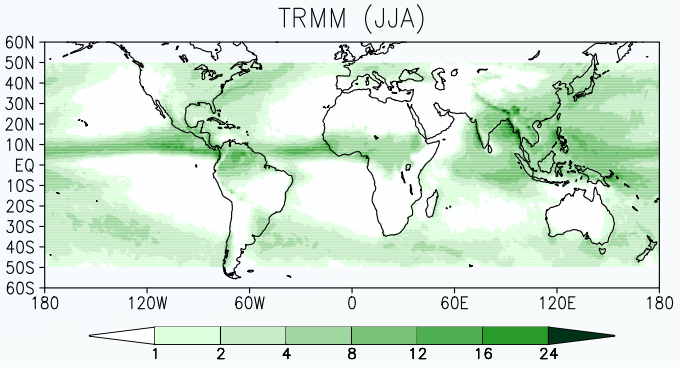
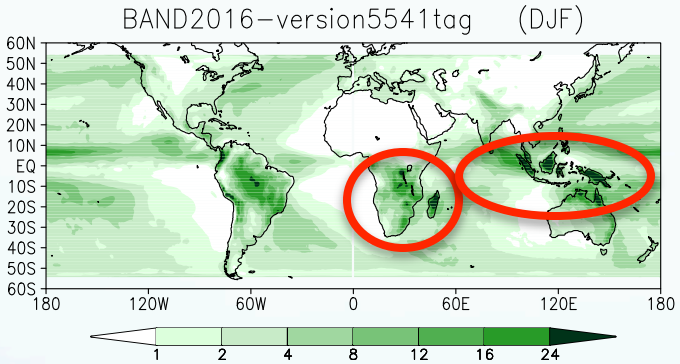
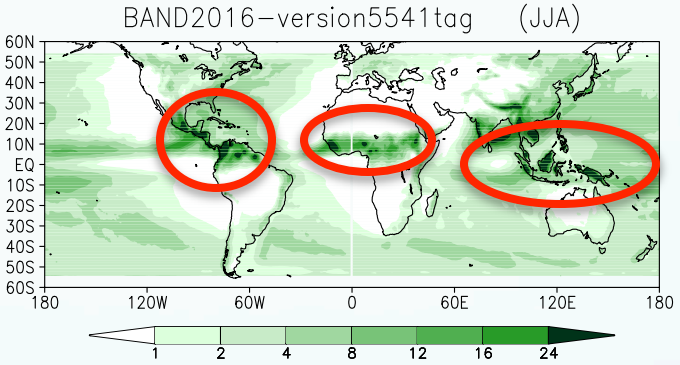
What happen? I do not recognize my model behavior!

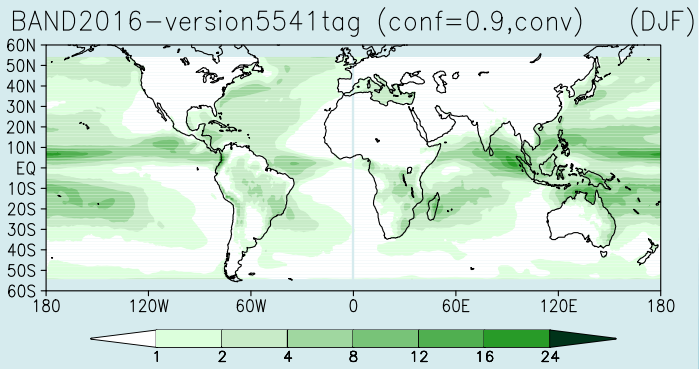
Story of a parameter : Condensation efficiency

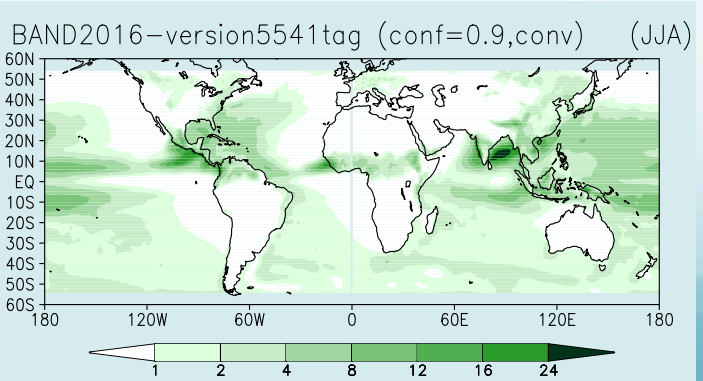












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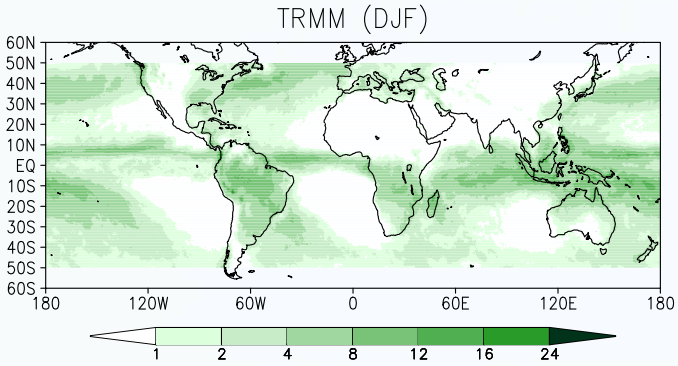
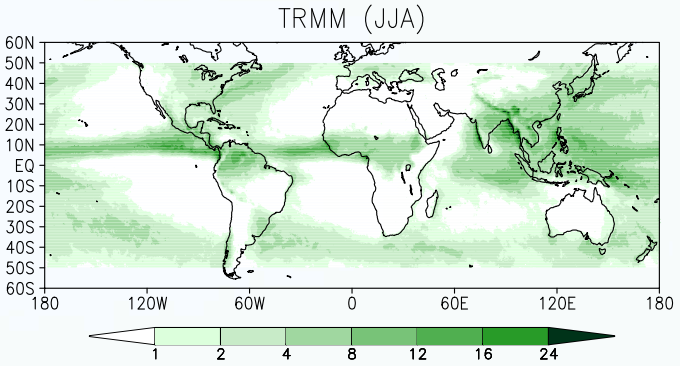
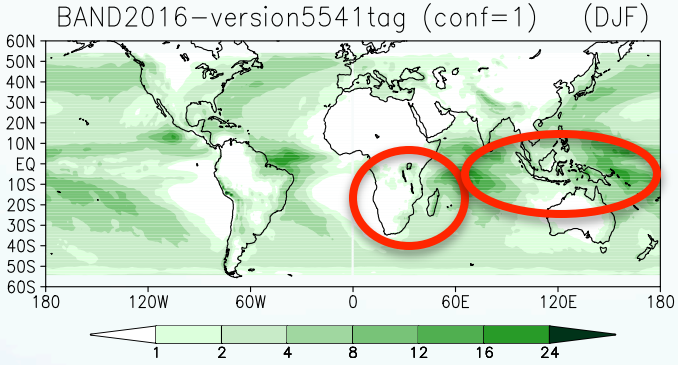
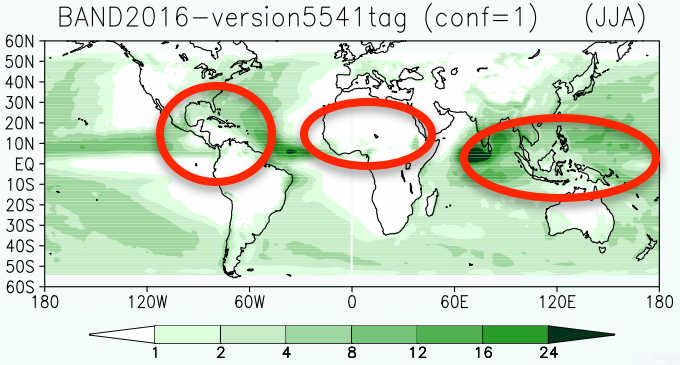
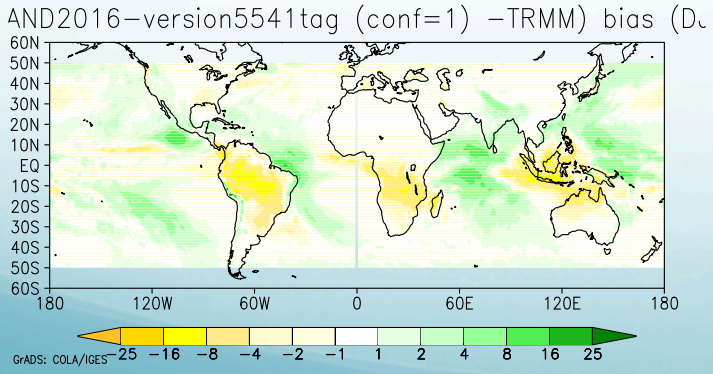
Story of a parameter : Condensation efficiency

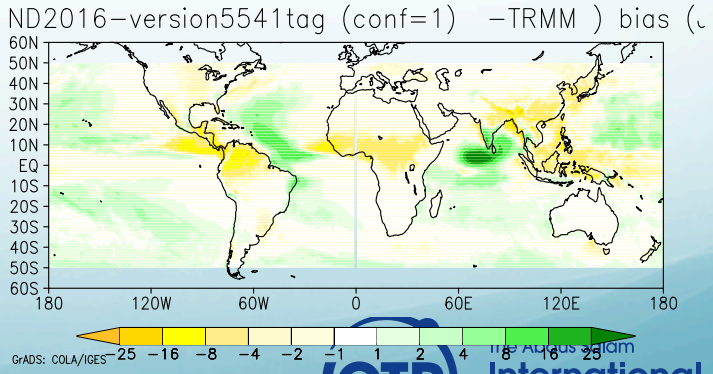












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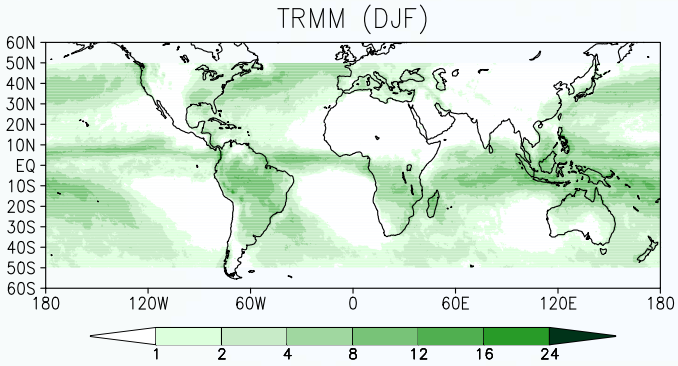

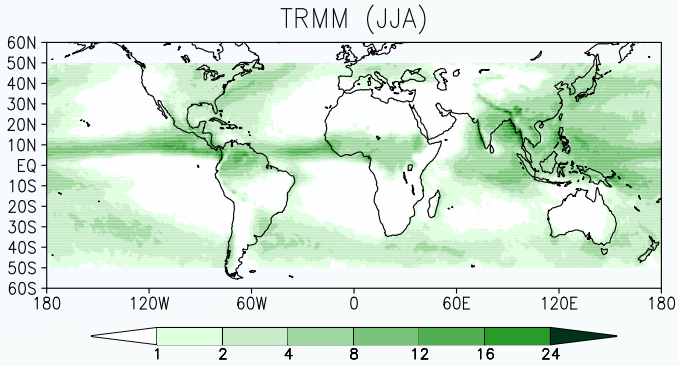

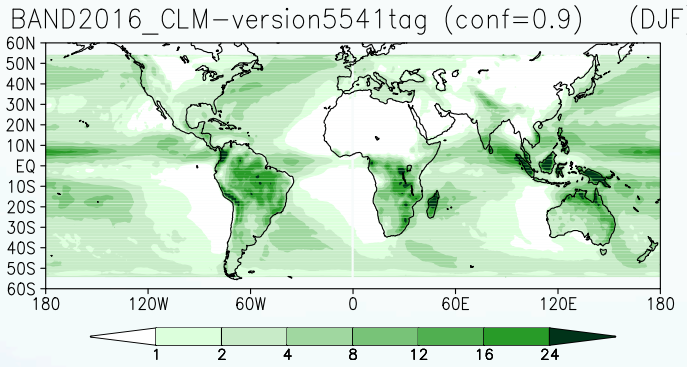

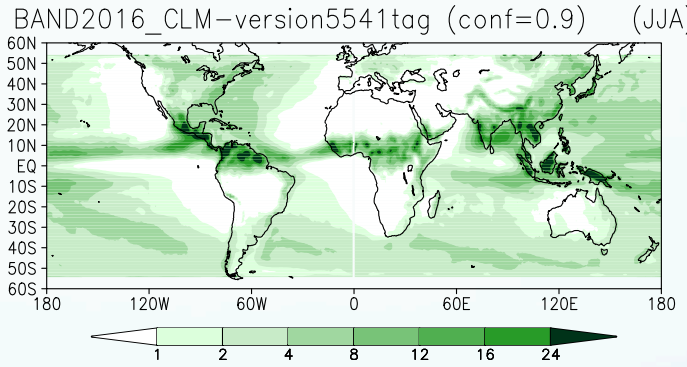

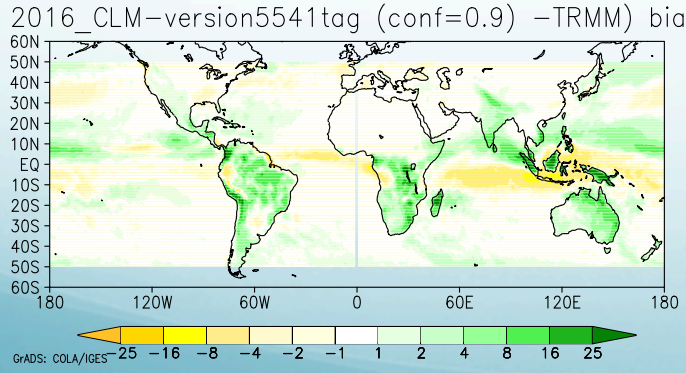

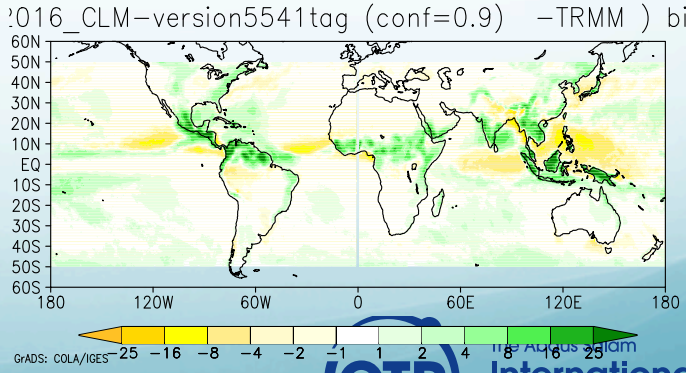

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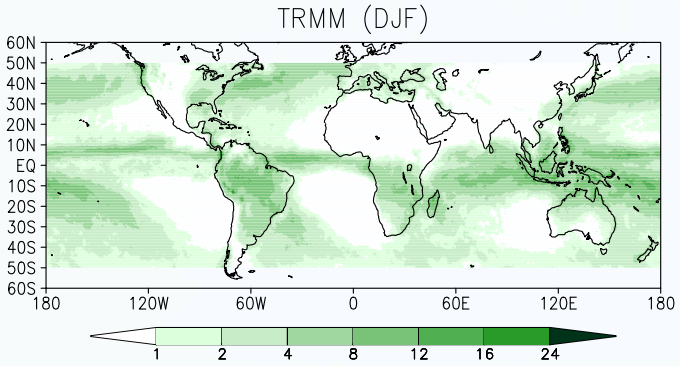

