

Simulation of Drought in Central Asia during the Last Millennium

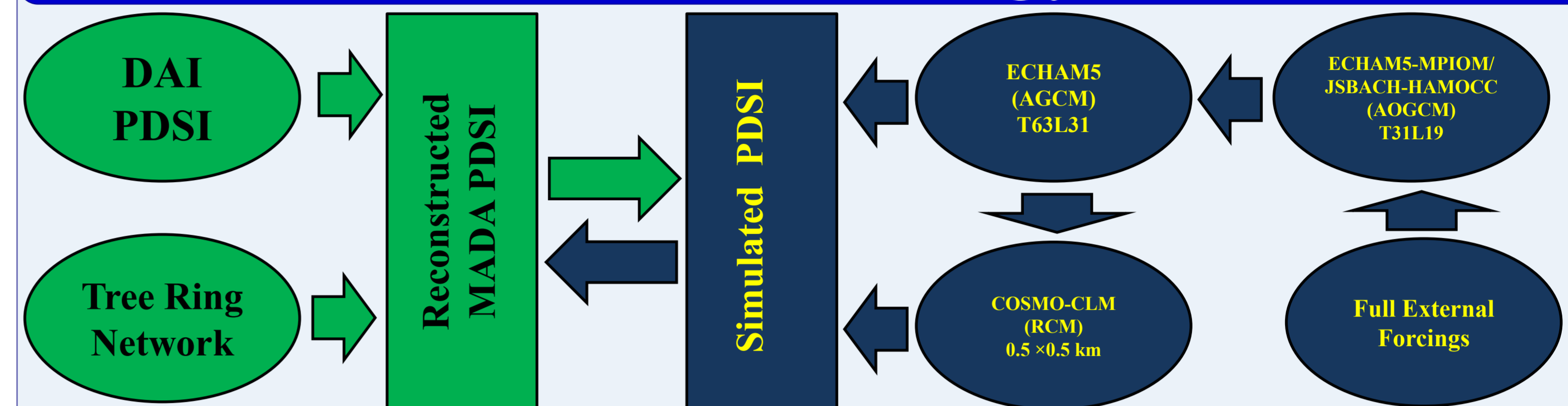
Bijan Fallah¹, Stefan Polanski¹, Ingo Kirchner¹ and Ulrich Cubasch¹

¹ Freie Universität Berlin, Institute of Meteorology, Carl-Heinrich-Becker-Weg 6-10, 12165-Berlin, Germany, email: bijan.fallah@met.fu-berlin.de

