Comparisons of China operational analysis data with two reanalysis datasets

Jingwei Liu

National Meteorological Information Center(NMIC),

China Meteorological Administration (CMA)

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OUTLINE

- Background
- Data and methodology
- Results
- Summary

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Background

- China Meteorological Administration has started the 2015-2020 action plan to develop high quality datasets. It includes quality controls, merging of multi-source observational datasets and reanalysis.
- In the field of reanalysis, we are newer, and now trying to do some preliminary work by using our operational weather forcast model with the assimulation system updated from GSI to GSI-Hybrid through the cooperation with NCAR, as well as collecting and preparing conventional and satellite datasets.
- To reveal the general performance of China operational analysis data(COA), firstly, the comparisons were conducted by using ERA interim reanalysis data (ERAI) and NCEP/DOE reanalysis data(NCEP2).

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Data and methodology

- The period was selected from Jan 1, 2010 to Dec 31, 2012.
- The original horizontal resolution of COA (T639), ERAI and NCEP2 are 0.28x0.28 degrees, 0.75x0.75 degrees and 2.5x2.5 degrees. And all datasets were interplated to the resolution of ERAI.
- To evaluate the COA data, time series, biases, correlation coefficients (CC) and root mean square errors (RMSE) were conducted by taking ERAI as a reference.
- As two typical different results, geopotential height (GPH) and relative humidity (RH) at 500 hPa would be presented here.

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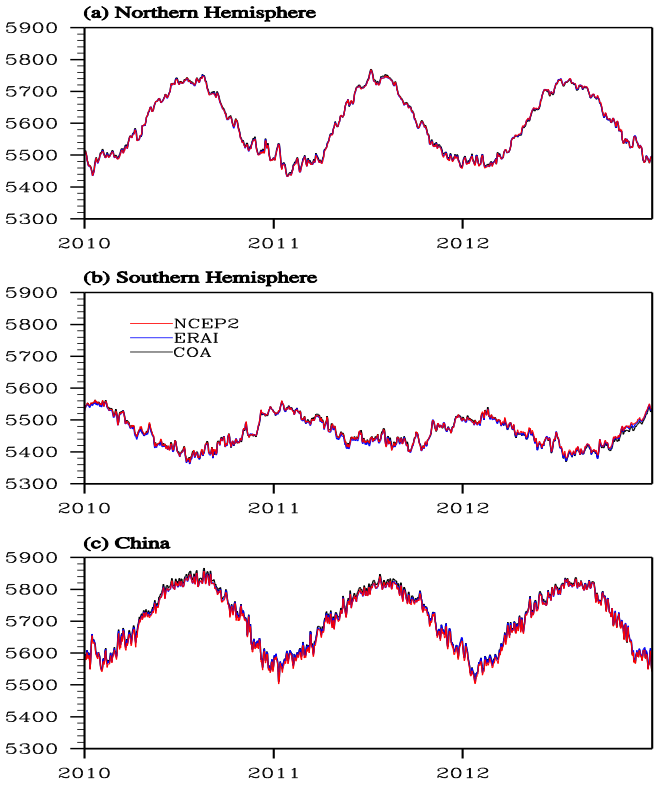
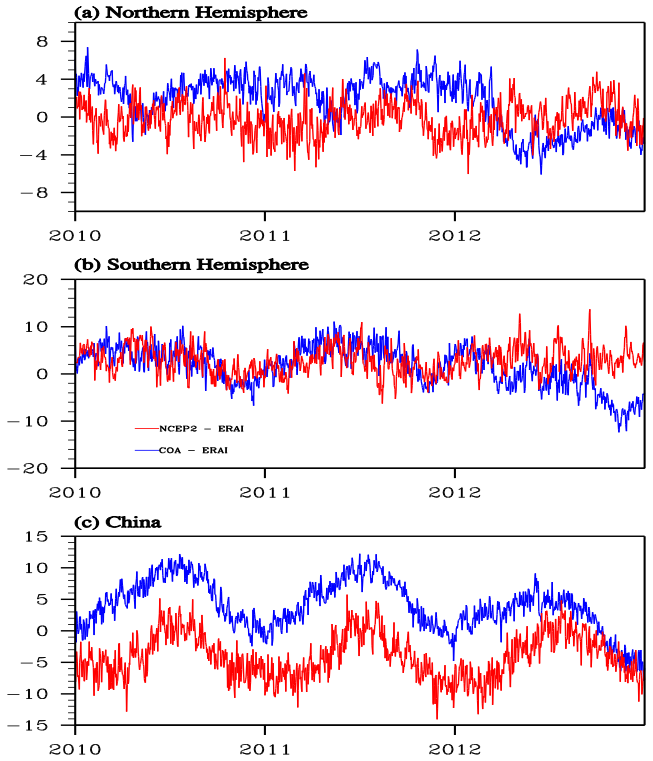
Time series of GPHs