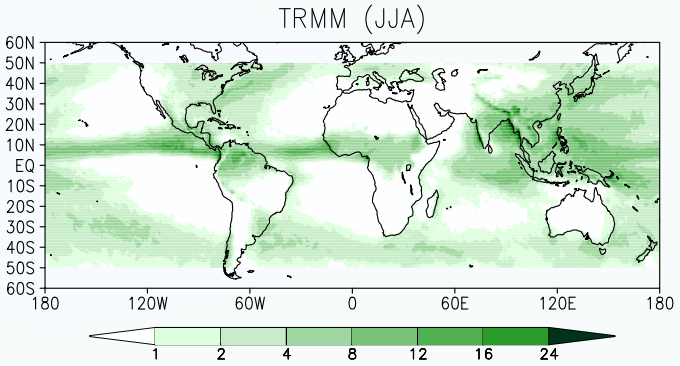

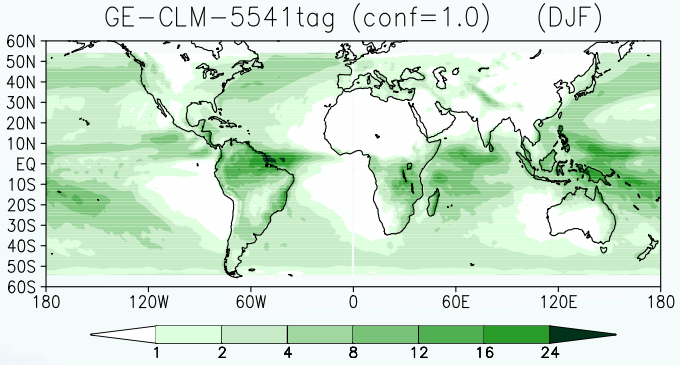

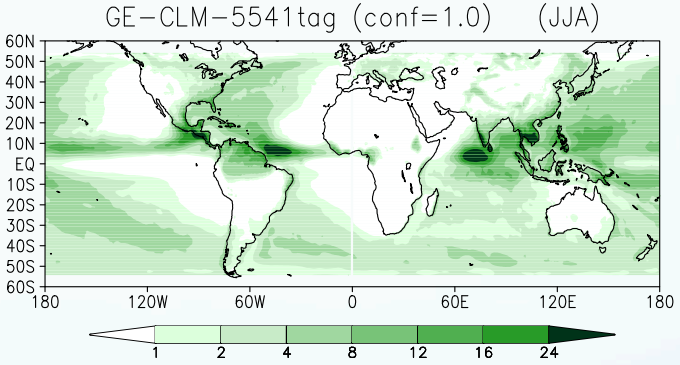

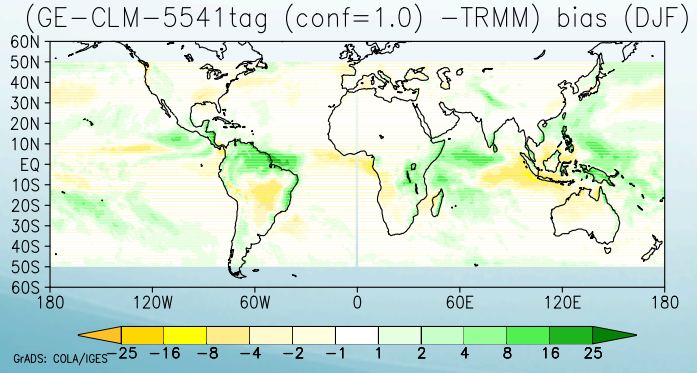

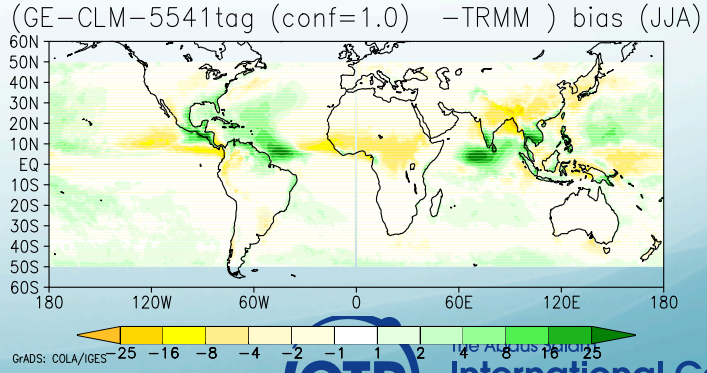

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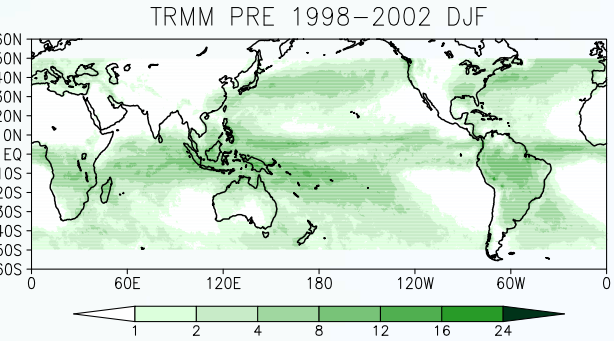

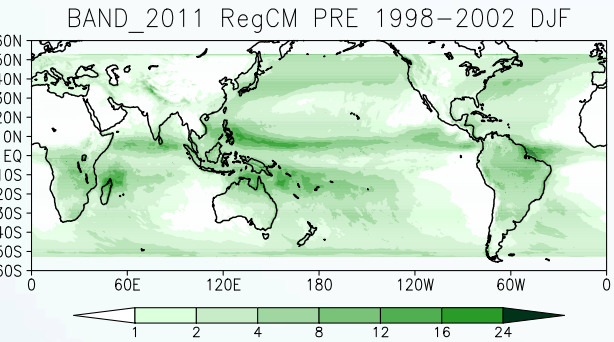

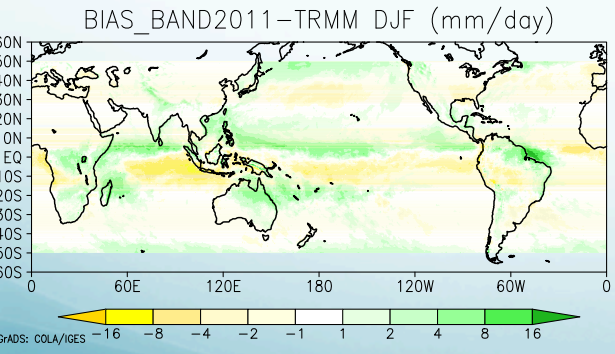

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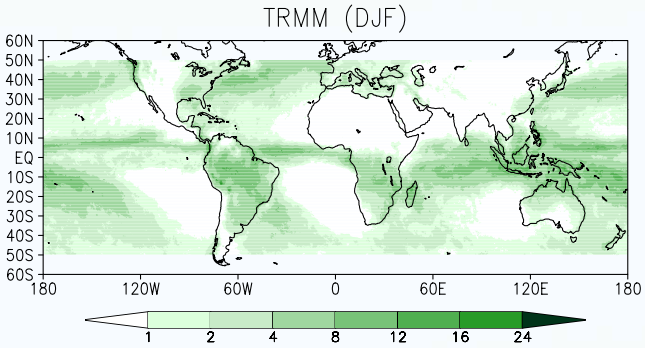

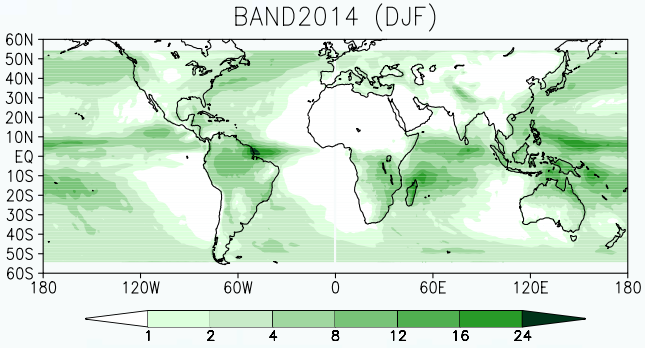

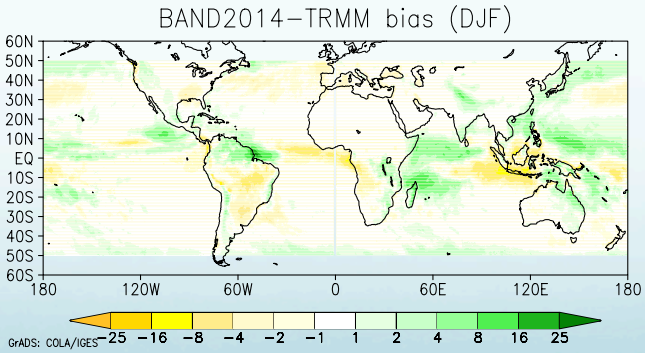

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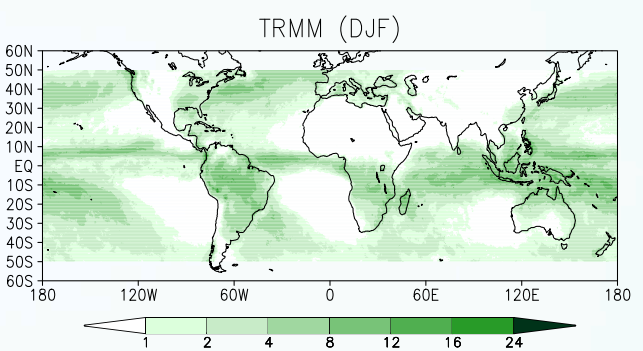

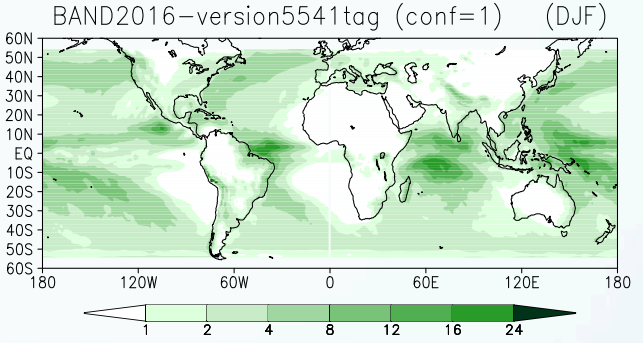

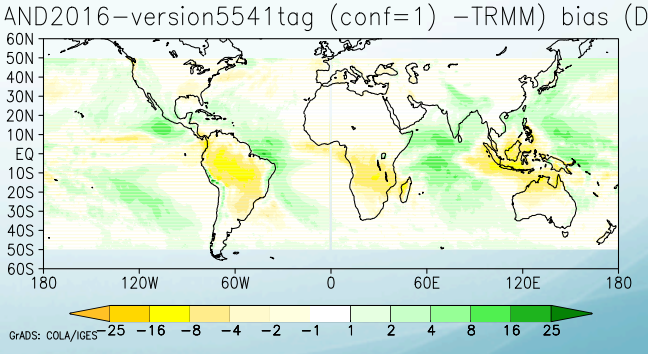

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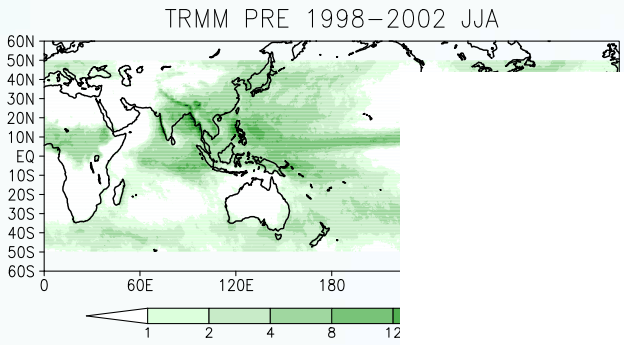
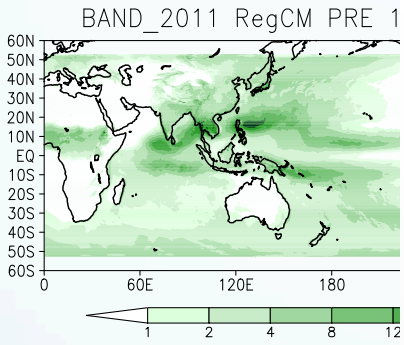
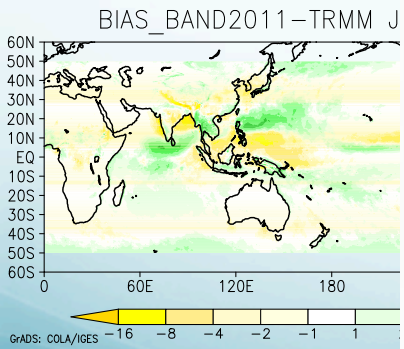
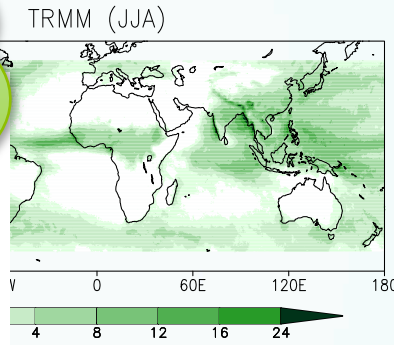
2014

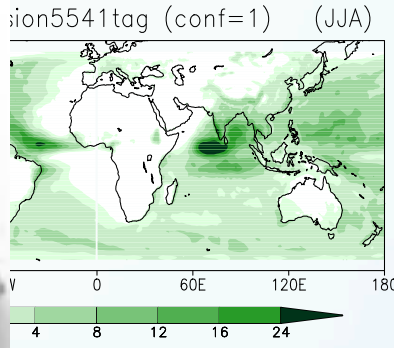
2016

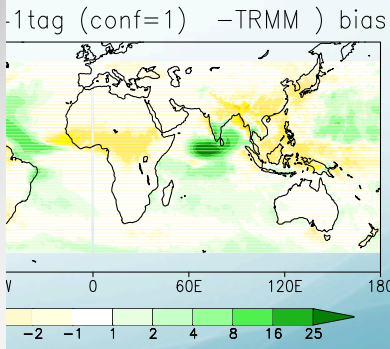












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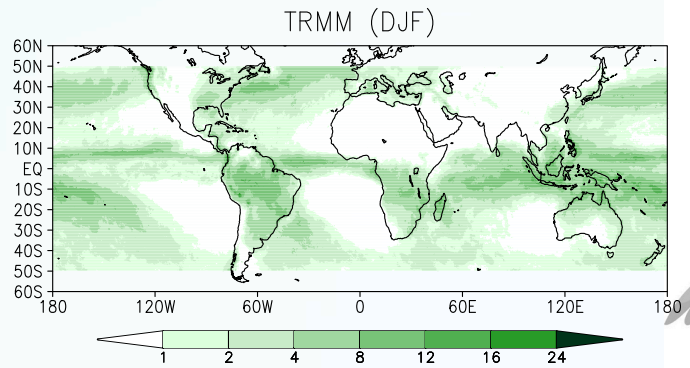

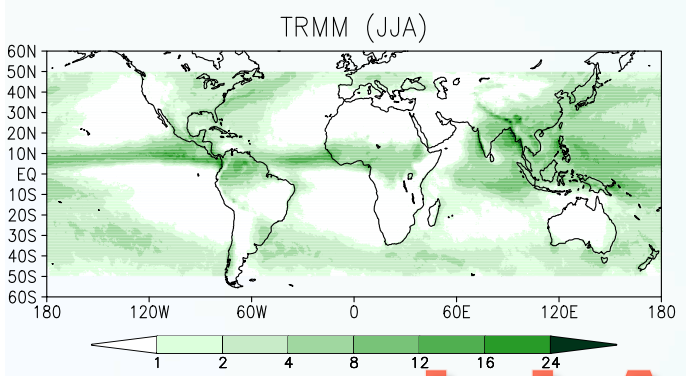

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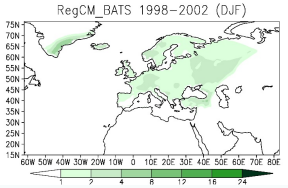

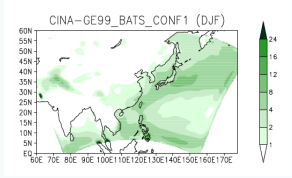

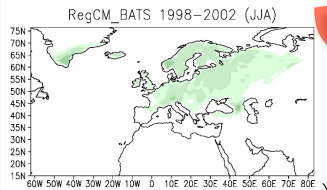

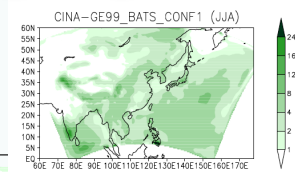

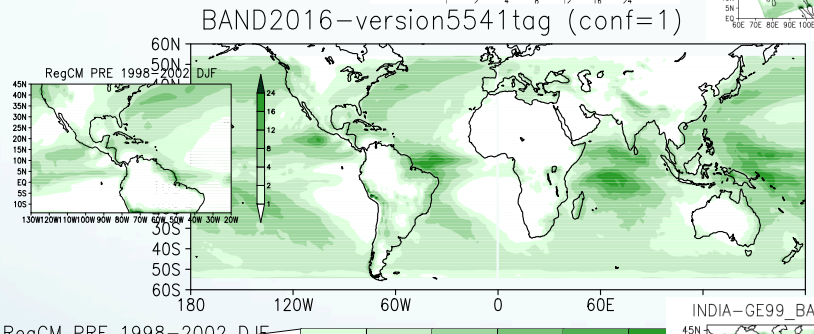

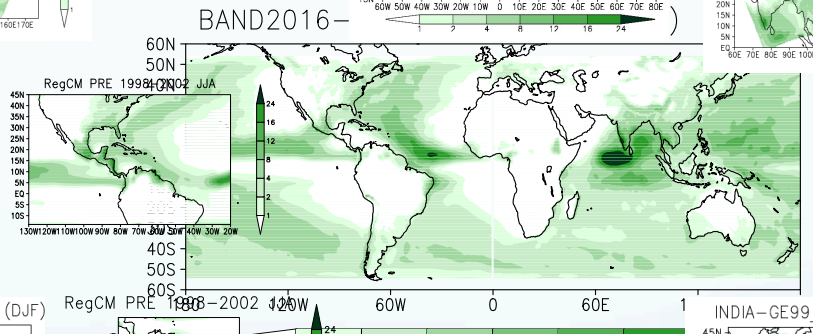

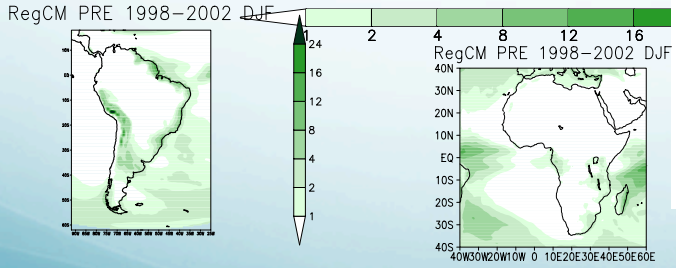

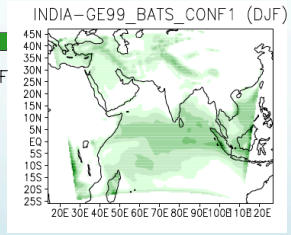

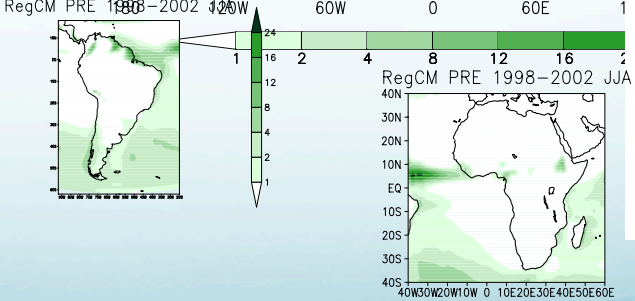

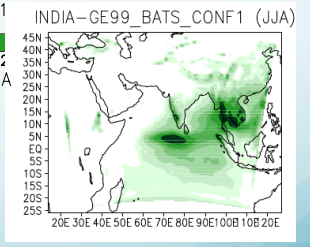

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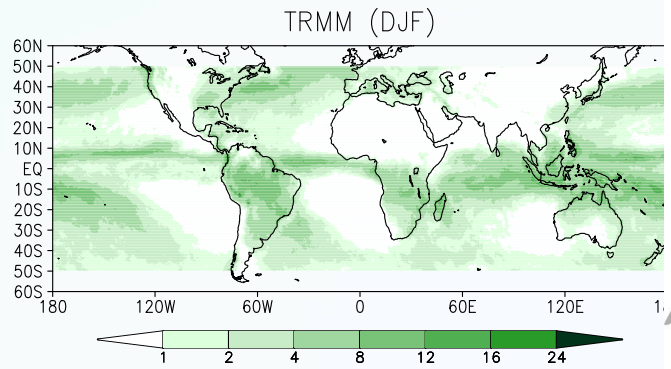

