WMO-WGSIP initiative: Long-Range forecasts of the monsoon
(Coordinators: Y. Takaya, MRI, Japan; H-L. Ren, CMA, China)

Predictability Assessment of Global Monsoon Precipitation in Three Dynamical Models

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Outline

1. Datasets and Methods

- **Models：**

  BCC_CSM1.1m: 0-month lead to 12-month lead (LM0 to LM12),

  NCEP CFSv2: 0-month lead to 9-month lead (LM0 to LM9),

  ECMWF SEAS4: 0-month lead to 6-month lead (LM0 to LM6).

- **Observation:**

  Global Precipitation Climatology Project version 2.3 (**GPCP**).

- **Period：** 1983 – 2019.

- **Metric：** The temporal correlation coefficient (**TCC**).

1. Datasets and Methods

➢ Definition of the annual range of precipitation (AR):

local summer precipitation minus the preceding local winter precipitation, which is used to measure monsoon precipitation intensity.

- Summer refers to June-July-August (JJA) in the Northern Hemisphere (NH) and December-January-February (DJF) in the Southern Hemisphere (SH), respectively.

➢ Definition of the global monsoon precipitation domain:

The AR exceeds 180 mm and the local summer precipitation exceeds 35% of annual precipitation;

- Annual is from December to the following November in NH and from June to the following May in SH, respectively.

1. Datasets and Methods

➢ Definition of the global monsoon precipitation index:

- For the Northern Hemisphere: the averaged precipitation falling in the NH monsoon domain in JJA (NHMP);
- For the Southern Hemisphere: the averaged precipitation falling in the SH monsoon domain in DJF (SHMP);
- Global monsoon precipitation index (GMP Index): the average of SHMP and NHMP in the following season.

Here, the global monsoon precipitation over the land and ocean domain, as well over the land domain in NH and SH are also examined.