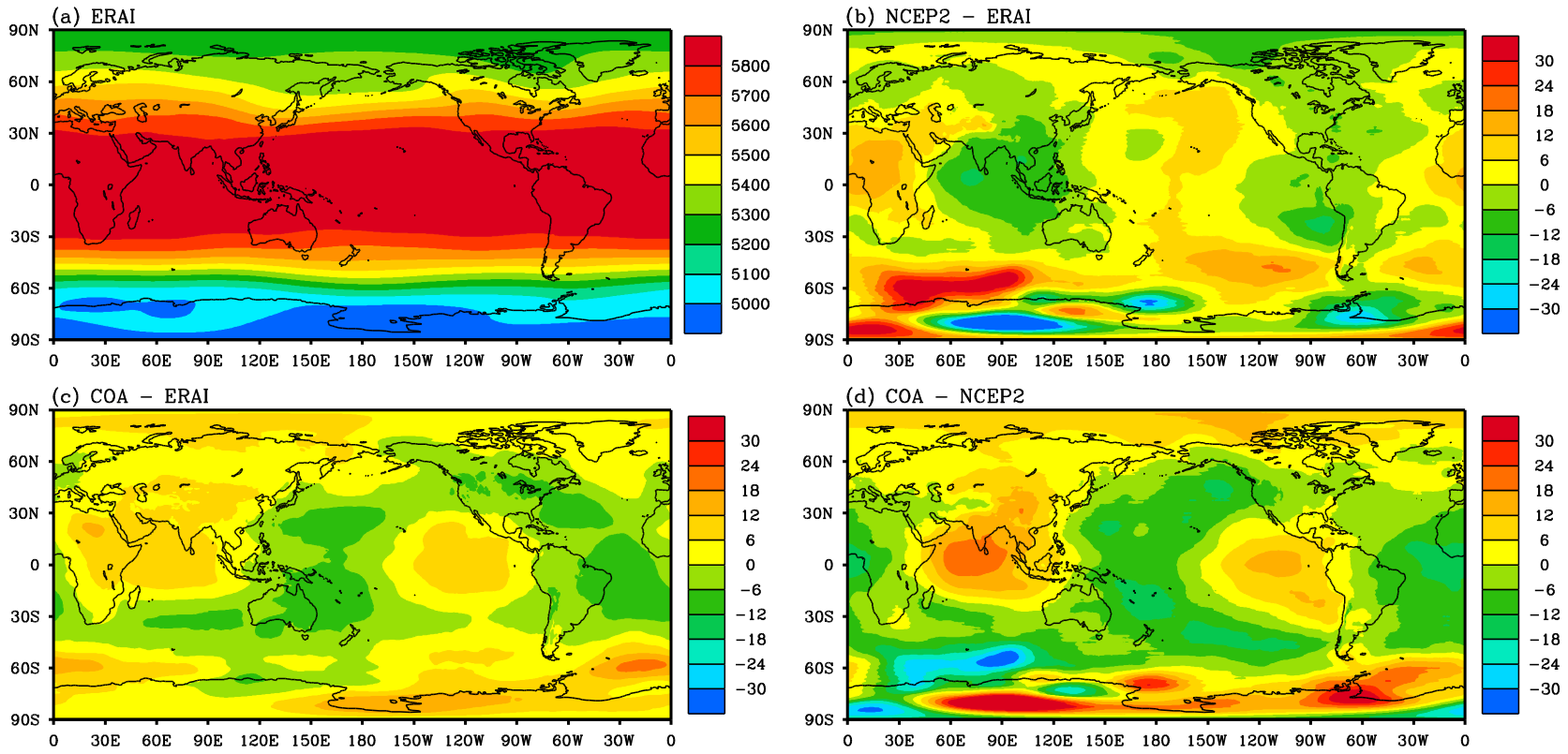




Biases

- The RMSEs of COA to ERAI **are 2.63, 4.29 and 3.96** at northern hemisphere (NH), southern hemisphere)SH and China, respectively.
- The RMSEs of COA to NCEP2 are 3.31, 4.80 and 3.38 at NH, SH and China, respectively.
- Besides, the RMSEs of NCEP2 to ERAI are **1.77, 2.93 and 3.53** at NH, SH and China, respectively.
- Both seasonal variabilities and biases in China can be seen, which implies the systematic biases of COA and NCEP2.
- Generally, relative to COA, ERAI and NCEP2 are more coincident.