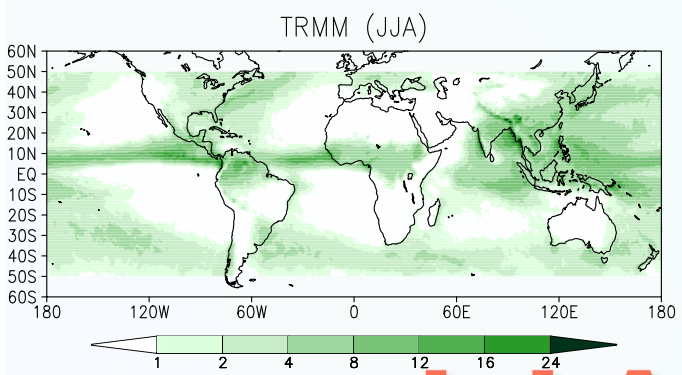

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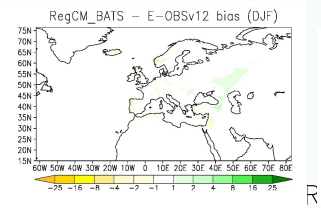

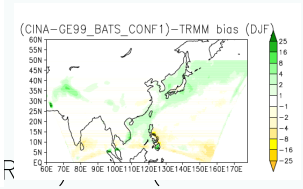

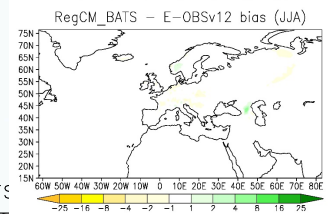

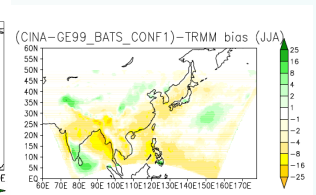

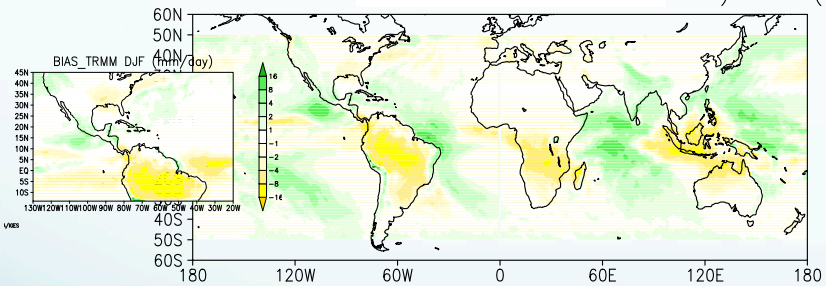

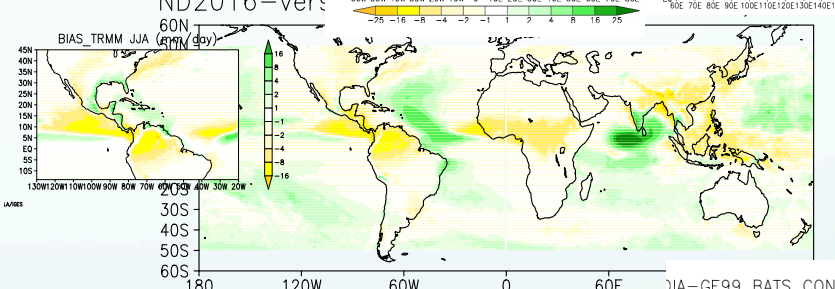

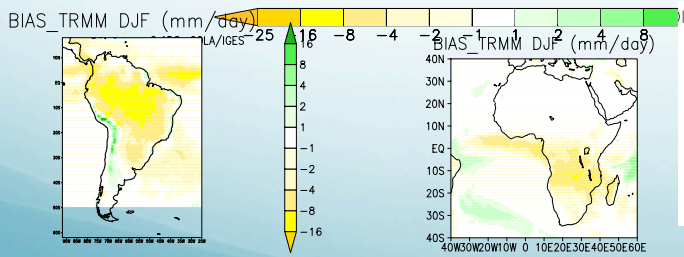

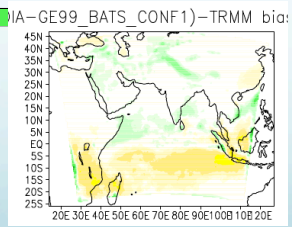

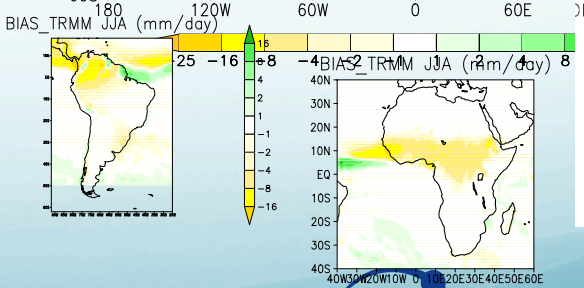

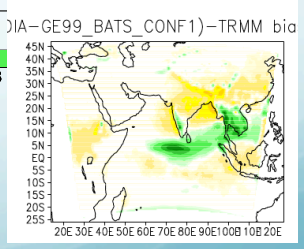

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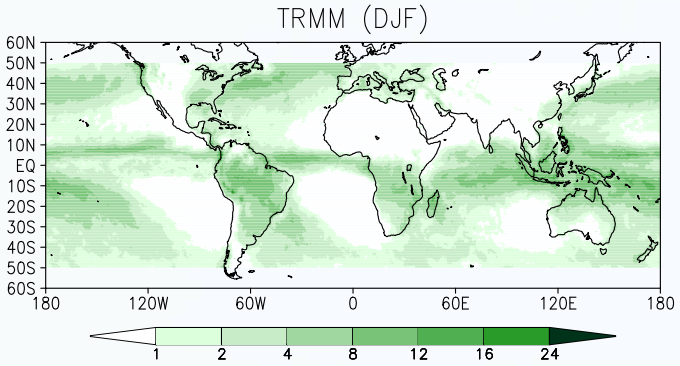
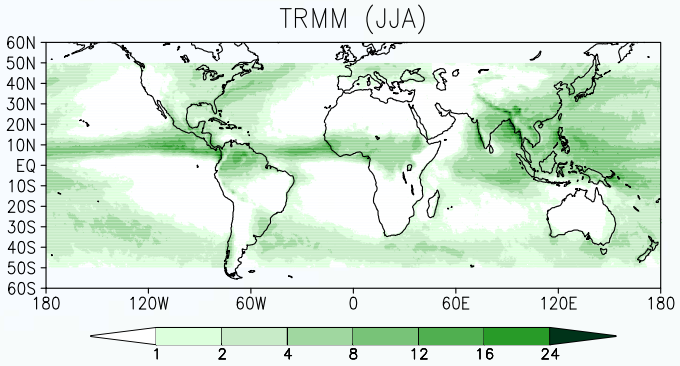
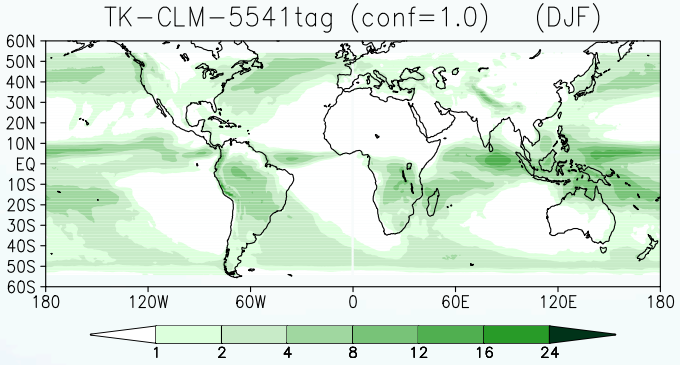
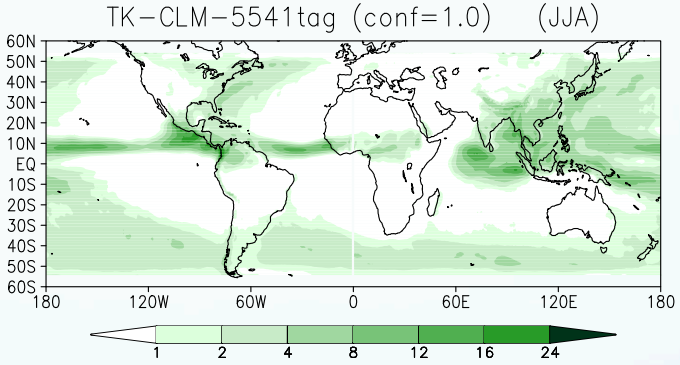
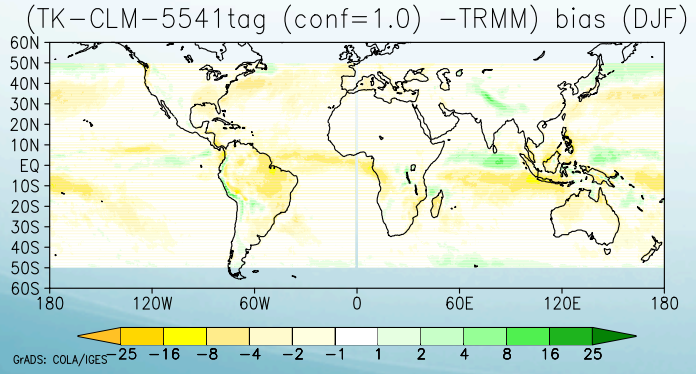
Toward a convergence: many test later. Test 1

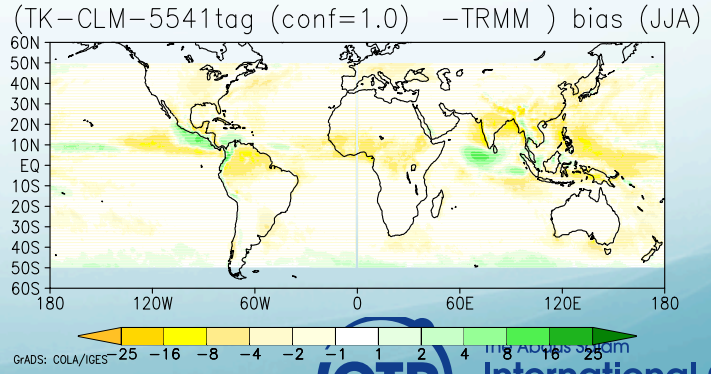












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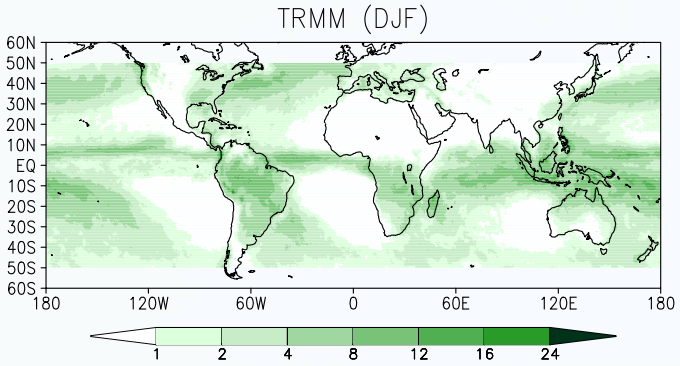
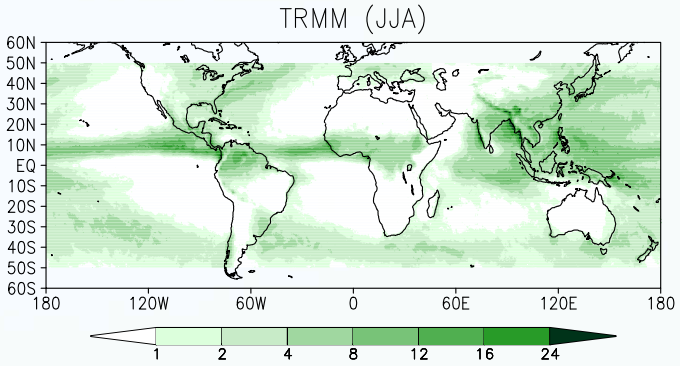
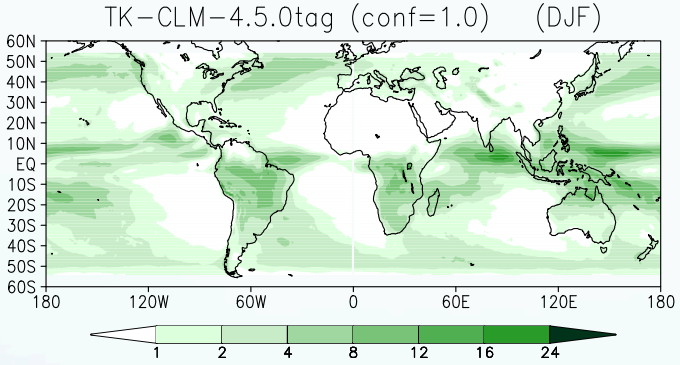
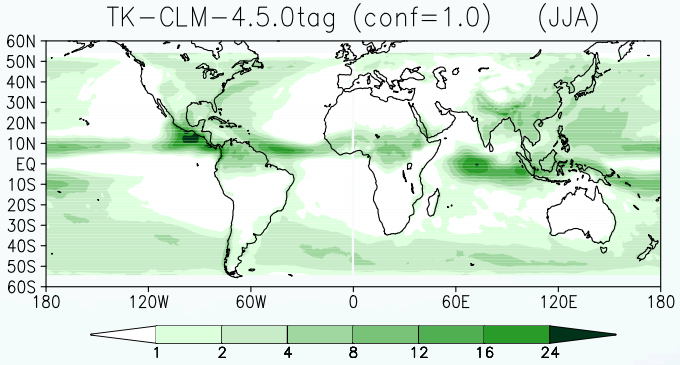
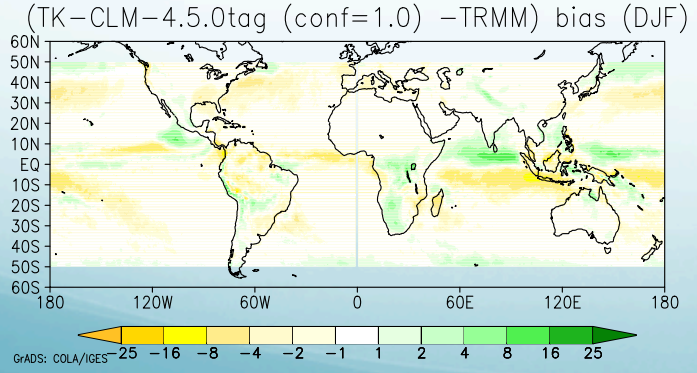
Toward a convergence: many test later. Test 2

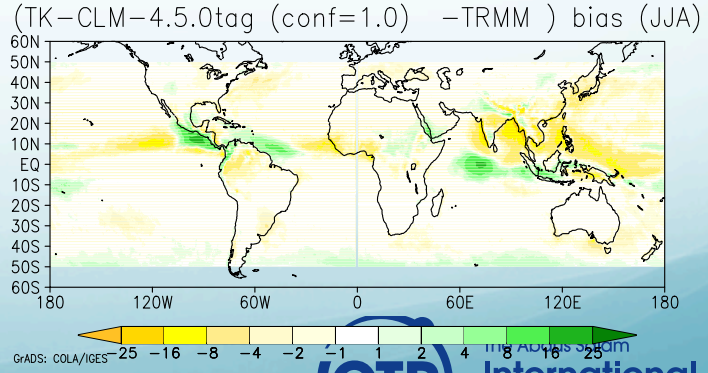












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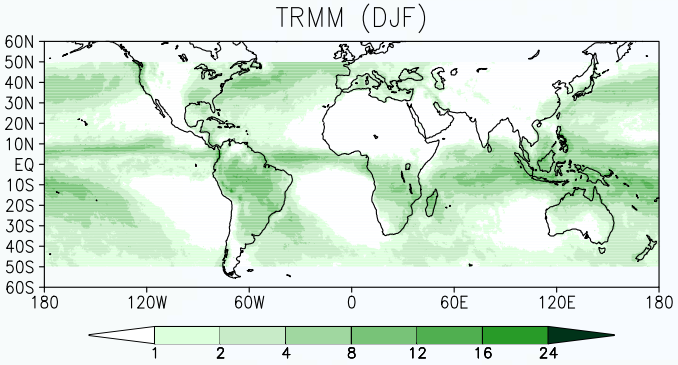
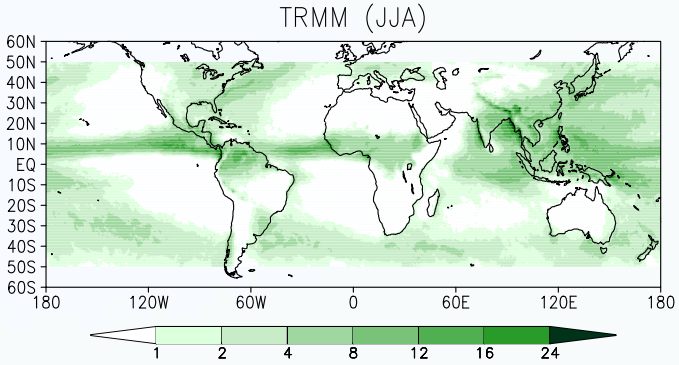
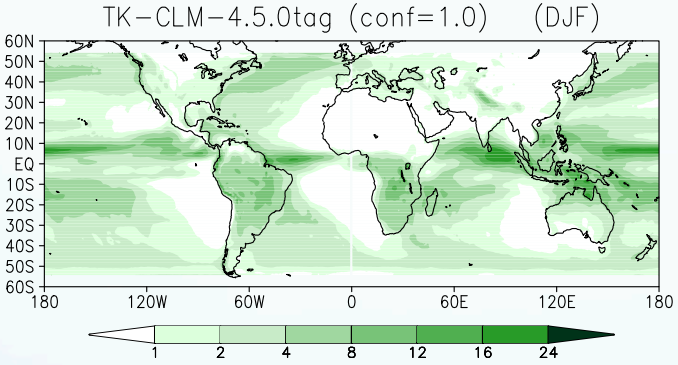
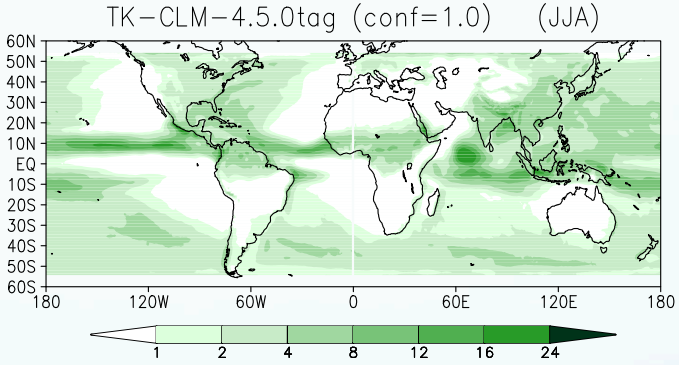
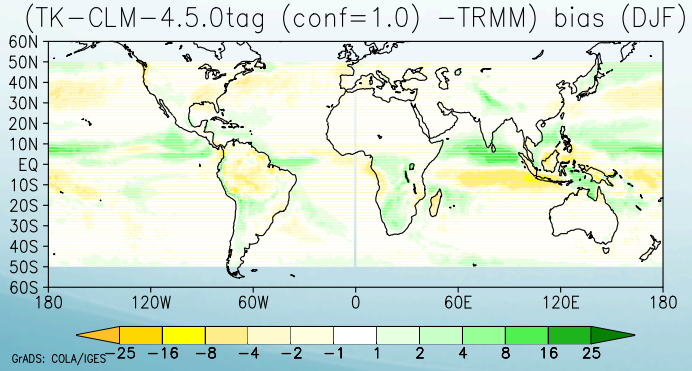
Toward a convergence: many test later. Test 3