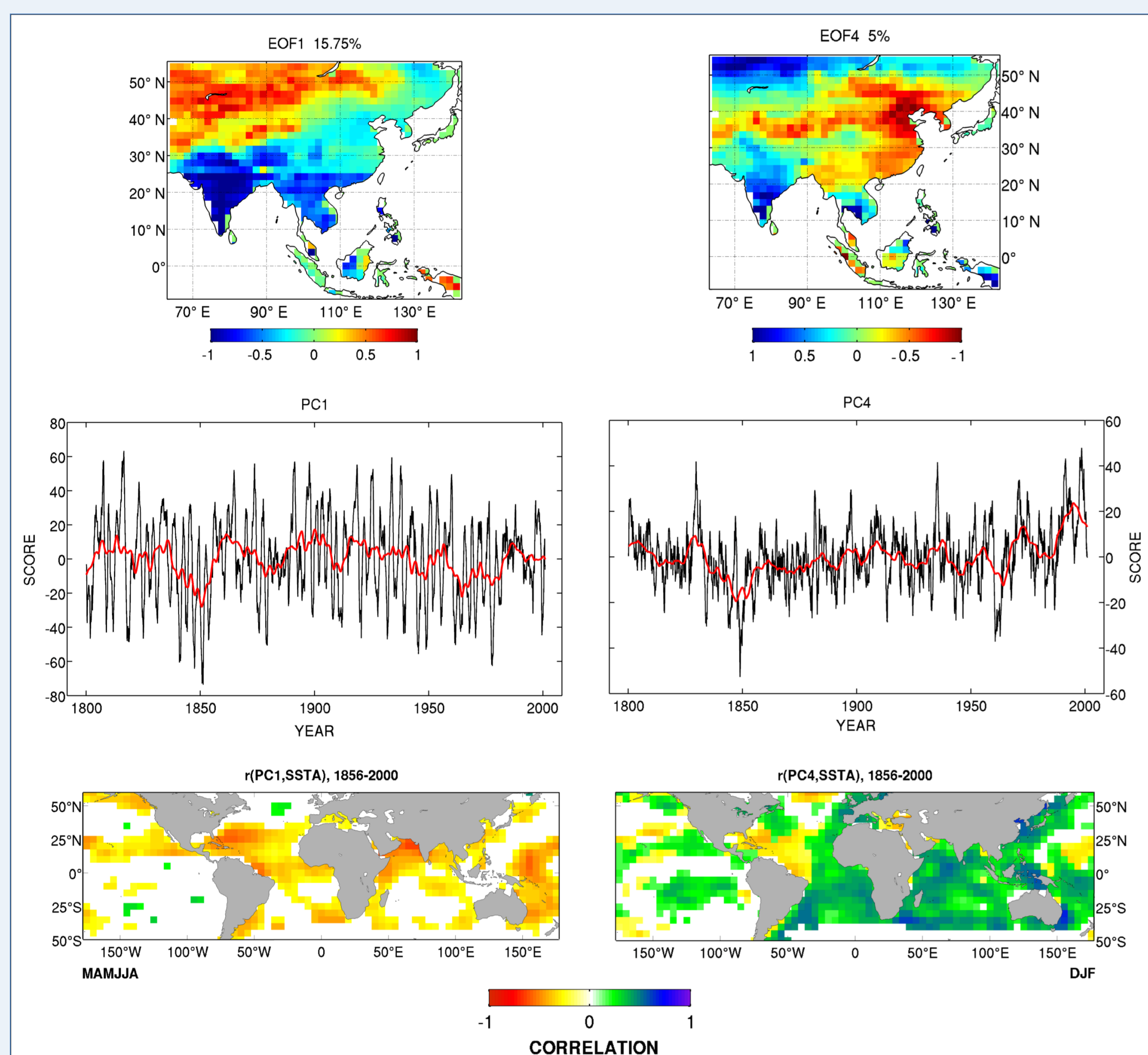
1. Introduction

- ✓ All the Central Asian Countries rely heavily on irrigated agriculture.
- ✓ We aim to apply proxy reconstructions and climate models to analyse and (semi)quantify the climate variability and regional hydrology in Central Asia.