The climatologies of GPHs



- Large disagreements can be seen at the southern hemisphere between NCEP2 and ERAI.
- There are similar +/- patterns for the biases of COA relative to ERAI and NCEP2, respectively.
- The biases of COA relative to NCEP2 are larger than that of ERAI at the southern hemisphere, especially the region around Antarctica.

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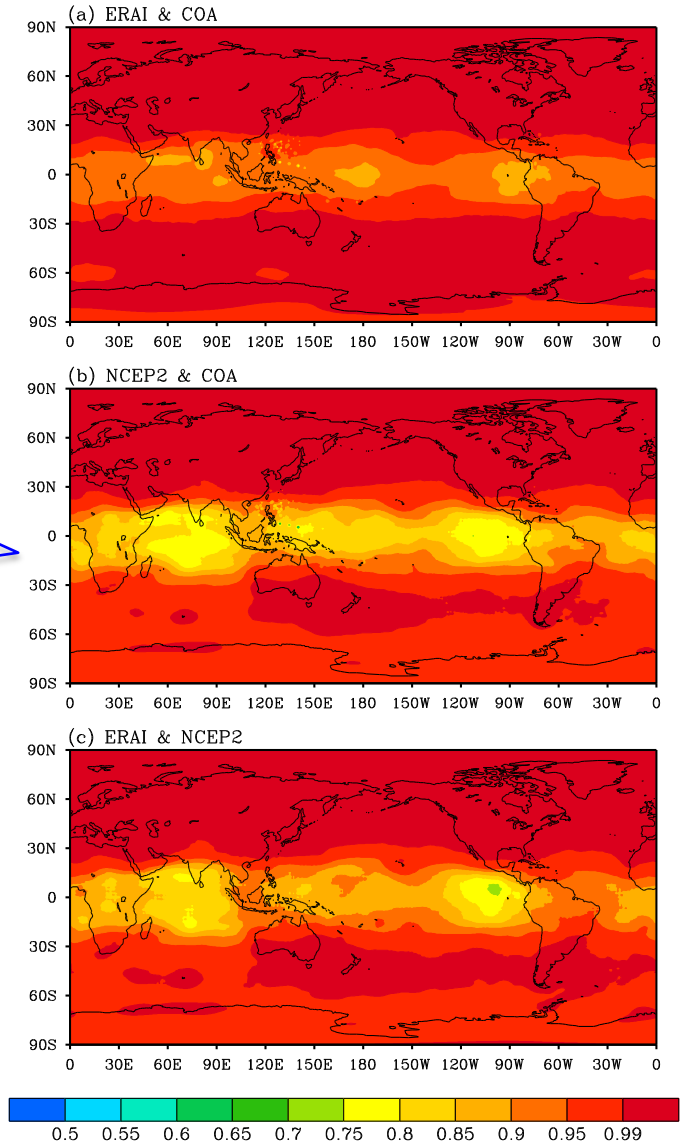
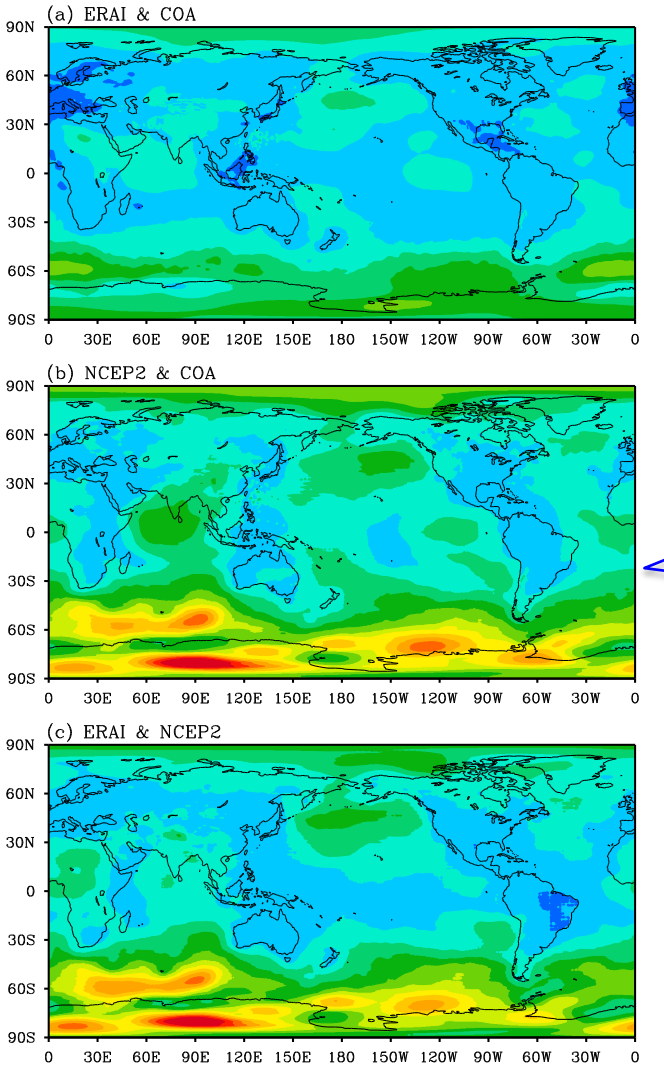
Correlation coefficients (CC) and root mean square errors (RMSE) of GPHs