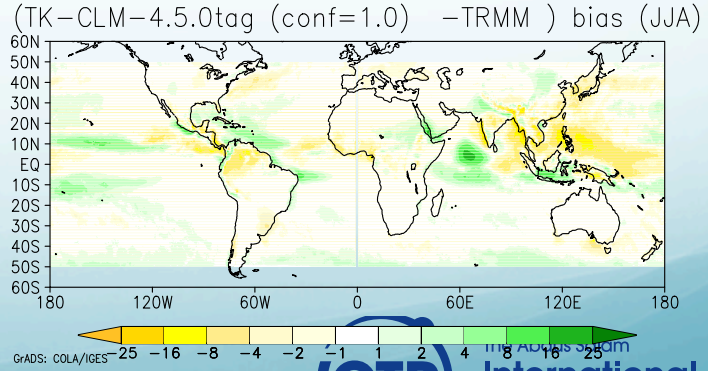












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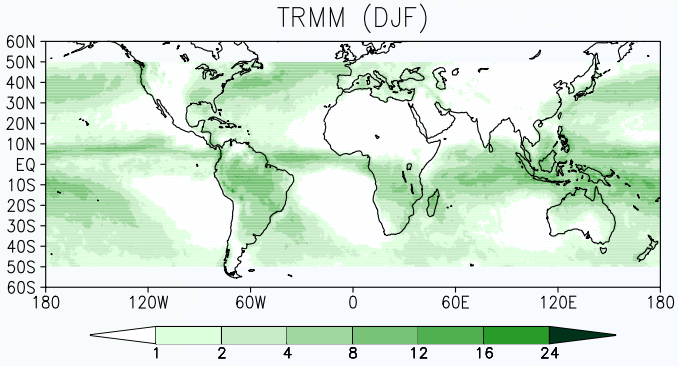
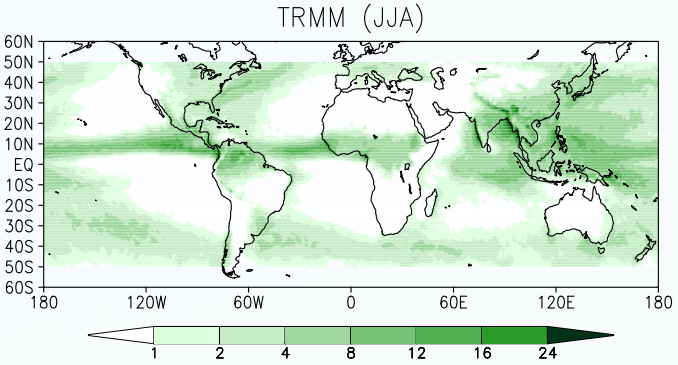
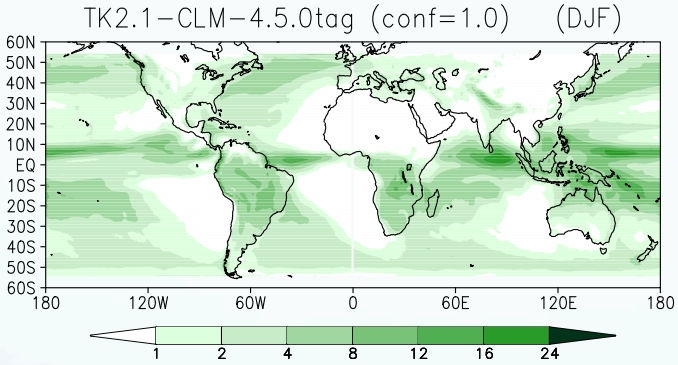
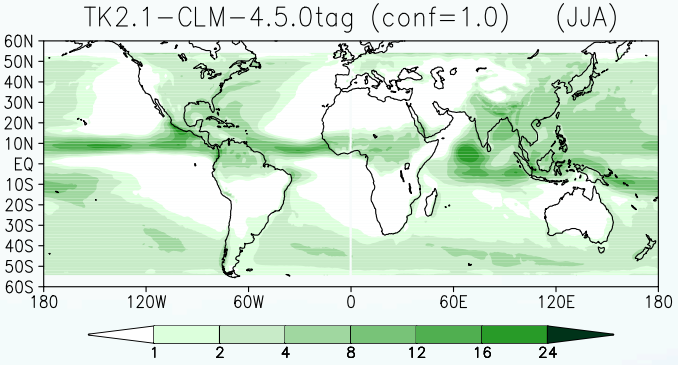
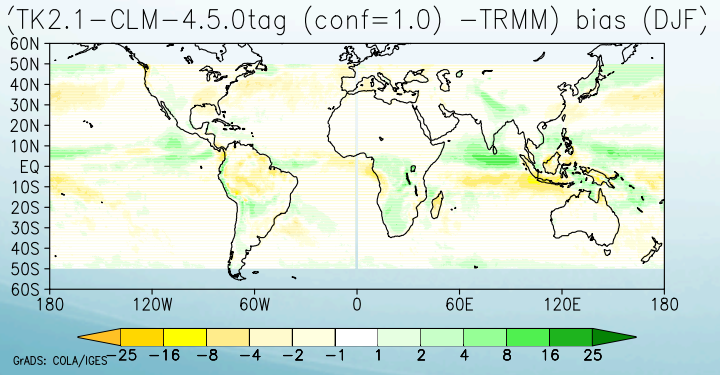
Toward a convergence: many test later. Test n

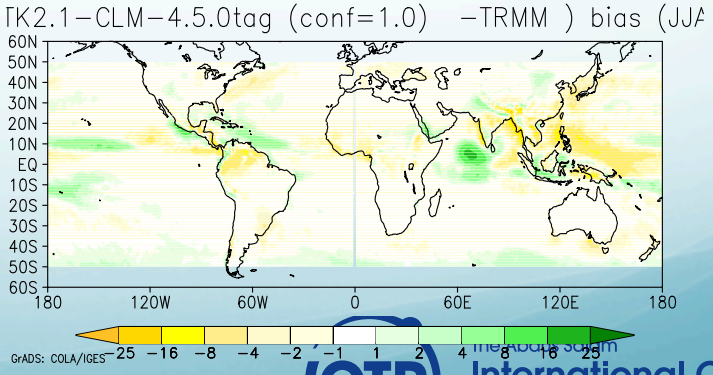












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Africa

CLM+Emanuel-Emanuel, UW PBL, 100km
CLM+Emanuel-Kain Fritsch, UW PBL, 100km
CLM+Emanuel-Kain Fritsch, UW PBL, 50km

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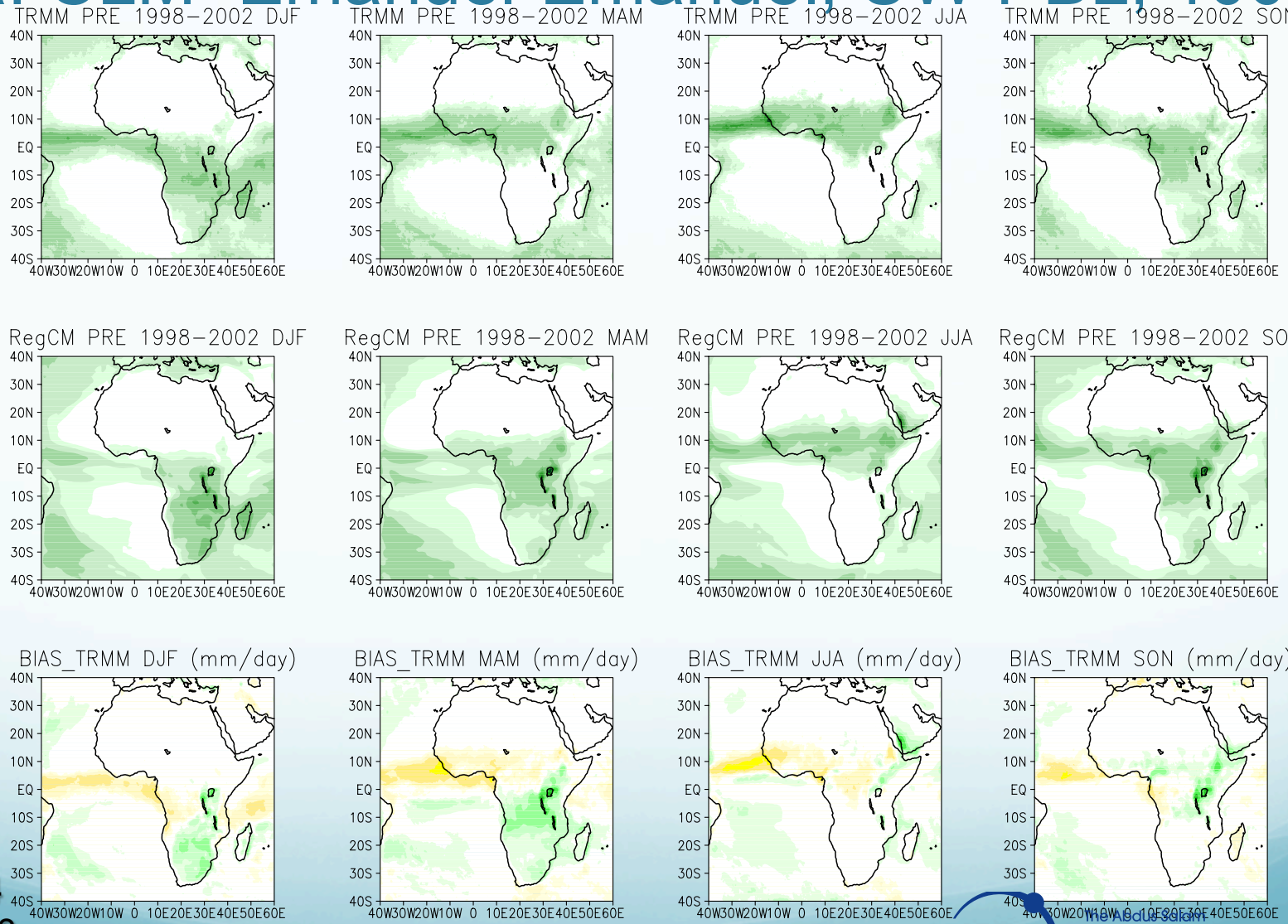
Africa: CLM+Emanuel-Emanuel, UW PBL, 100km



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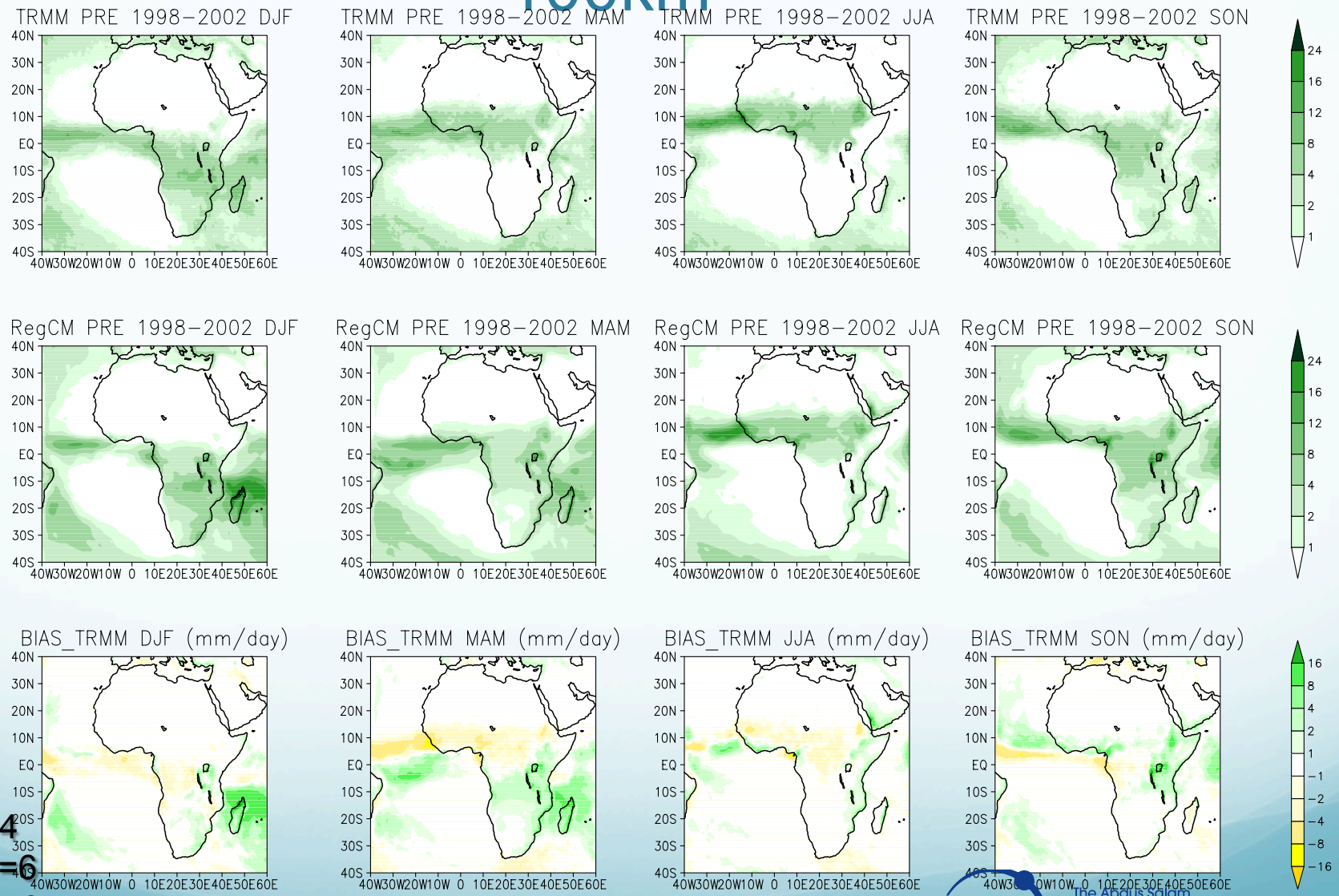
International Centre
for Theoretical Physics