2. Methodology

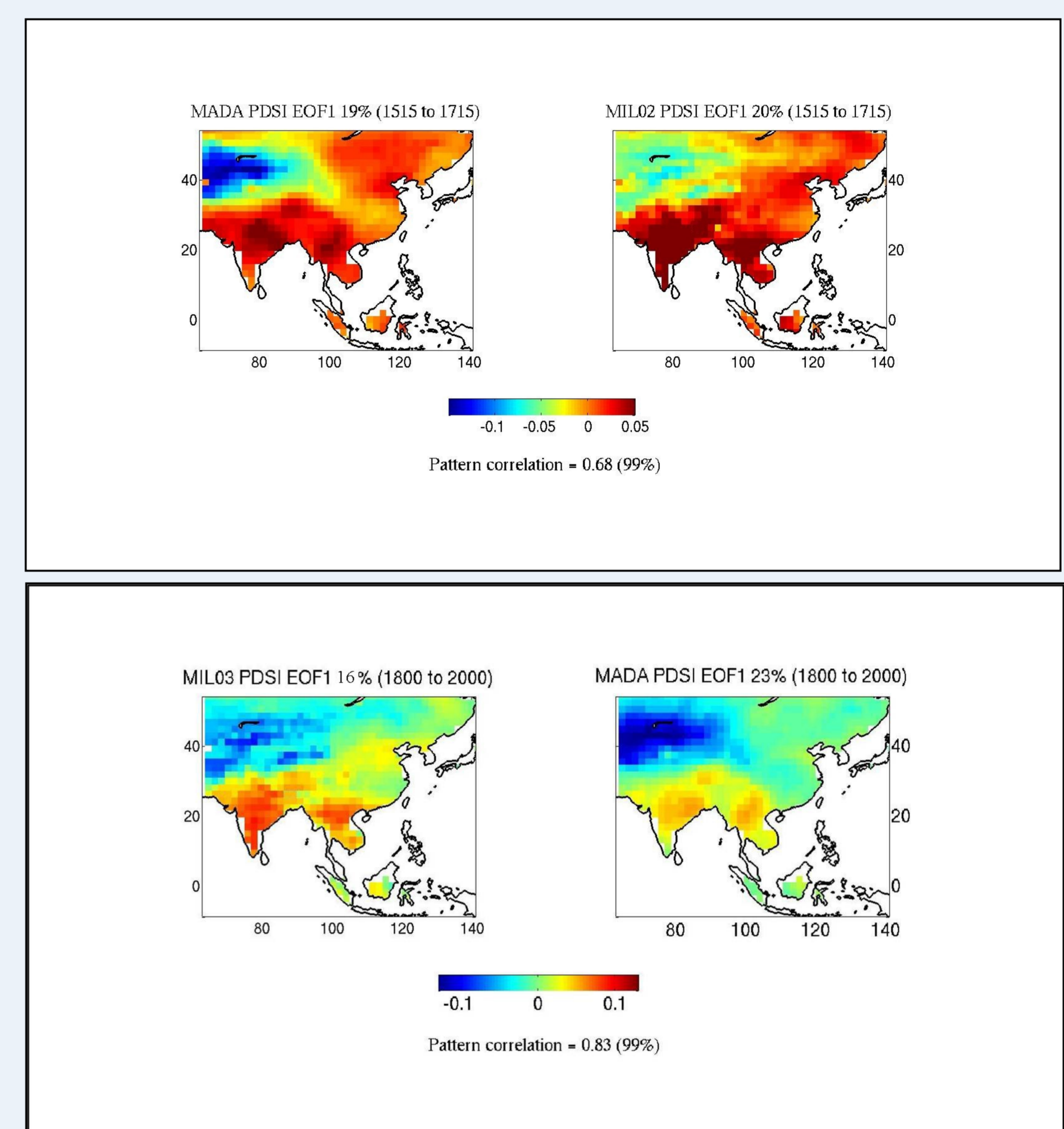


3. Spatiotemporal patterns of simulated PDSI



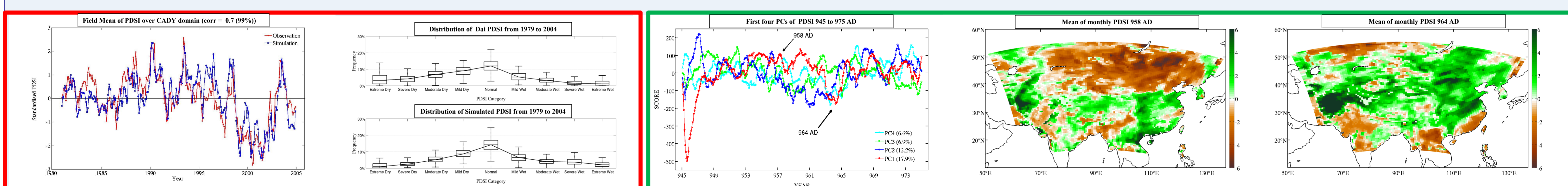
- Upper panels** : EOF analysis of PDSI with two modes (EOF1 and EOF2).
Middle panels : Time serie expansion (PCs) of corresponding spatial modes in top row.
Lower panels : Pearson correlations with SSTA and PC1 are simultaneous with the monsoon and pre-monsoon season (MAMJJA), whereas the SSTA patterns for PC4 are for the previous winter (DJF) season.

4. Spatial patterns of simulated and reconstructed PDSI



- Upper panels** : EOF analysis of reconstructed and simulated PDSI (first mode) for Little Ice Age (LIA).
Lower panels : EOF analysis of reconstructed and simulated PDSI (first mode) for Recent Climate (REC).

5. RCM Simulations



Model vs. Observational PDSI (DAI)

Examples of Dry and Wet spells during MWP

6. Conclusions

- ✓ There are similarities in Drought patterns (Leading EOF) of reconstructed and simulated PDSI during REC and LIA.
- ✓ There are significant correlations between time-serie expansions of PDSI and SST anomalies.
- ✓ Positive scores of PC1 shows more dry spells over Central Asia.
- ✓ Simulated and observed PDSI (DAI) show the same trend in time.
- ✓ For further data-model comparisons, there is a need of well dated reconstructions (Temperature and Precipitation) over Central Asia.

7. References

1. Cook, E.R., Anchukaitis, K. J., Buckley, B. M., D'Arrigo R. D., Jacoby, G. C., and wright, W. E.: Asian Mansoon Failure and Megadrought During the Last Millennium, *Science*, 328, 486-489, 2010.
2. Dai, A., K. E. Trenberth, and T. Karl, 1998: Global variations in droughts and wet spells: 1900-1995. *Geophys. Res. Lett.*, 25, 3367-3370.
3. Jungclaus, J. H. et al. (2010): Climate and carbon-cycle variability over the last Millennium, *Climate of the Past* 6, 723-737, 2010.
4. Palmer, W. C, 1965: Meteorological Drought. Res. Paper No.45, 58pp., Dept. of Commerce, Washington, D.C.
5. Webb, R. W. Rosenzweig, C. E., and Levine, E.R.: Global Soil Texture and Derived waterholding Capacities, data set, available online under <http://www.daac.ornl.gov>
6. Wells, N., Goddard, S., and Hayes, M. J.: A self-Calibrating Palmer Drought Severity Index, *Journal of Climate*, 17, 2335-2351, 2004.