CC

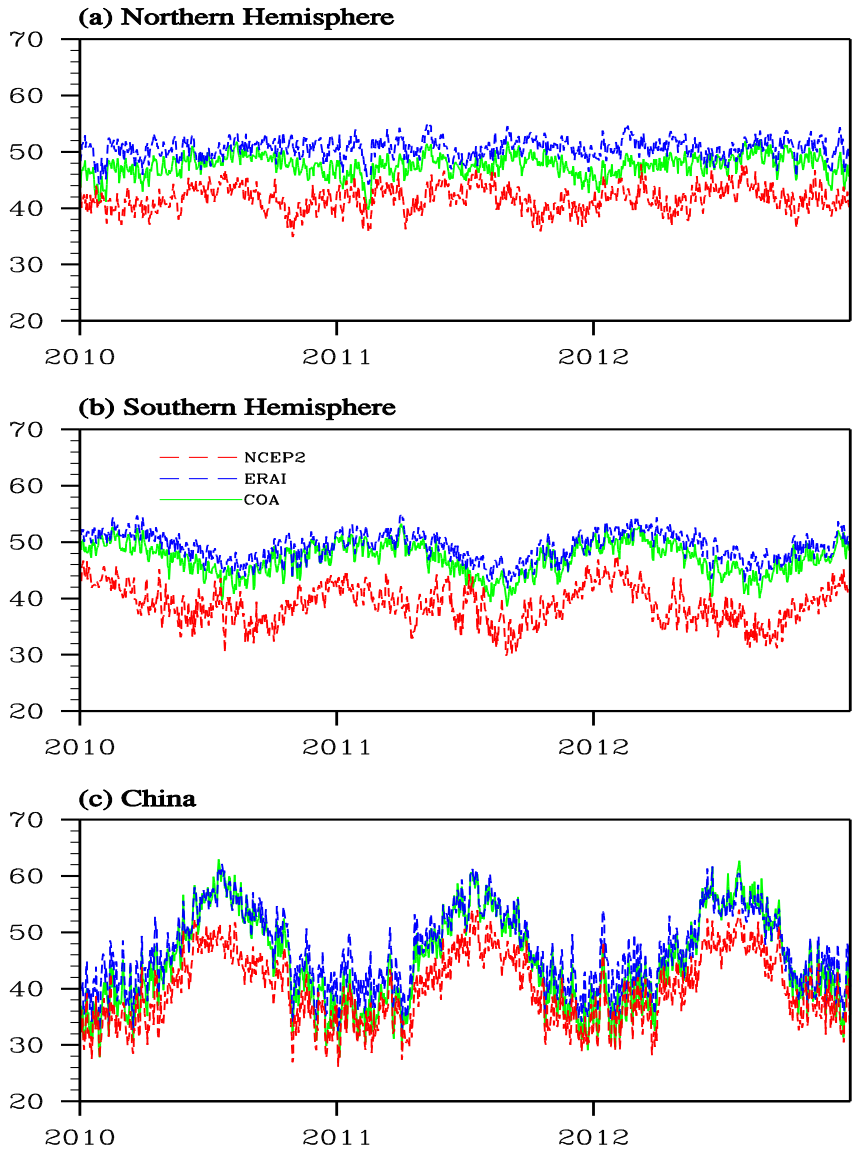


RMSE



Higher correlations can be seen between NCEP2 and ERAI.

Time series of relative humidity (RHs)



- The RMSEs of COA to ERAI are 1.23, 1.07 and 2.15 at NH, SH and China, respectively.
- The RMSEs of COA to NCEP2 are 2.31, 2.77 and 2.80 at NH, SH and China, respectively.