Africa: CLM+Emanuel-Kain Fritsch, UW PBL, 100km



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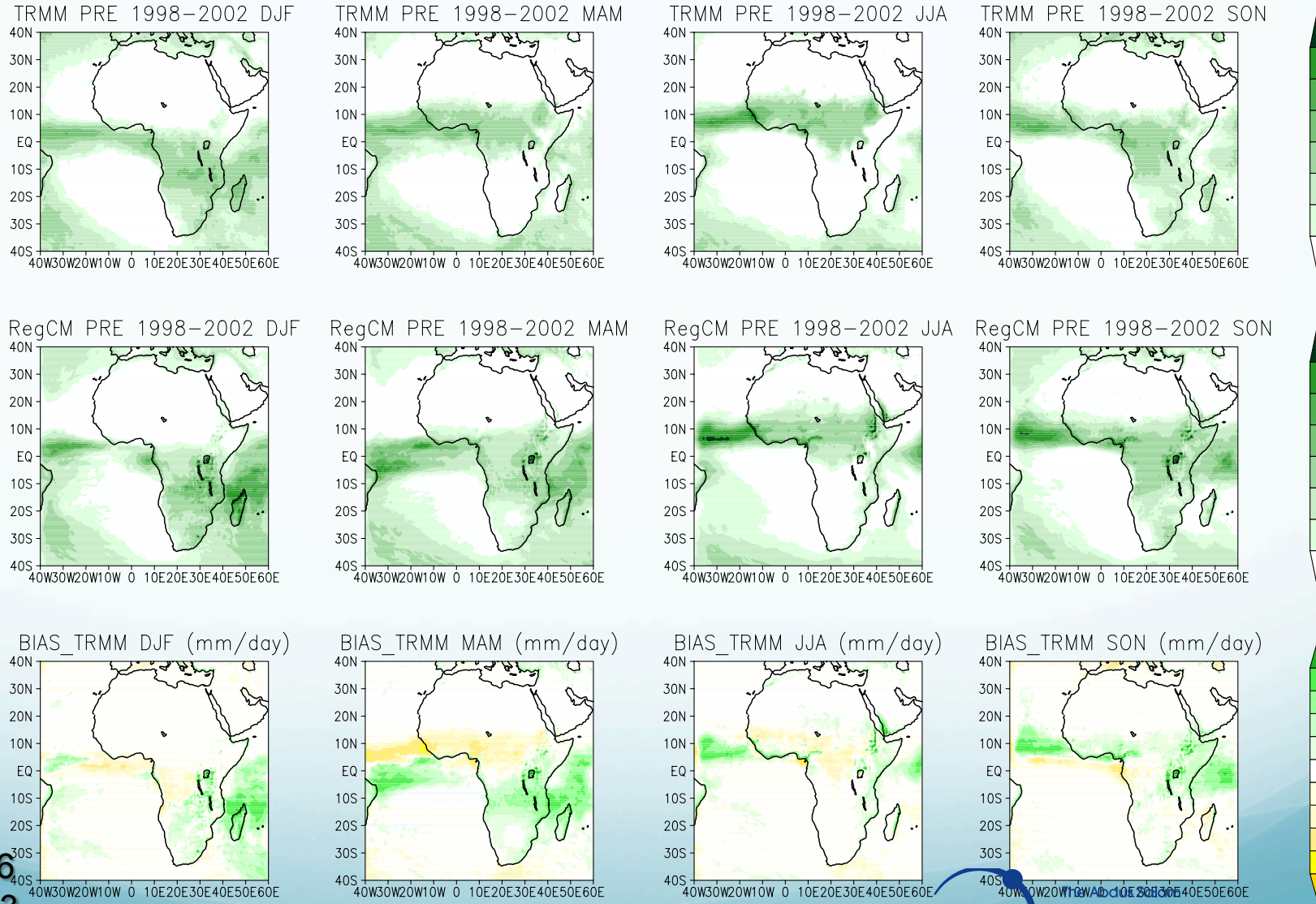
Africa: CLM+Emanuel-Kain Fritsch, UW PBL, 50km



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India

CLM+Tiedtke100km

CLM+Tiedtke 50km

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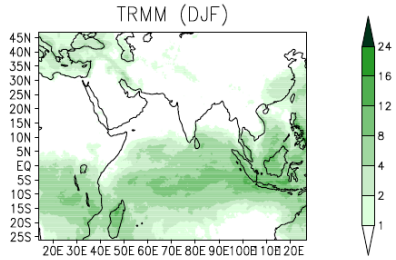
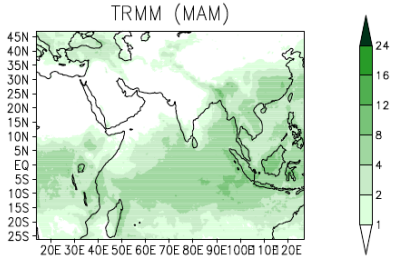
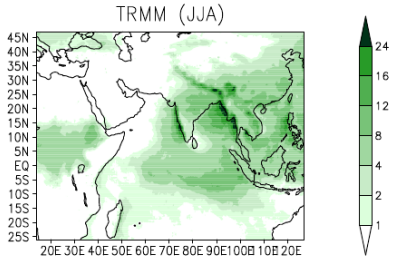
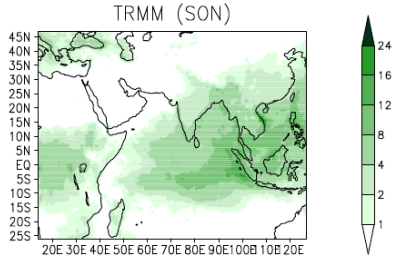
for Theoretical Physics

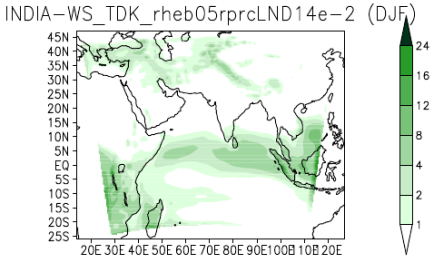
INDIA – 100km – Tiedtke – CLM conf=1

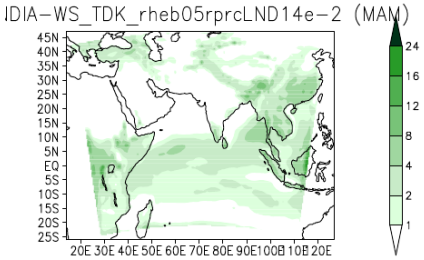


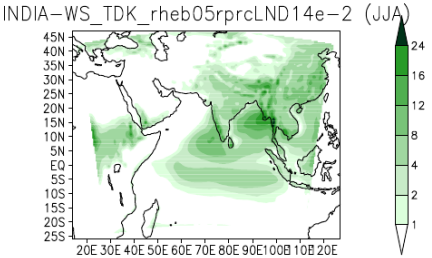


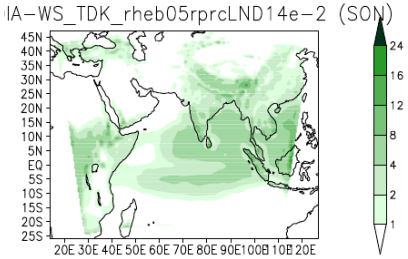


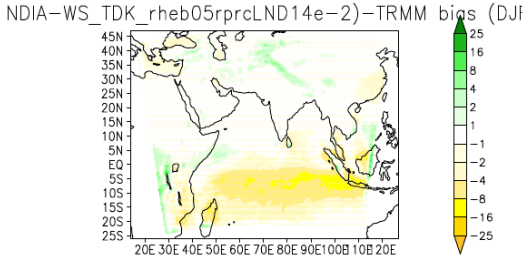


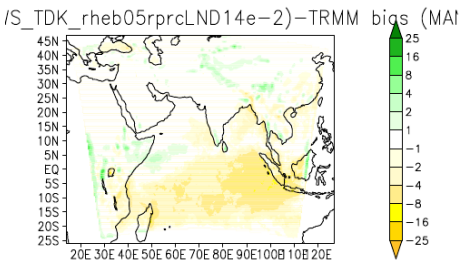


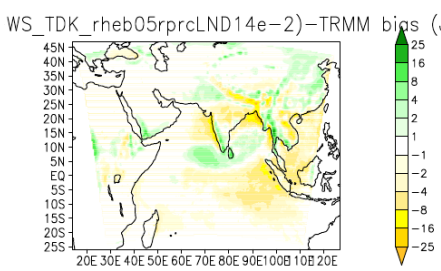


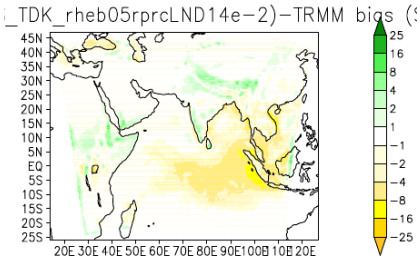












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rprc_lnd = 1.4e-2, ! conversion coefficient from cloud water iconv=4 (default= 1.4e-3)

iocnrough = 1, ! Zeng Ocean model roughness formula to use

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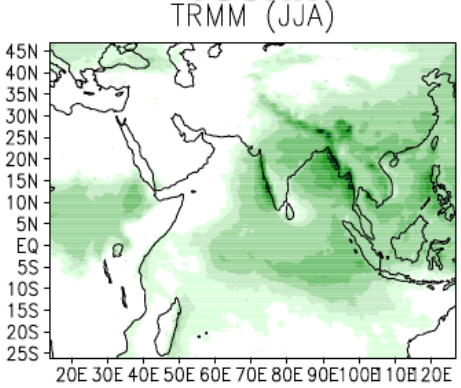
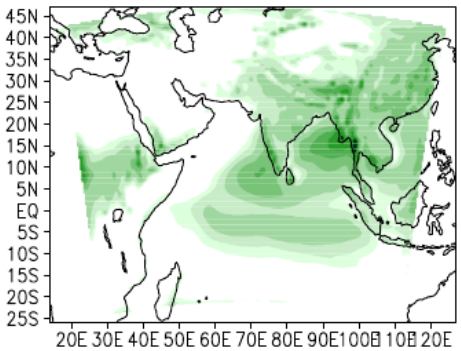
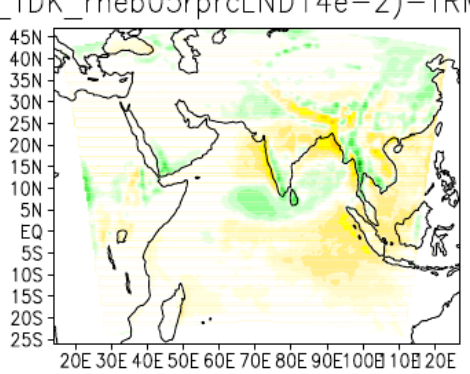
INDIA – 50km – Tiedtke – CLM conf=1

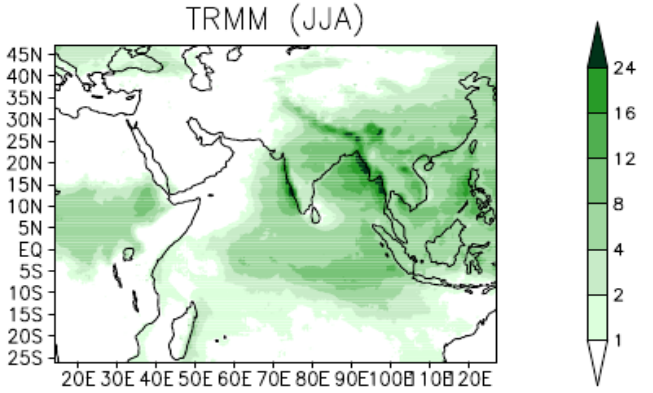
100km

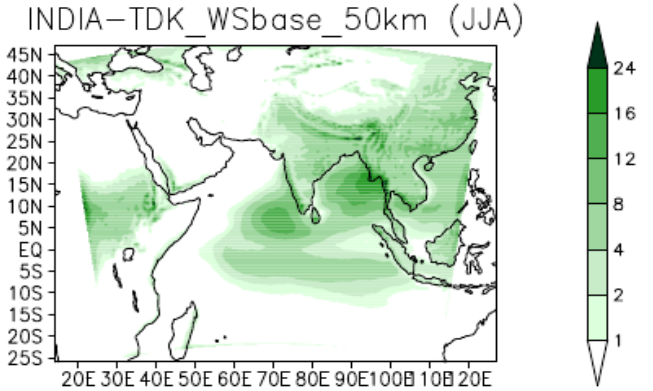


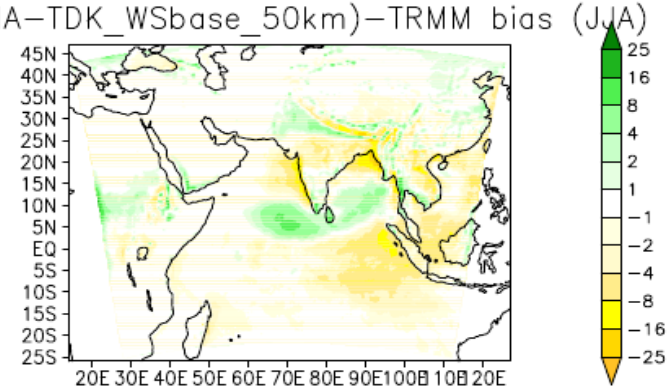




50km







50km_TDK_entrpen=0.75E-3_rhebcLi=0.5/0=C
RPRCI=1.4E-2_Orough=1

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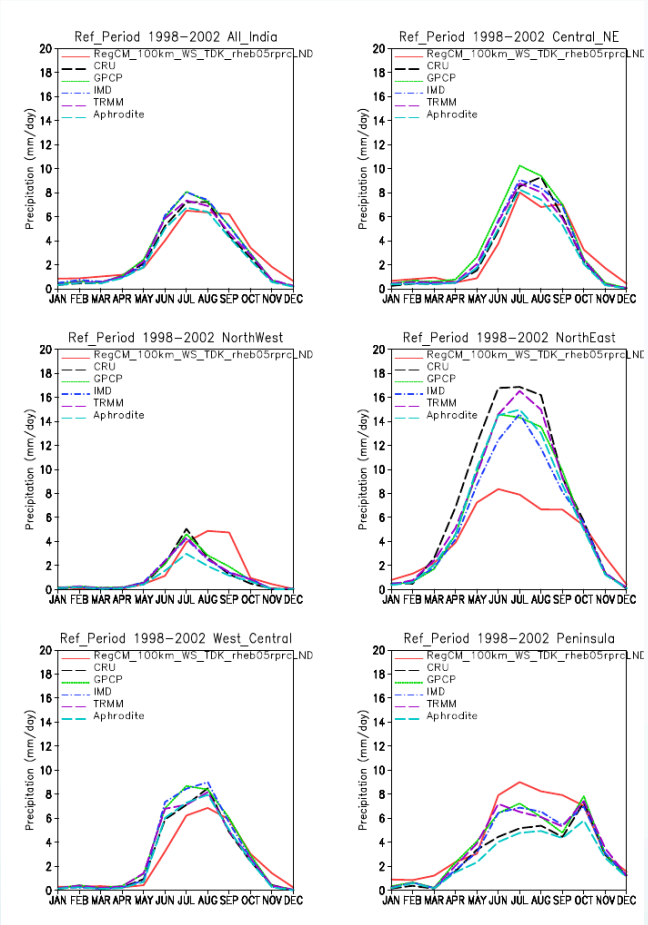
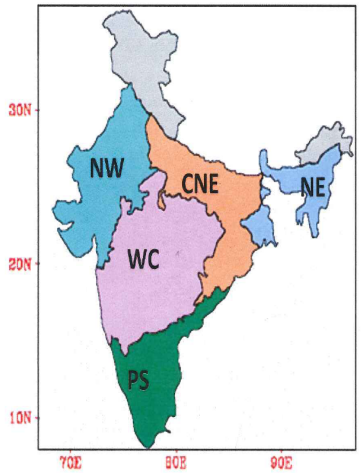
Physics

INDIA – 100km – Tiedtke – CLM conf=1



❑ Homogeneous Climate Subregions and Data



Indian homogeneous monsoon regions (based on source available at www.tropmet.res.in)

Northwest (NW),

Central Northeast (CNE),

Northeast (NE),

West Central (WC)

Peninsular (PS)

entrpen = 0.75e-3, ! Entrainment rate for penetrative convection (default= 1.75e-3)
rhebc_lnd = 0.5, ! Critical rh below cloud for evaporation iconv=4 (default= 0.7)
rprc_lnd = 1.4e-2, ! conversion coefficient from cloud water iconv=4 (default= 1.4e-3)

iocnrough = 1, ! Zeng Ocean model roughness formula to use

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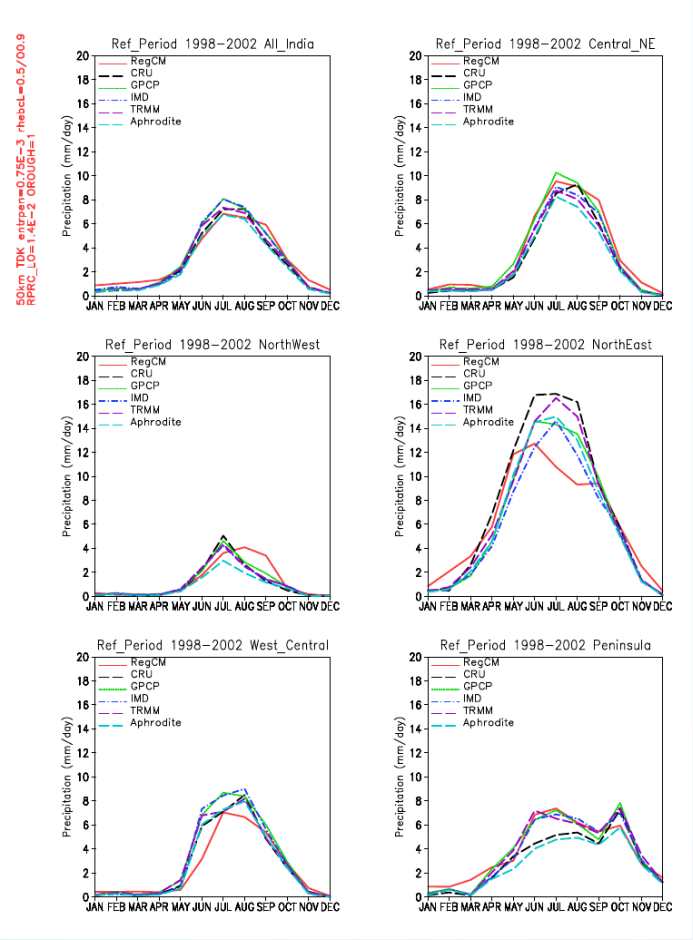
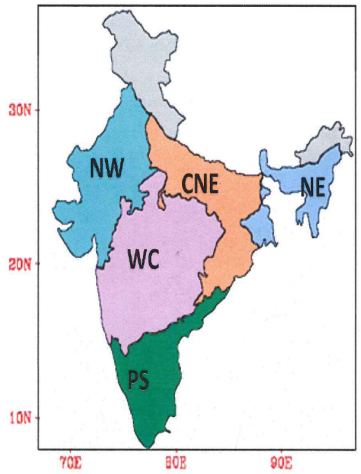
INDIA – 50km – Tiedtke – CLM conf=1



