4.8 SPATIO-TEMPORAL ANALYSIS AND COMPARISON OF TOTAL PRECIPITABLE WATER FROM DIFFERENT DATASETS

[1]Arief Sudradjat* and [2]Ralph R. Ferraro
[1]University of Maryland, College Park
[2]NOAA/NESDIS, Camp Springs, MD

1. INTRODUCTION

Total precipitable water (TPW) is one of the key components in the water cycle and climate analyses. TPW represents the total vertically integrated water vapor of an air column overlying a unit area of the earth's surface. The air column exchanges water, including water vapor, with the surrounding air columns and the earth's surface as components of the water cycle. Hence, TPW is a parameter in the water balance equation. Because the water cycle plays an important role in the climate, understanding the variability of TPW is also significant in climate analysis. It is therefore important to have a reliable estimate of TPW.

There are several global TPW estimates currently available for the water cycle and climate analyses. Most of them have good spatial and temporal resolutions. They are based on satellite and ground observational datasets and numerical weather prediction (NWP) model analysis fields. This study compares and analyzes TPW from various datasets.

2. DATASETS AND METHODS

The TPW datasets used in this study are summarized in Table 1.

Source	Years	Type	Comments
NVAP	1988-1999	Blended	Land/ocean Randel et al., 1996
NCEP reanalysis	1953-2000	Model & in situ	Land/ocean Kalnay et al., 1996
NCEP-DOE reanalysis 2	1979-1997	Model & in situ	Land/ocean Kanamitsu et al., 2002
ECMWF	1978-1994	Model & in situ	Land/ocean Gibson et al., 1999
SST	1981-present	Blended	Reynolds et al., 2002

Table 1. TPW and SST datasets

* Corresponding author address: Arief Sudradjat, CICS/ESSIC, Univ. of Maryland, College Park, MD 20742-2465; e-mail: arief@essic.umd.edu

We regridded the datasets into 2.5°x2.5° grids. We computed monthly means and anomalies from each time series. We obtained the anomalies by removing the corresponding interannual means of each grid point. We then performed statistical analysis on the time series.

3. PRELIMINARY RESULTS

EOF analysis was performed on the anomalies of the datasets for a 12-year period from 1988 to 1999, except for the ECMWF dataset. EOF1 from the NVAP (explaining about 12% of the variance) and NCEP-DOE reanalysis 2 (explaining about 8% of the variance) are shown in Figures 1 and 2, respectively. The associated time series of the first principal components (PC1) are shown in Figures 3 and 4, respectively.

Figures 1 and 2 show similar dominant spatial patterns as a response to sea surface temperature (SST) anomalies associated with the warm and cold phases of ENSO. Both PC1s show the cold phase of 1988 (around month 12) and the warm phases of 1991-1994 and 1998 (around month 48 through 84 and month 120, respectively). However, the strengths of the warm phases are different.

More detailed results will be presented at the conference.

4. REFERENCES

Gibson, J., et al., 1999: ERA-15 description. *ECMWF Re-Analysis Project Report Series*, 84 pp.
Kalnay, E., et al., 1996: The NCEP/NCAR 40-year reanalysis project. *Bull. Am. Meteorol. Soc.*, **77**, 437-471.
Kanamitsu, M., at al., 2002: NCEP–DOE AMIP II Reanalysis (R-2). *Bull. Am. Meteorol. Soc.*, in press.
Randel, D. L., et al., 1996: A new global water vapor dataset. *Bull. Am. Meteorol. Soc.*, **77**, 1233-1246.
Reynolds, R. W., et al., 2002: An improved in situ and satellite SST analysis for climate. *J. Clim.*, 1609-1625.

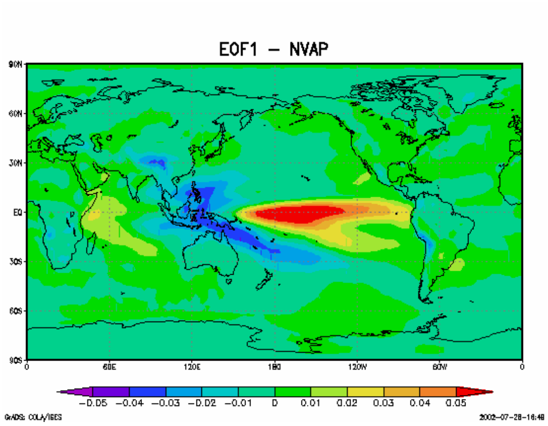

Figure 1. EOF1 of the NVAP time series (1988-1999).

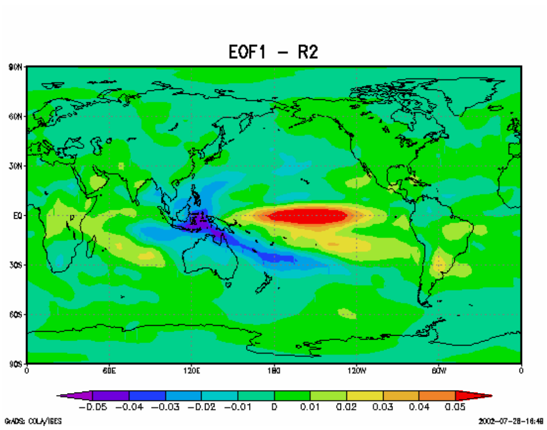

Figure 2. EOF1 of the NCEP-DOE reanalysis 2 time series (1988-1999).

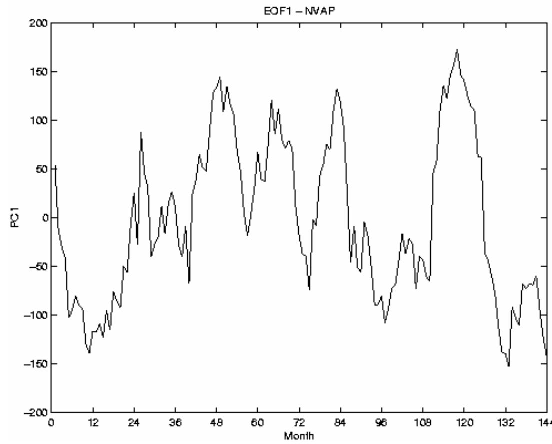

Figure 3. PC1 of the NVAP time series (1988-1999).

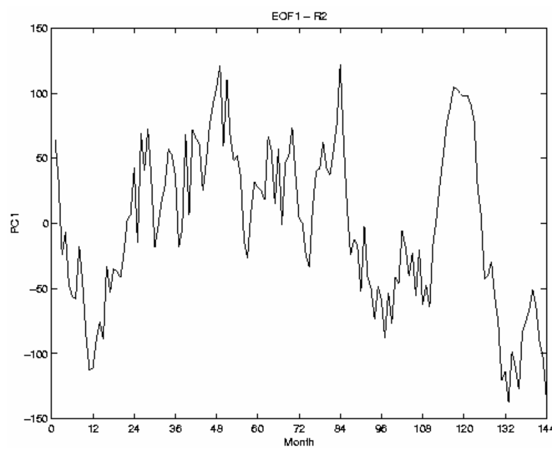

Figure 4. PC1 of the NCEP-DOE reanalysis 2 time series (1988-1999).