2.1 Climatology of the Global Monsoon Precipitation Domain
- *Annual Mean Precipitation Rate*

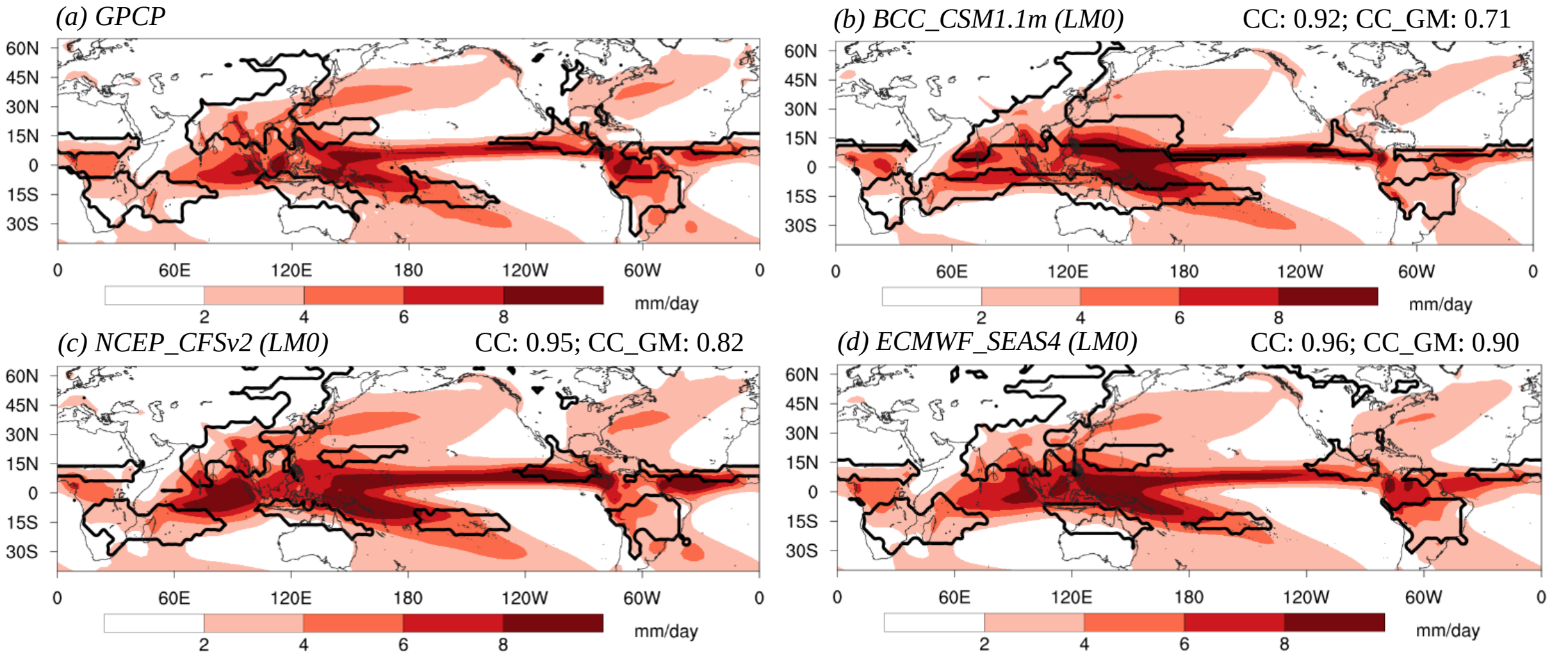


Fig. 1 The climatologies of the annual mean precipitation rate for both observation and models at 0-month lead. The bold lines delineate the climatology of global monsoon precipitation domain at LM0.
CC (correlation coefficient) is over the global domain, CC_GM is over the global monsoon precipitation domain