❑ Homogeneous Climate Subregions and Data



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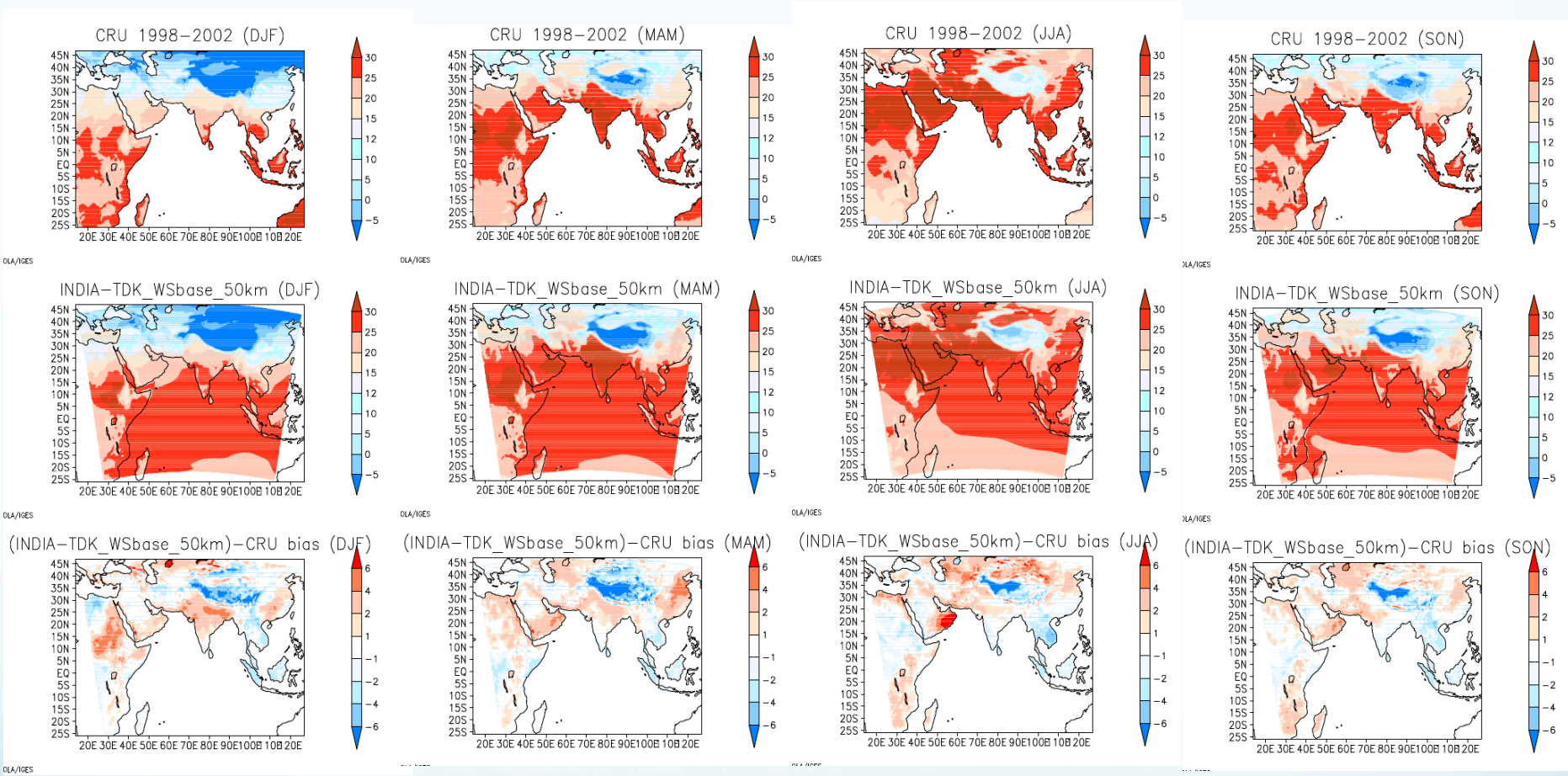
INDIA – 50km – Tiedtke – CLM conf=1 TEMPERATURE



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rhebc_lnd = 0.5, ! Critical rh below cloud for evaporation iconv=4 (default= 0.7)
rprc_lnd = 1.4e-2, ! conversion coefficient from cloud water iconv=4 (default= 1.4e-3)

iocnrough = 1, ! Zeng Ocean model roughness formula to use

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China

CLM+Tiedtke (LAND) + Kain Fritsch (OCN)

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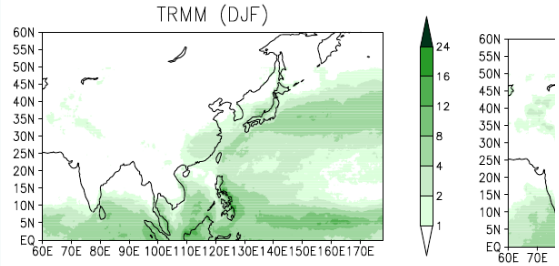
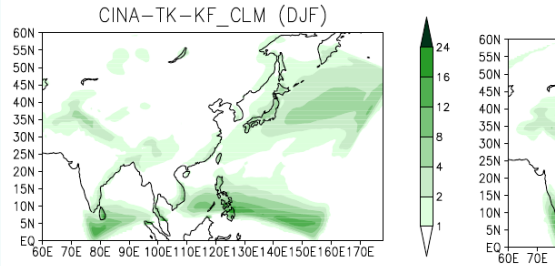
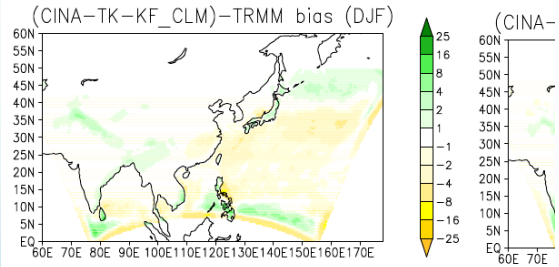
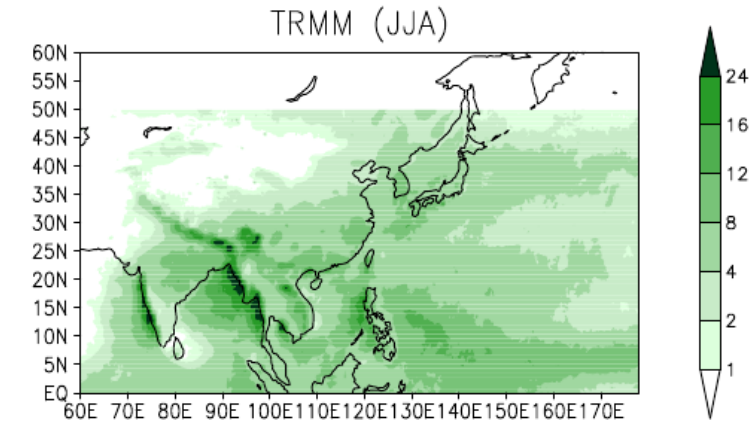
International Centre
for Theoretical Physics

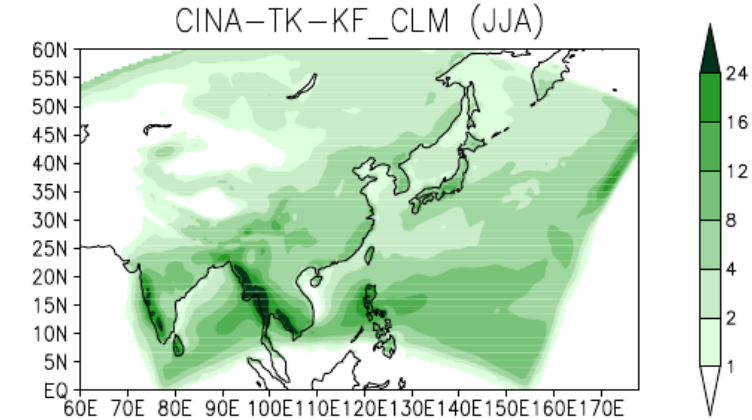
CINA – 100km - CLM conf=1

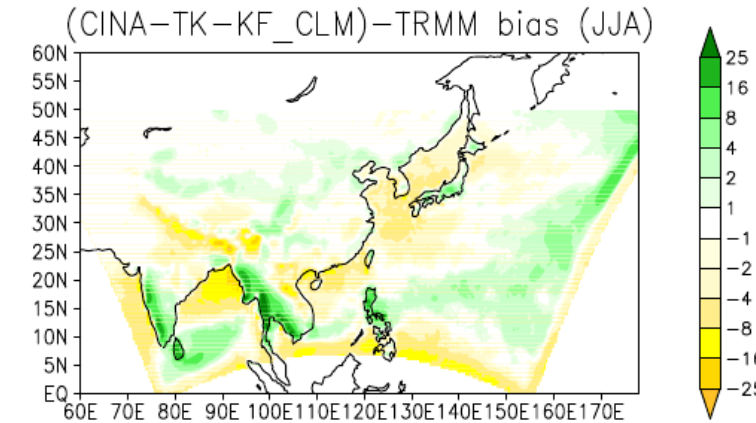


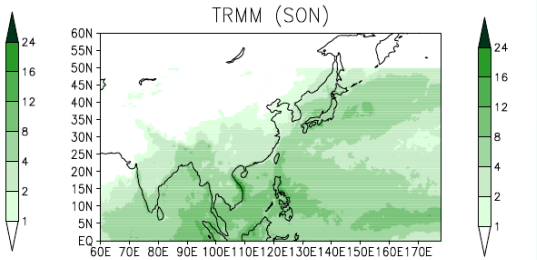


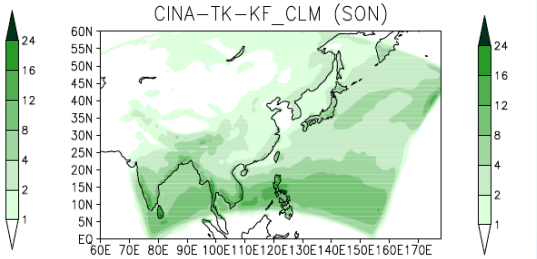


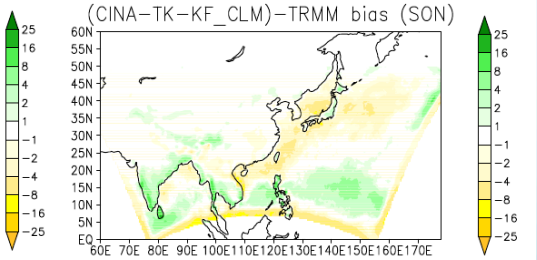












Tiedtke::
entrpen = 0.75e-3, ! Entrainment ra
rhebc_lnd = 0.5, ! Critical rh belov
rprc_lnd = 1.4e-2, ! conversion coe

iocnrough = 3, ! Zeng Ocean mo

Kain Fritsch :: default

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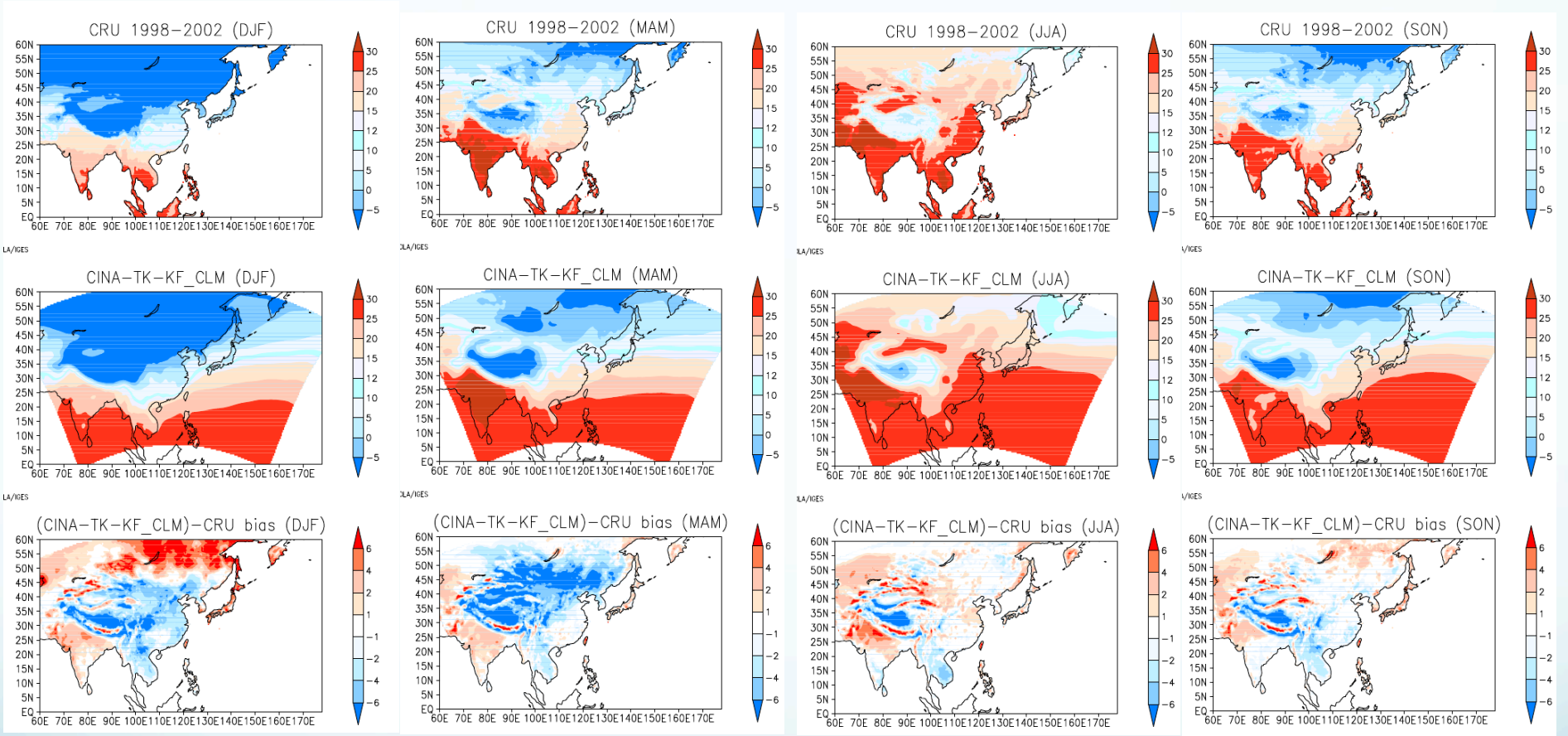
CINA – 100km – Tiedtke (LAND) + Kain Fritsch (OCN) – CLM conf=1
TEMPERATURE



Tiedtke::
entrpen = 0.75e-3, ! Entrainment rate for penetrative convection (default= 1.75e-3)
rhebc_lnd = 0.5, ! Critical rh below cloud for evaporation iconv=4 (default= 0.7)
rprc_lnd = 1.4e-2, ! conversion coefficient from cloud water iconv=4 (default= 1.4e-3)

iocnrough = 3, ! Zeng Ocean model roughness formula to use

Kain Fritsch :: default

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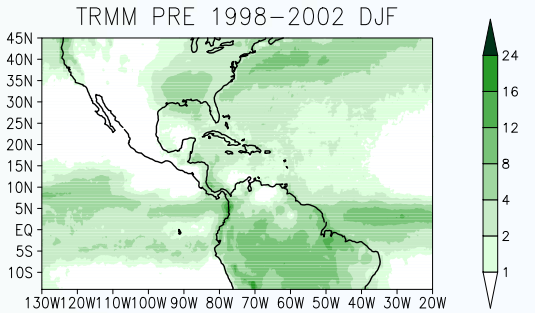
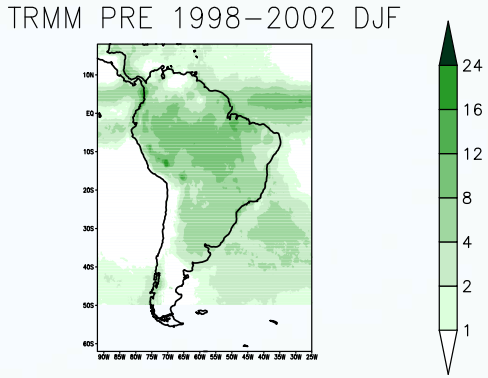
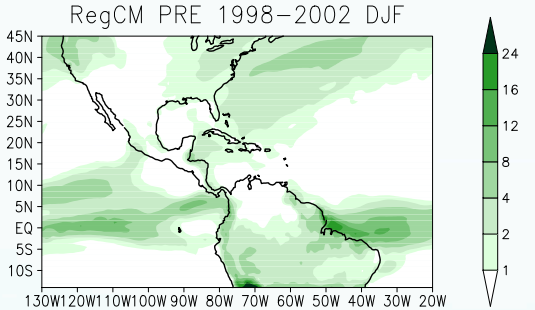
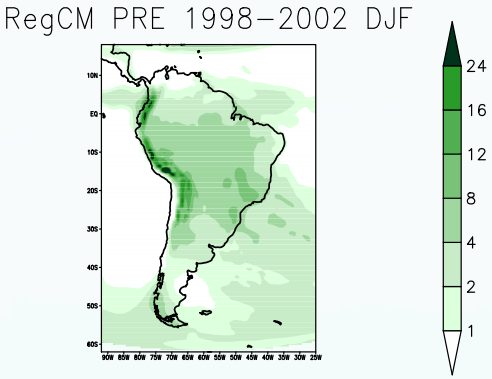
Central[1] and South America[2]

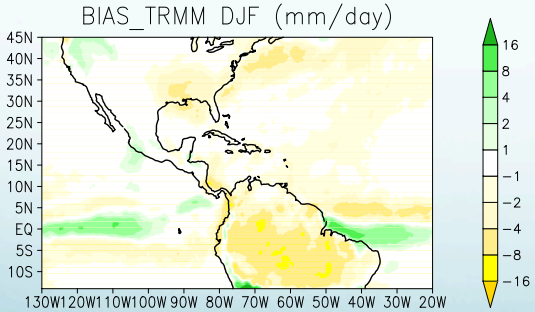
1-CLM+Grell (LAND) + Kain Fritsch (OCN),100km
2-CLM+Emanuel,100km