- Besides, the RMSEs of NCEP2 to ERAI are 2.52, 2.85 and 1.91 at NH, SH and China, respectively.
- NCEP2 departs from ERAI more severely than COA.

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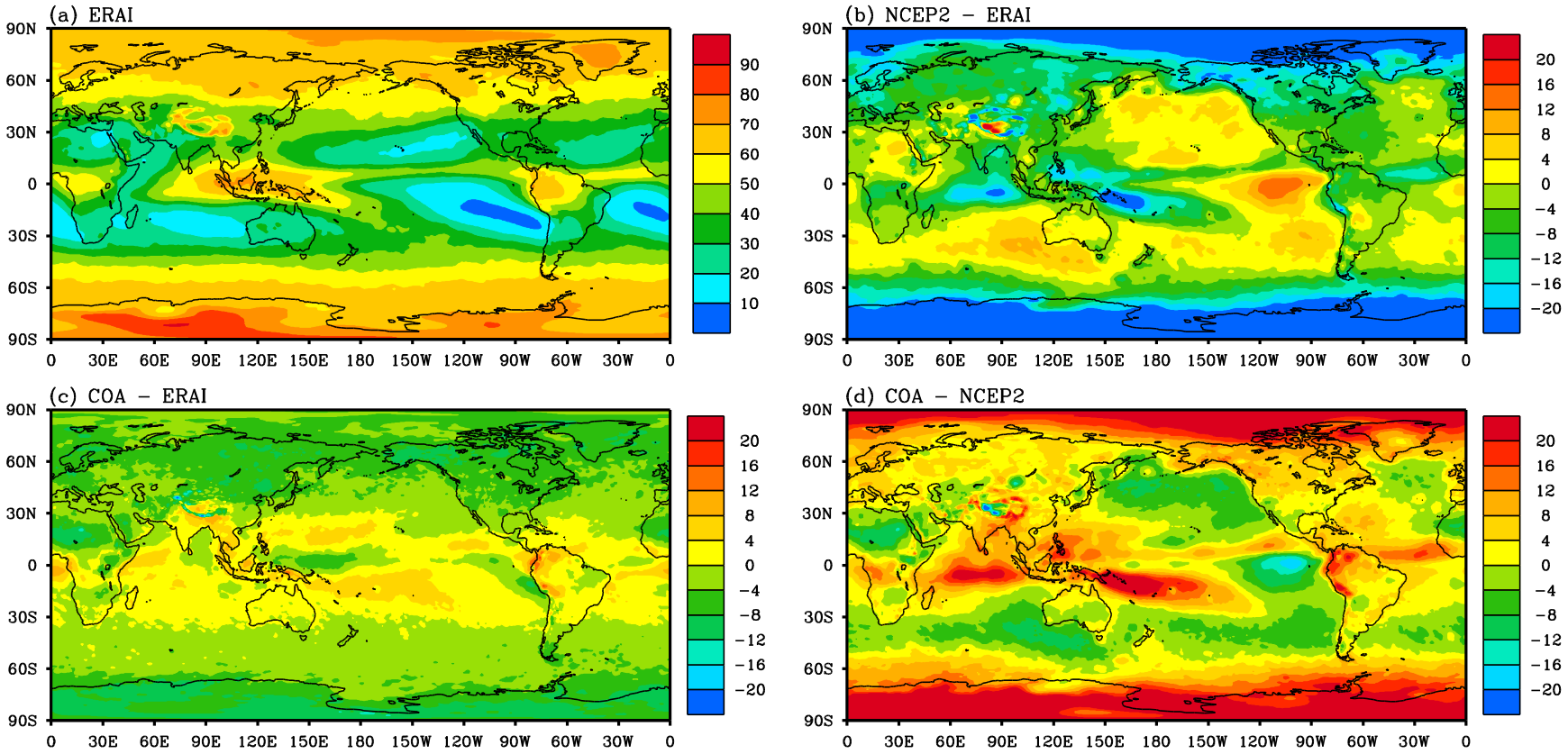
Climatologies of RHs