2.1 Climatology of the Global Monsoon Precipitation Domain
- *Annual Range of Precipitation*

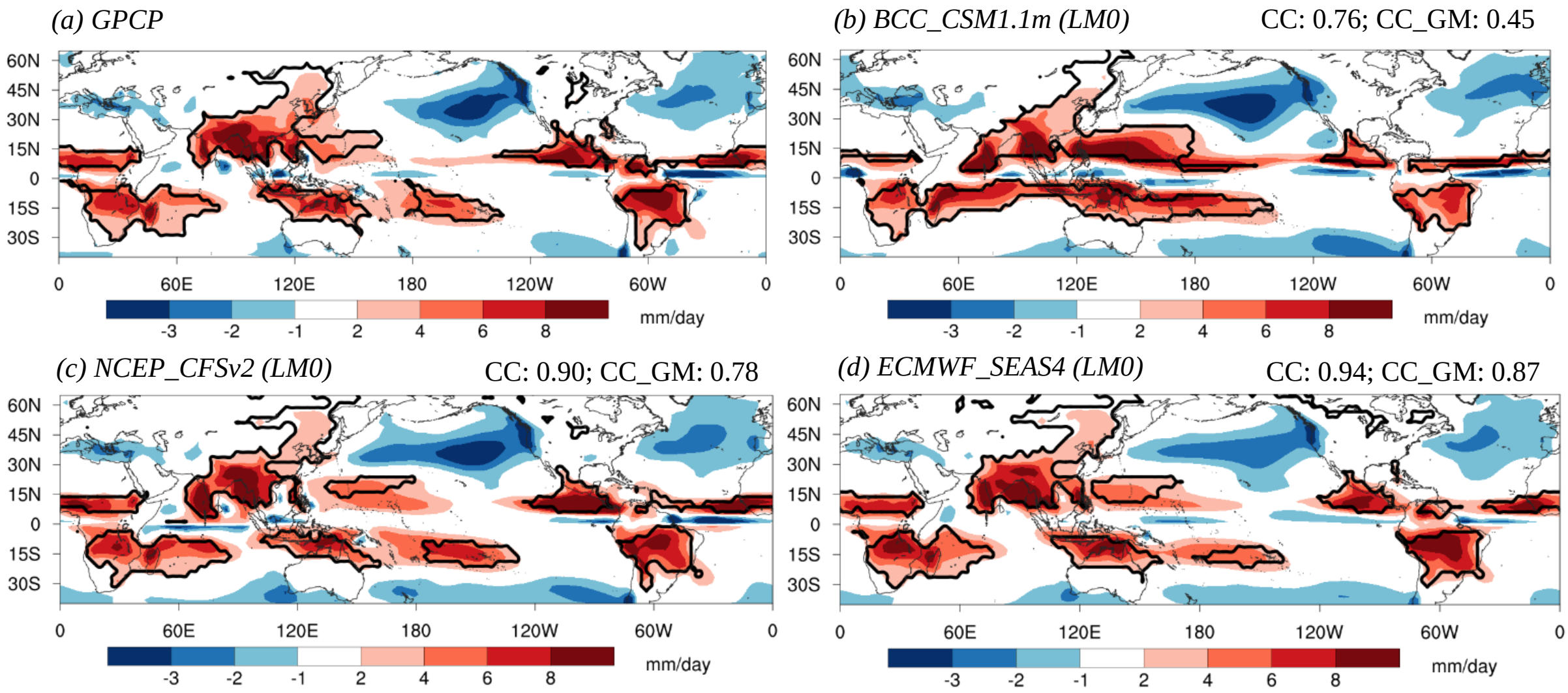


Fig. 2 Same as Fig. 1, but