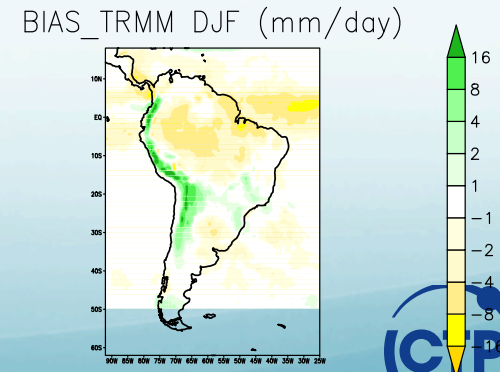












GrADS: COLA/IGES

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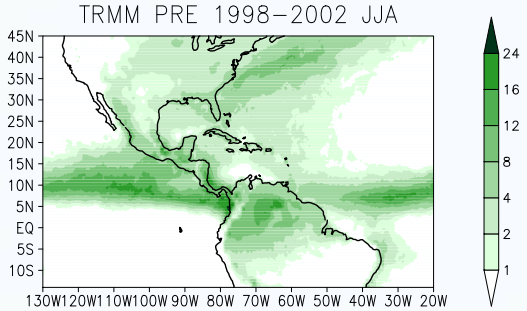

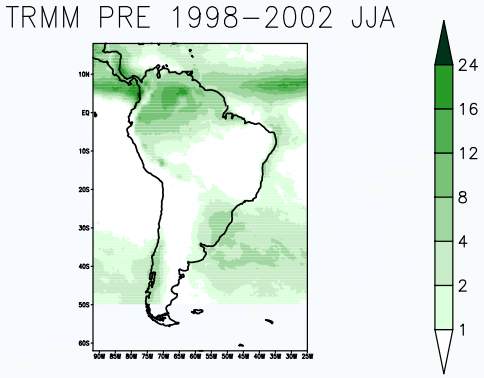

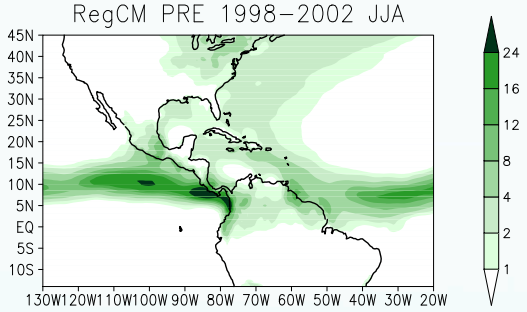

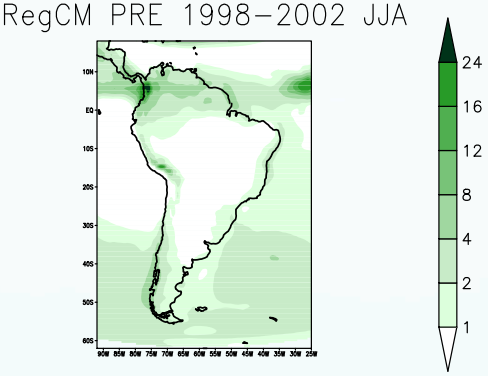

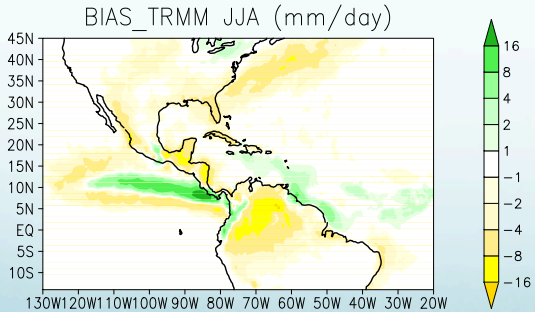

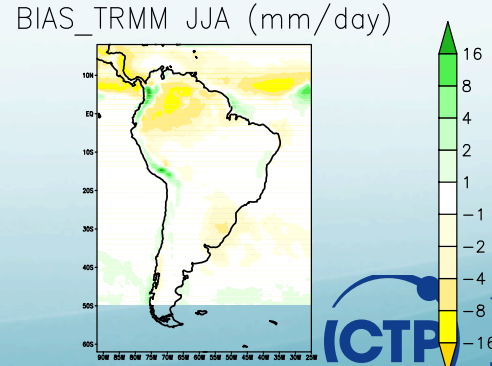

GrADS: COLA/IGES

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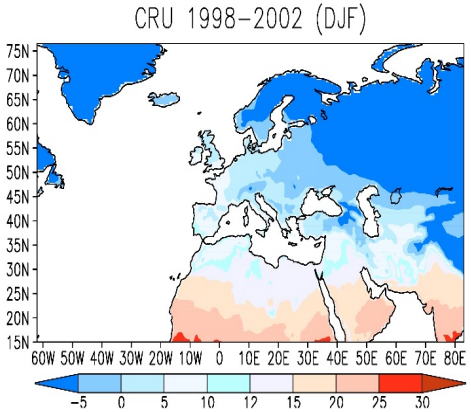
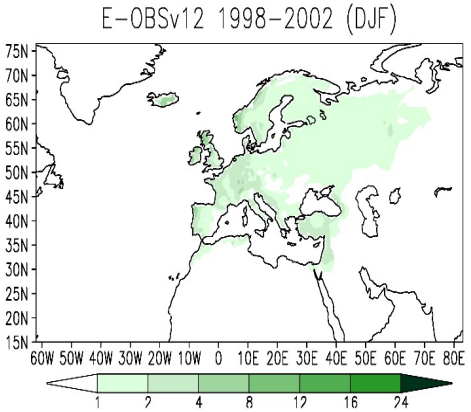
EUROPE

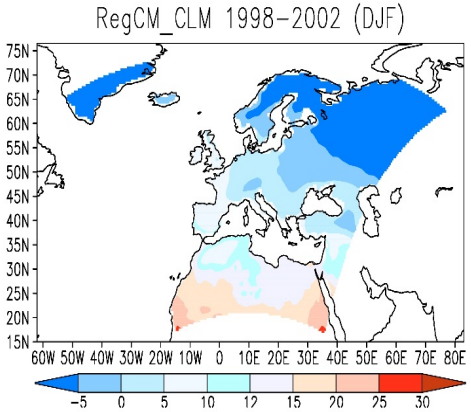
CLM+Grell (LAND) + Kain Fritsch (OCN),100km

Basic settings, but:

```
&grellparam
 shrmin = 0.25,      ! Minimum Shear effect on precip eff.
 shrmax = 0.50,      ! Maximum Shear effect on precip eff.
  edtmin = 0.25,     ! Minimum Precipitation Efficiency
  edtmax = 0.50,     ! Maximum Precipitation Efficiency
 edtmino = 0.25,     ! Minimum Precipitation Efficiency (o var)
 edtmaxo = 0.50,     ! Maximum Precipitation Efficiency (o var)
 edtminx = 0.25,     ! Minimum Precipitation Efficiency (x var)
 edtmaxx = 0.50,     ! Maximum Precipitation Efficiency (x var)
```


CRU 1998-2002 (DJF)
75N 70N 65N 60N 55N 50N 45N 40N 35N 30N 25N 20N 15N
60W 50W 40W 30W 20W 10W 0 10E 20E 30E 40E 50E 60E 70E 80E
-5 0 5 10 12 15 20 25 30


E-OBSv12 1998-2002 (DJF)
75N 70N 65N 60N 55N 50N 45N 40N 35N 30N 25N 20N 15N
60W 50W 40W 30W 20W 10W 0 10E 20E 30E 40E 50E 60E 70E 80E
1 2 4 8 12 16 24


RegCM_CLM 1998-2002 (DJF)
75N 70N 65N 60N 55N 50N 45N 40N 35N 30N 25N 20N 15N
60W 50W 40W 30W 20W 10W 0 10E 20E 30E 40E 50E 60E 70E 80E
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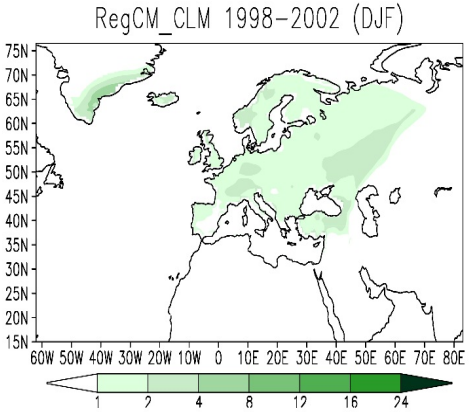
RegCM_CLM 1998-2002 (DJF)
75N 70N 65N 60N 55N 50N 45N 40N 35N 30N 25N 20N 15N
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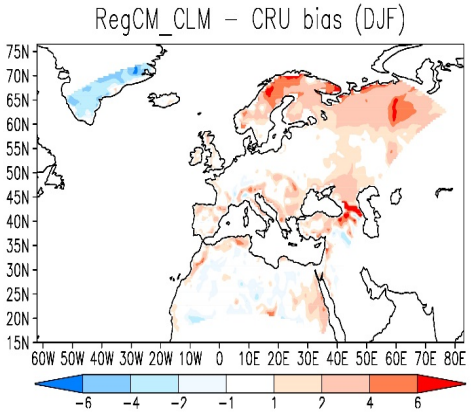
RegCM_CLM - CRU bias (DJF)
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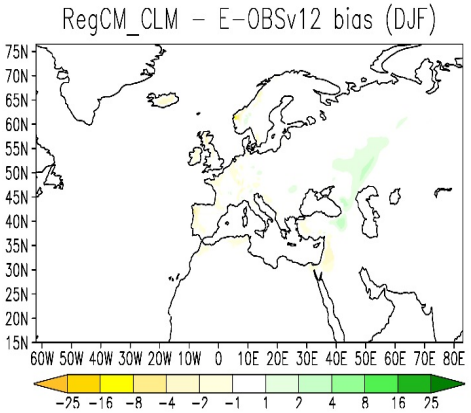
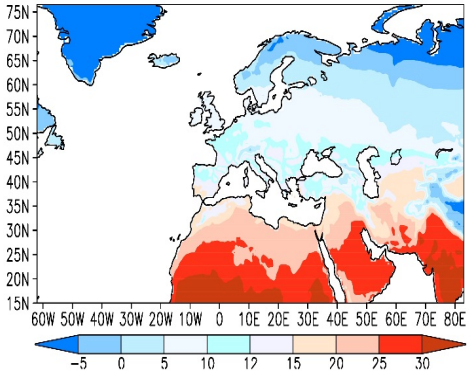
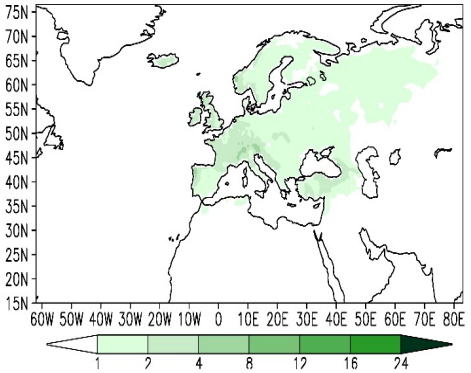
60W 50W 40W 30W 20W 10W 0 10E 20E 30E 40E 50E 60E 70E 80E
-6 -4 -2 -1 1 2 4 6


RegCM_CLM - E-OBSv12 bias (DJF)
75N 70N 65N 60N 55N 50N 45N 40N 35N 30N 25N 20N 15N
60W 50W 40W 30W 20W 10W 0 10E 20E 30E 40E 50E 60E 70E 80E
-25 -16 -8 -4 -2 -1 1 2 4 8 16 25

CRU 1998–2002 (MAM)



E–OBSv12 1998–2002 (MAM)



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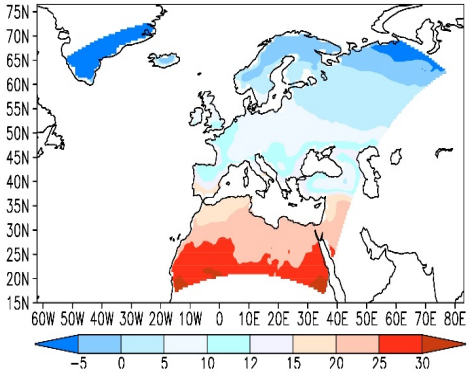
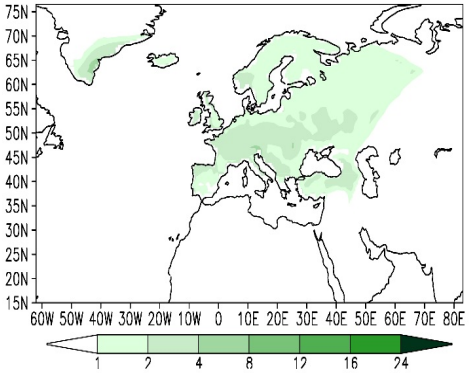
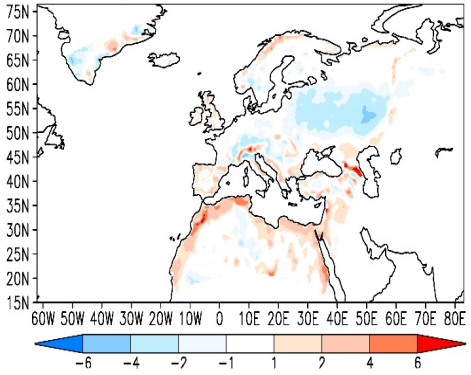


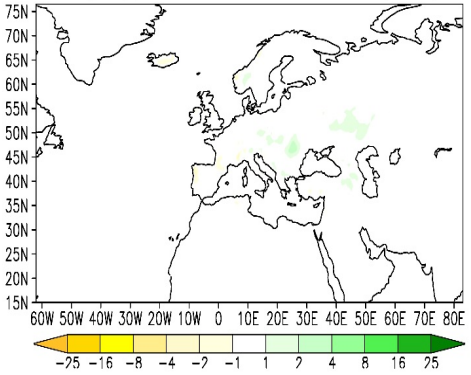
RegCM_CLM 1998–2002 (MAM)



RegCM_CLM – CRU bias (MAM)



RegCM_CLM – E–OBSv12 bias (MAM)



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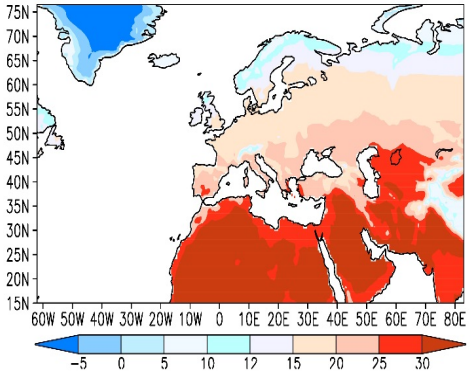

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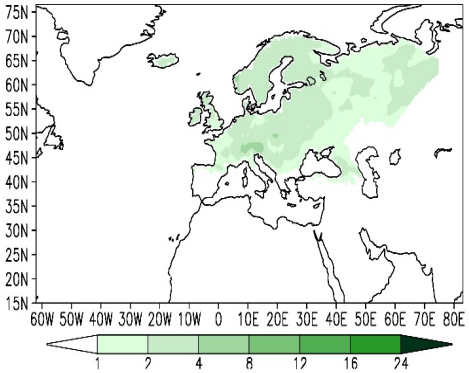

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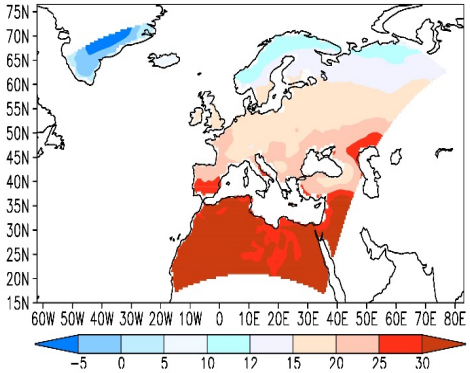

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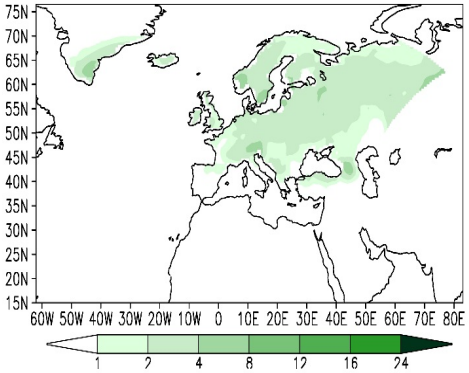

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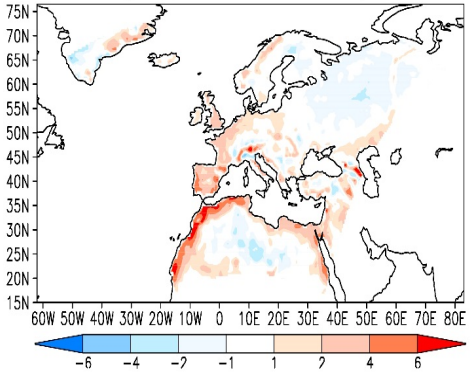

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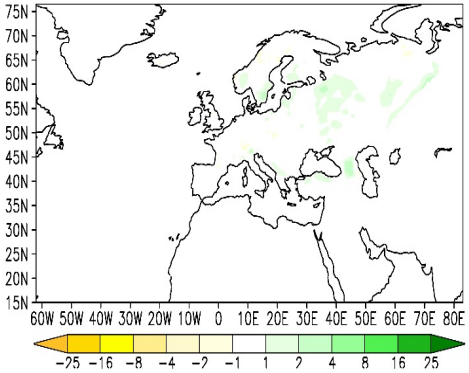

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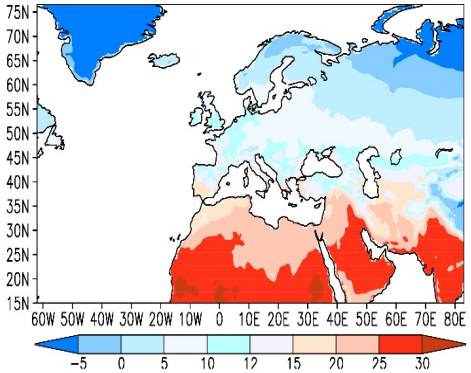

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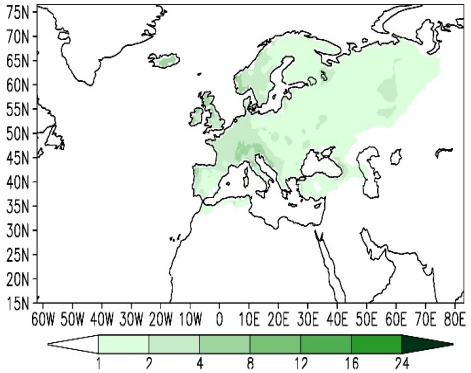