- For RH, the maximum at the tropic and the minimums at the subtropics are weaker in NCEP2 than in ERAI.
- There are quite different +/- patterns for the biases of COA relative to ERAI and NCEP2, respectively.
- In general, the biases of NCEP2 are larger than those of COA, which indicates that COA is closer to ERAI than NCEP2 in climatology aspect.

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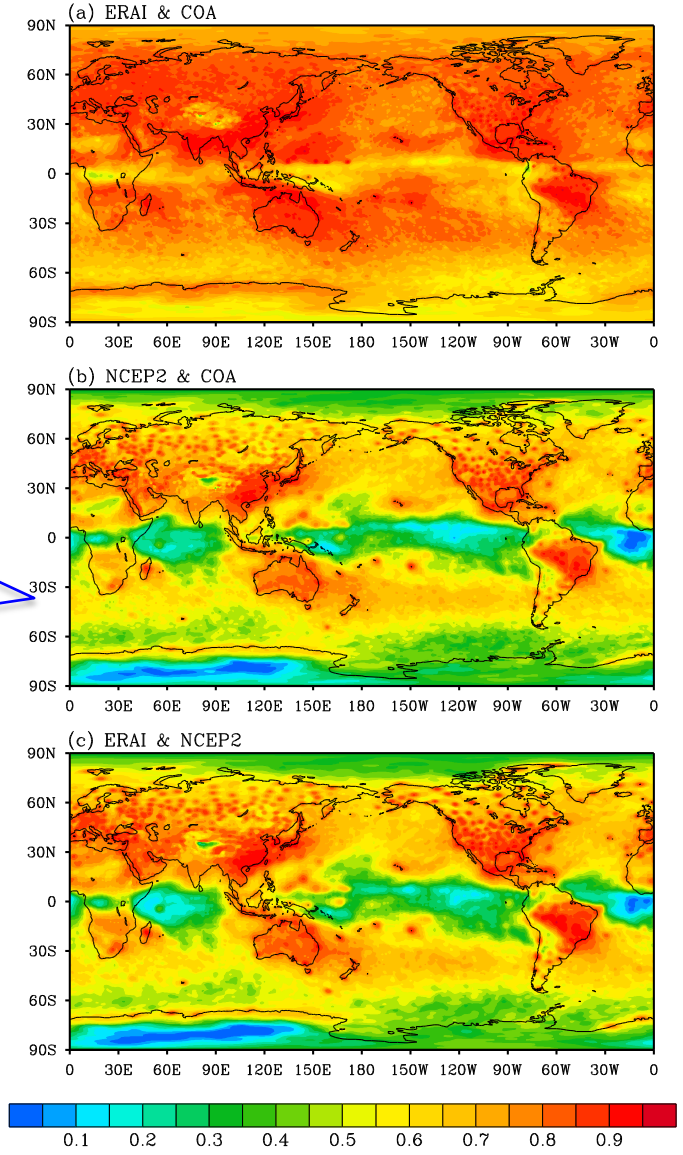
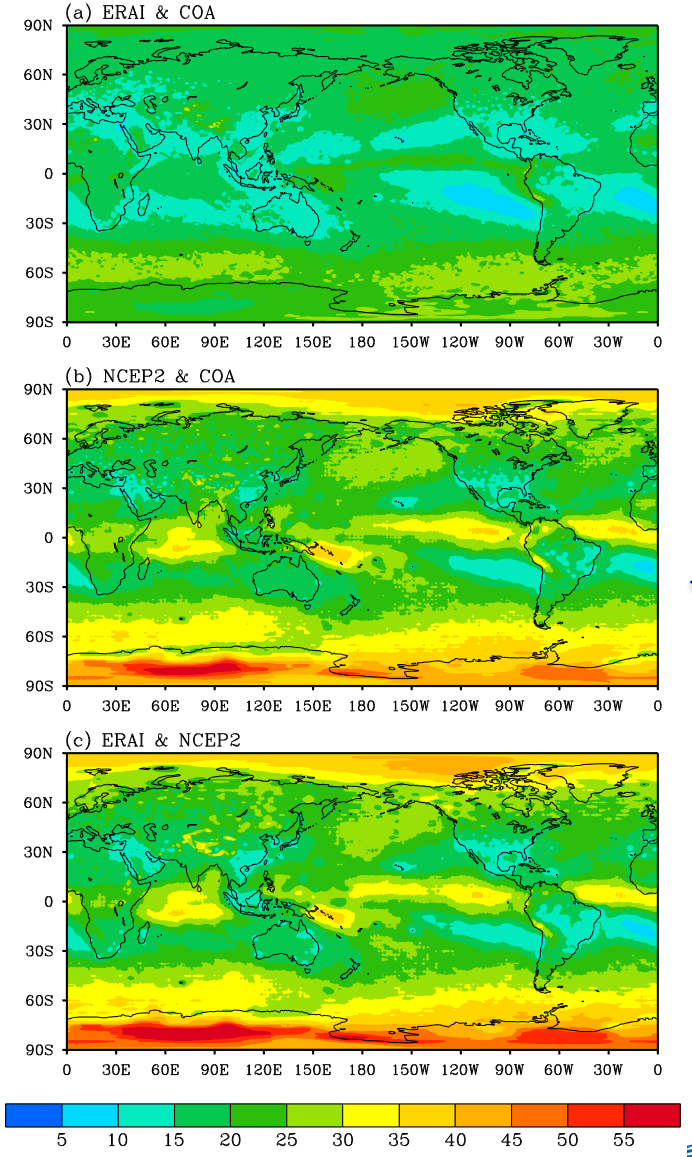
correlation coefficients (CC) and root mean square errors (RMSE) of RHs

CC



RMSE



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Summary

- COA data was generally well consistent with ERAI and NCEP2, and COA even showed some advantages in contrast with NCEP2 in relative humidity.
- Take the 500hPa geopotential height for example, COA data generally showed very high correlation coefficient and low root mean square errors compared to both reanalysises. The largest inconsistencies of GPHs lied in tropical area and Antarctica amongst the three sets of data.
- Compared to ERAI, the systematic biases of GPHs of COA and NCEP2 could be seen clearly in China.
- As for relative humidity at 500 hPa, COA generally showed smaller biases and RMSE over globe, and higher correlations with ERAI compared to NCEP2. What's more, NCEP2 showed much smaller correlations with ERAI over the tropical region and the polar regions.

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THANK YOU!

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