for the annual range of precipitation

2.2 Annual Range of Precipitation – TCC

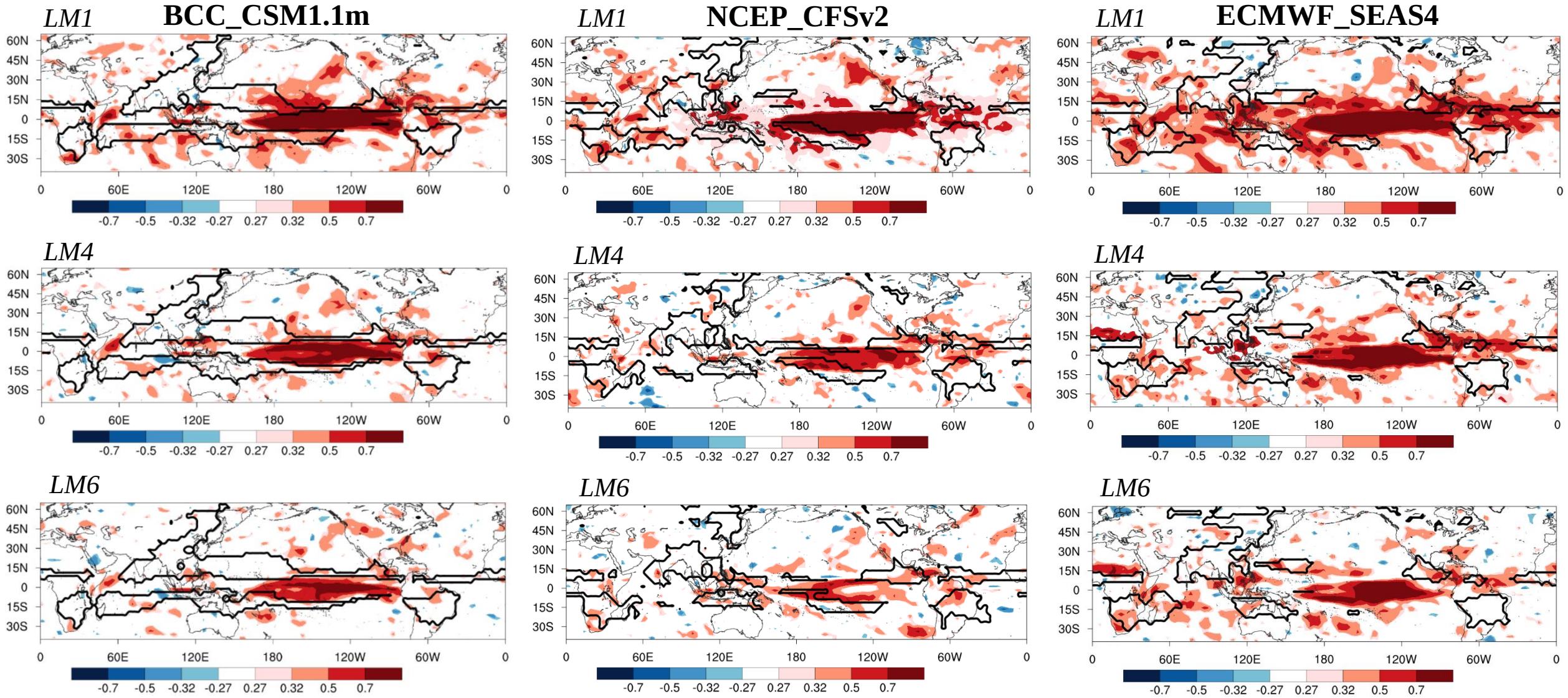
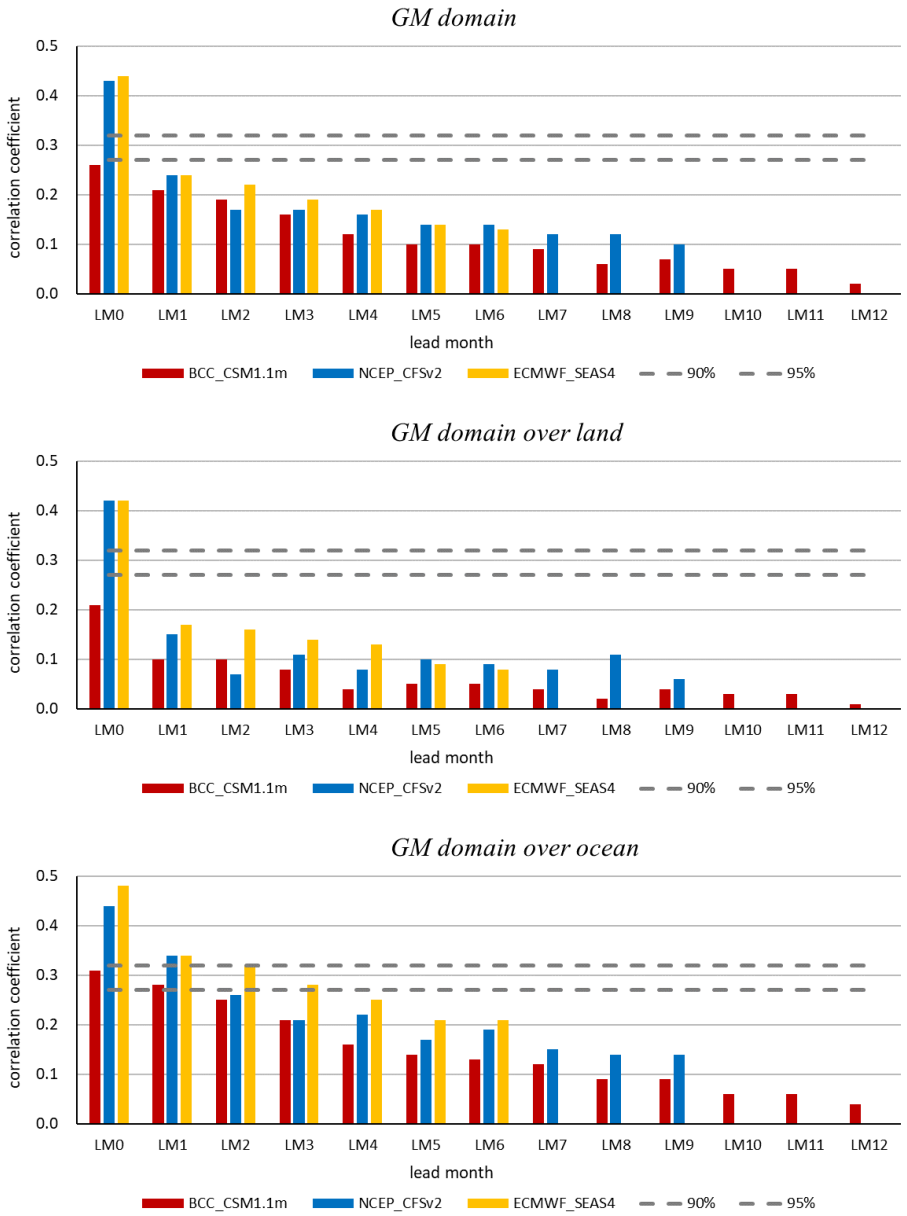