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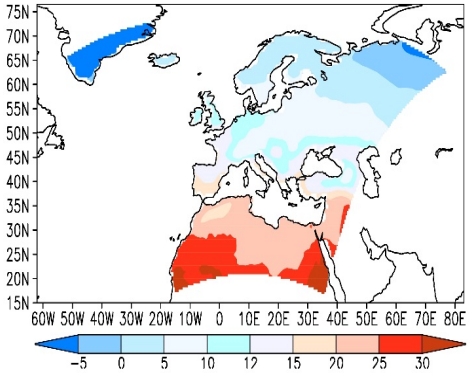

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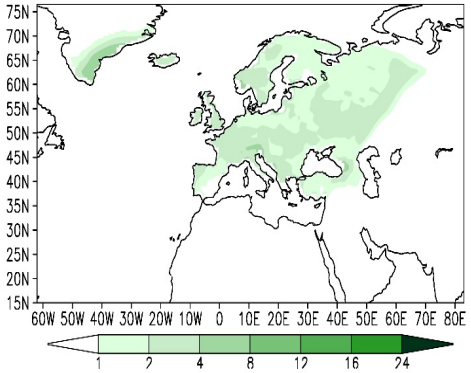

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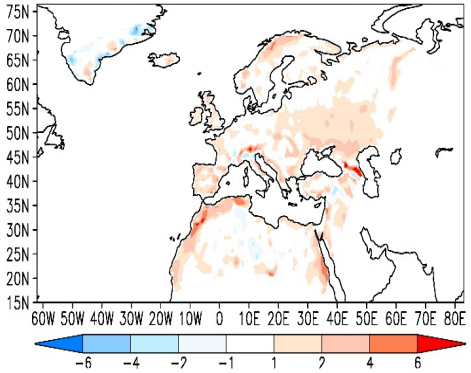

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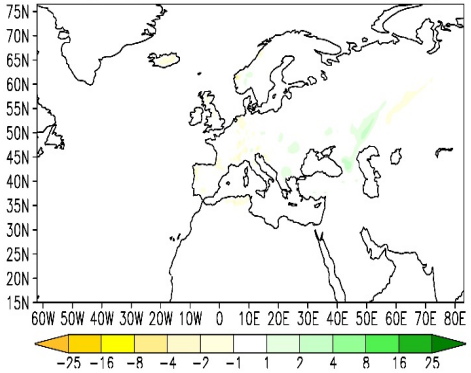

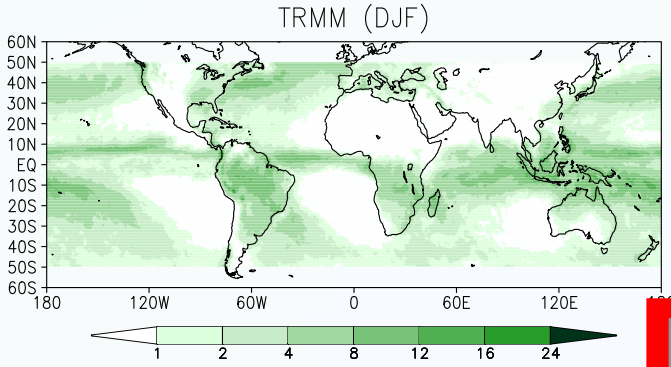

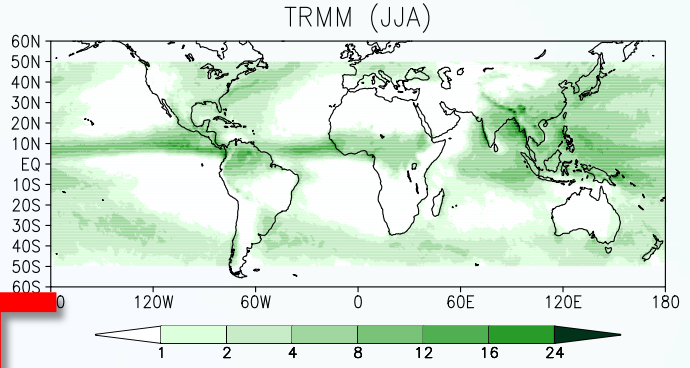

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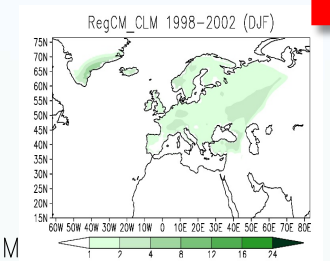

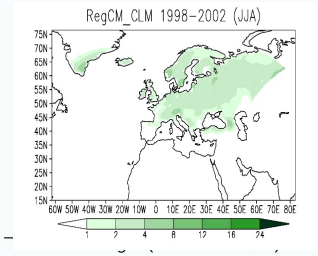

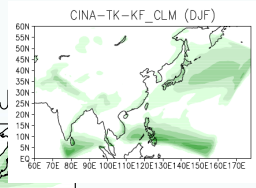

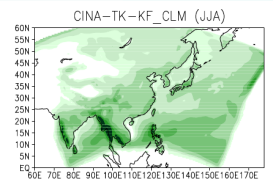

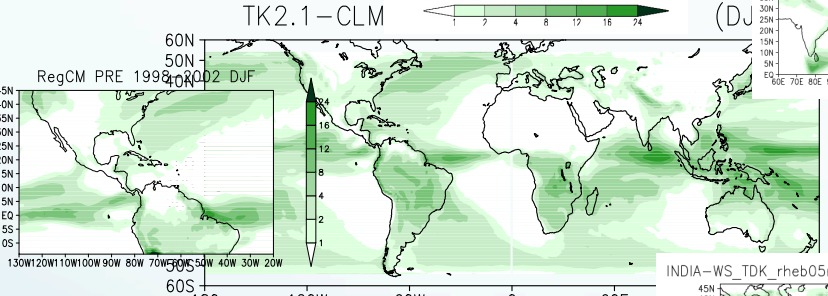

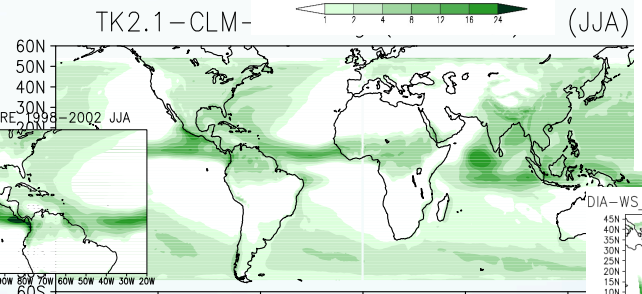

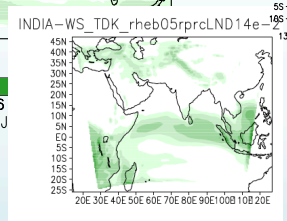

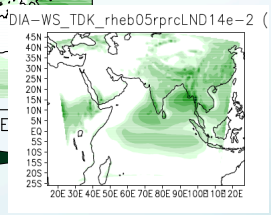

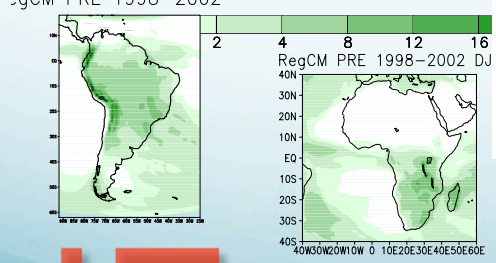

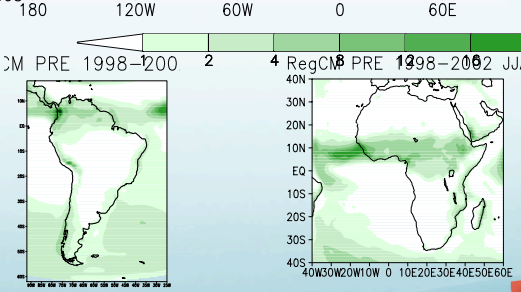

DJF

JJA

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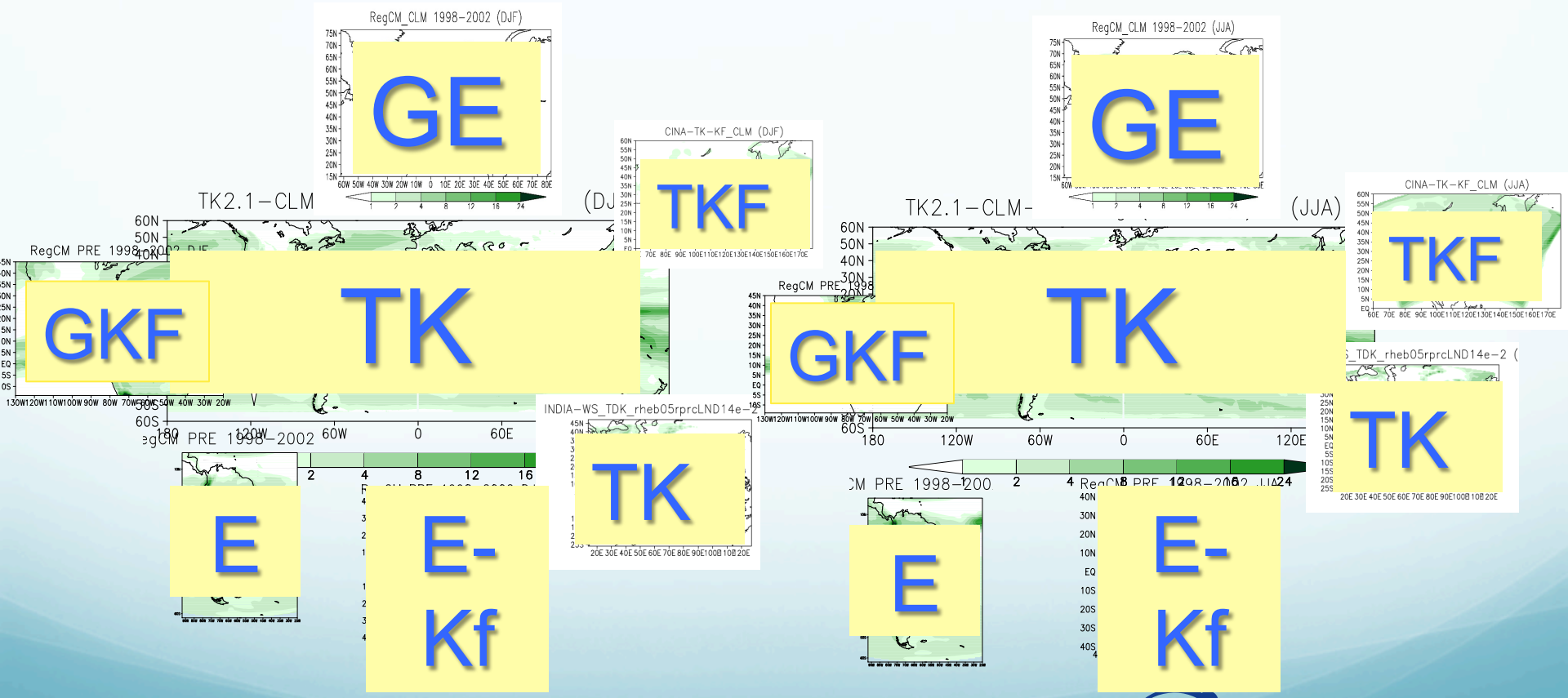
RegCM4.5.0



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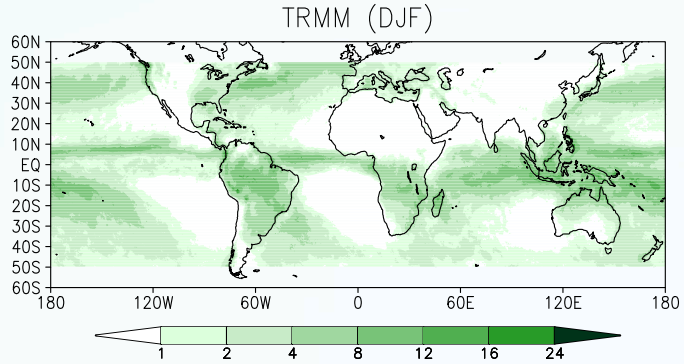
Take home messages

- The model is always changing. It is always impossible to reproduce identical results with an old setting and new model version, but you should be able to "recognize" the model behavior.
- To be able to tune a specific domain it is good to start with a low resolution and try to optimize the schemes before wasting time with a very high resolution setting.
- The same scheme can work in a different way when you change the domain, but the parameters of the scheme are working in the same way
- It is always safer to change one scheme and one parameter of the scheme per time, to fully understand the right direction.



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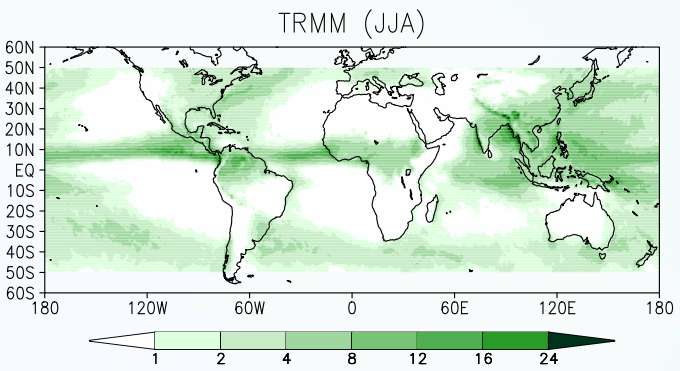

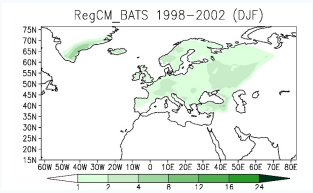

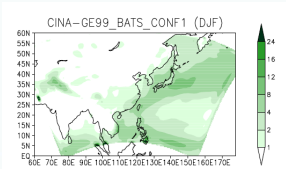

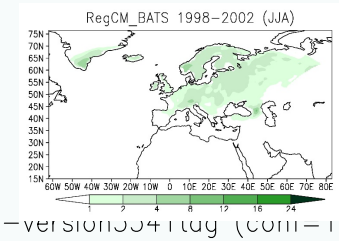

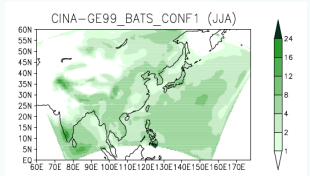

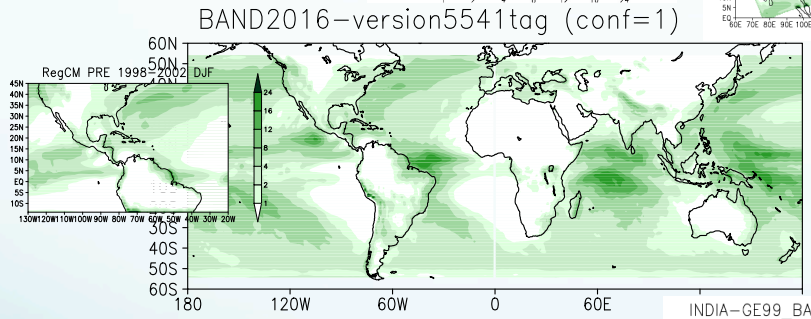

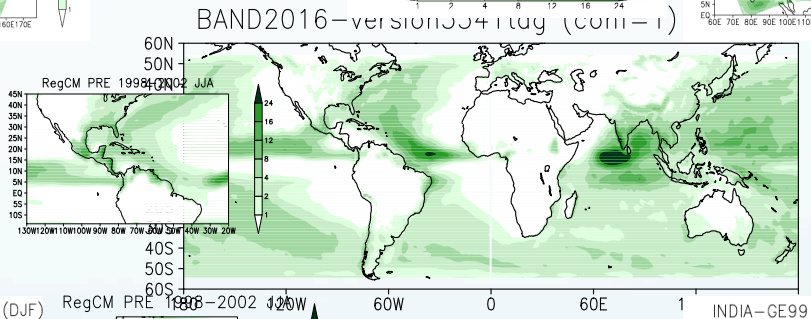

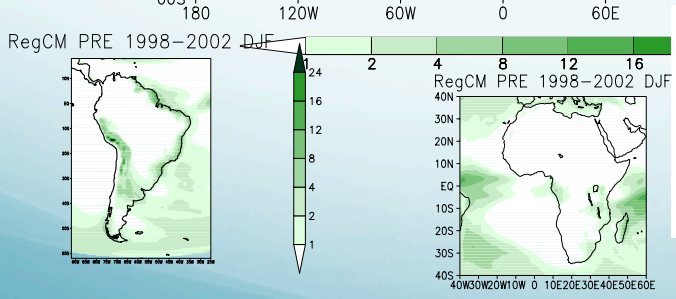

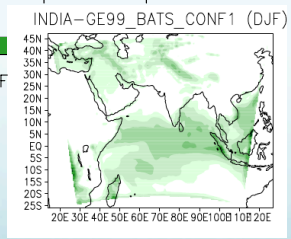

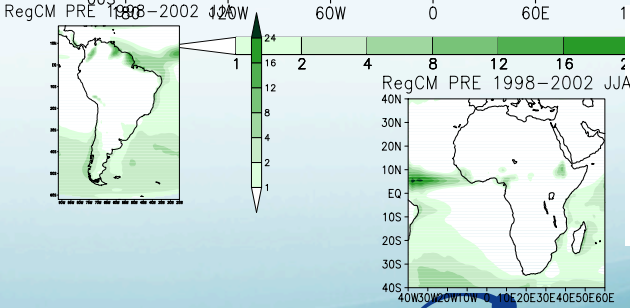

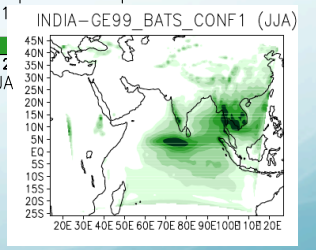

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