Fig. 3 TCCs of the annual range of precipitation between observation and models at different lead times. shaded areas represent the statistical significance at the 0.1 confidence level.

2.2 Annual Range of Precipitation – the Regional Average of TCC



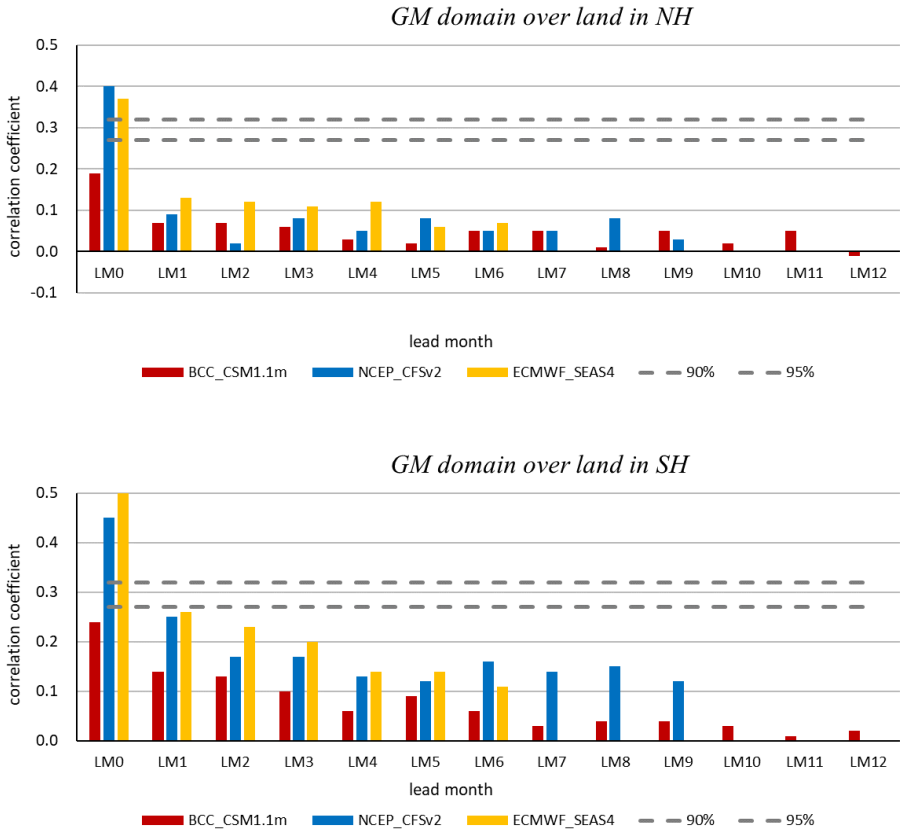
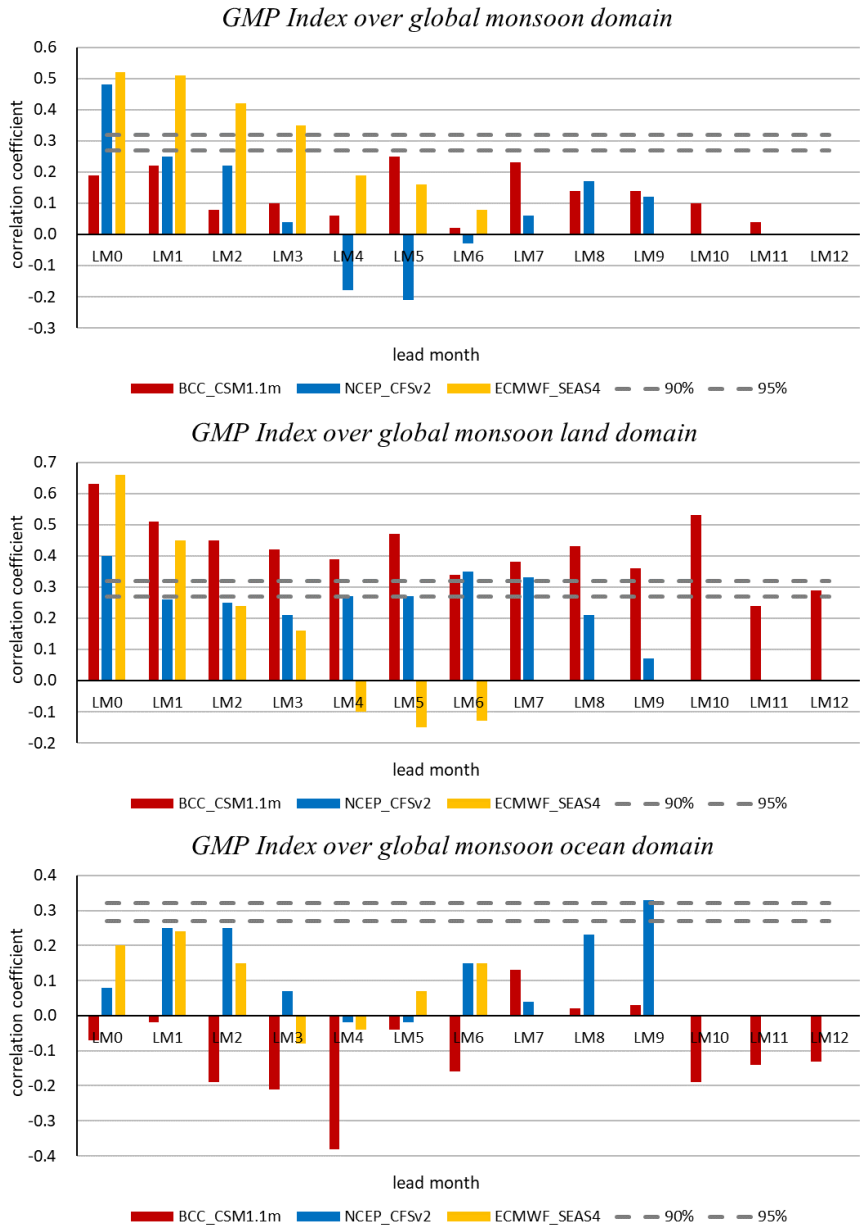


Fig. 4 The regional averaged TCCs of annual range of precipitation in the three models at all lead times over each global monsoon domain.

2.3 Global Monsoon Precipitation Index



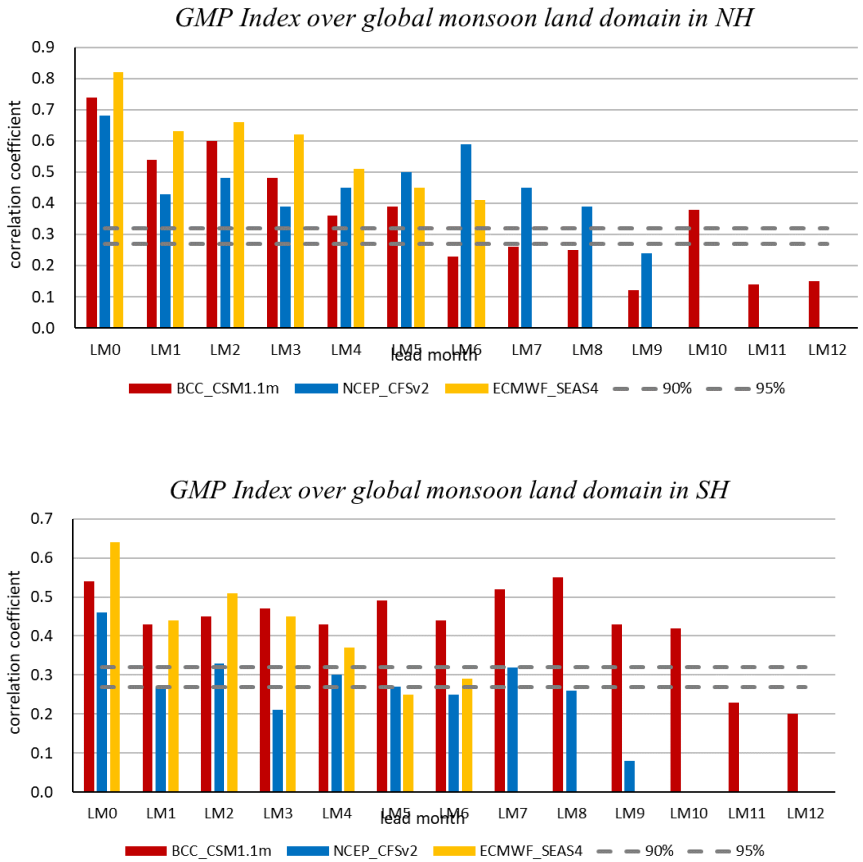


Fig. 5 The correlation coefficients of the global monsoon precipitation index between observation and models at all lead times over each global monsoon domain.

Summary

- The three models show reasonable prediction skill of the climatological global monsoon domain at all lead times.
- The predictability of AR is higher over the equatorial central-eastern Pacific and lower over the climatological global monsoon domain. Generally, the regional averaged TCCs are seen continuous decreasing in dynamical models as the lead time increases.
- For the prediction of GMP Index, skills fluctuate as the lead time increases. High skills are keeping from LM0 to LM3 in ECMWF_SEAS4 over global monsoon domain, and from LM0 to LM7 in NCEP_CFSv2 and to LM10 in BCC_CSM1.1m, respectively, over global monsoon land domain.