Long-Range Forecasts of Monsoons (LRFM)
WGSIP Prediction Capability Project

Leads: Yuhei Takaya (Meteorological Research Institute, Japan),
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Participants: Lauriane Batté (MetéoFrance, France), Asmerom Beraki (CSIR, SouthAfrica), June-Yi Lee (Pusan Univ., South Korea),Yvan Orsolini (NILU, Norway), Ramiro Saurral (CIMA, Universidad de Buenos Aires, Argentina), Adrian Tompkins (Abdus Salam International Center for Theoretical Physics, Italy)

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Meteorological Research Institute

Some updated information

- **The 7th WMO International Workshop on Monsoons (IWM-7) Training workshop, Nov. 1-12** (online)
  Ángel and Yuhei gave lectures.

- **IWM-7, 23-26 March 2022** in India, Pune (abstract deadline: 11/31)
  Hong-Li, Ángel, June-Yi, and Yuhei are organizing committee members.

- New **International Monsoons Project Office (IMPO)** has been established at the Indian Institute of Tropical Meteorology (IITM), Pune, India for a period of 5 years (2021 to 2025).

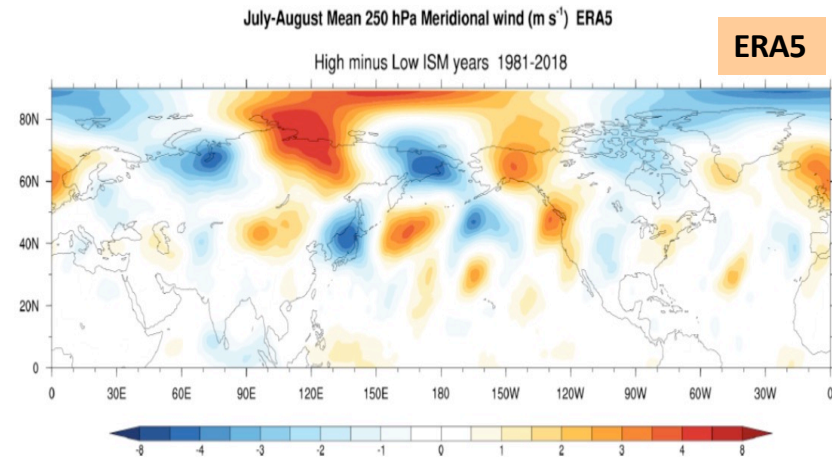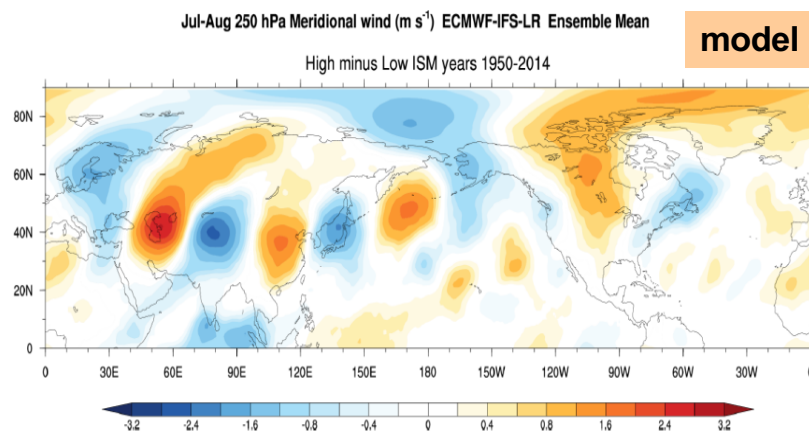- S2S Regional Activity Wiki (under development)
  South Asia: http://s2sprediction.net/xwiki/bin/view/RegionActv/SouthAsia

Some research highlights from members

Indian Summer Monsoon and Silk-Road pattern in PRIMAVERA simulations

Contribution: Y. Orsolini (NILU, Norway), R. Senan and F. Molteni (ECMWF)

Composite difference (HIGH mins LOW) based on an ISM rainfall index

V at 250 hPa
JUL-AUG

Jul-Aug 250 hPa Meridional wind (m s⁻¹) ECMWF-IFS-LR Ensemble Mean
High minus Low ISM years 1950-2014 — model

July-August Mean 250 hPa Meridional wind (m s⁻¹) ERA5
High minus Low ISM years 1981-2018 — ERA5

- ❏ Indian Summer Monsoon (ISM) as a contributing factor to the forcing of the two summertime circumglobal wavetrains (CGT) at mid and high-latitudes
- ❏ Representation of the CGT in the "PRIMAVERA" climate simulations (1950-2014) with the ECMWF coupled model
- ❏ Comparisons with the ERA5 reanalyses ; impact of model resolution
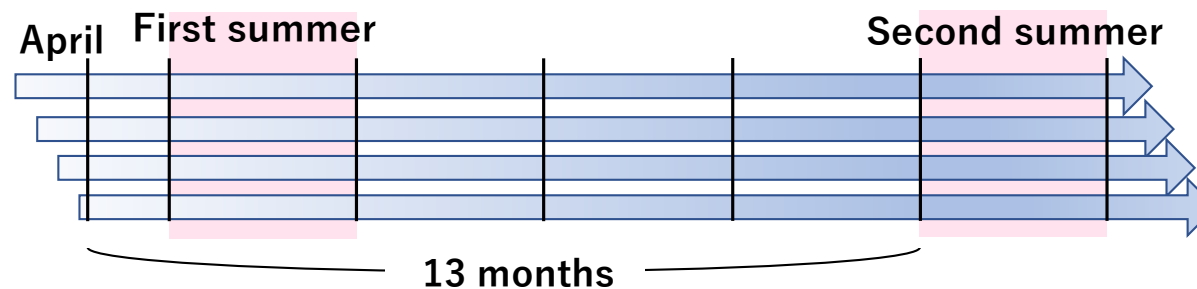
Asian summer monsoon prediction one year ahead

Model：**JMA/MRI-CPS2** (Takaya et al. 2018 *Clim. Dyn.*)

Initial dates：Four consecutive dates in **April** (11, 16, 21, 26 April) during **1979-2016**

Target period：**Boreal summer (Jun-Aug) with a 13-month lead**

**during 37 years (1980-2016)** (The one-month lead prediction was also analyzed.)

Ensemble size：**52 members**

Takaya, Y., Y. Kosaka, M. Watanabe, S. Maeda (2021) *Nature Communications*
Skilful predictions of the Asian summer monsoon one year ahead.
https://doi.org/10.1038/s41467-021-22299-6

Asian summer monsoon prediction one year ahead

Predictions of indices representing the ASM variability
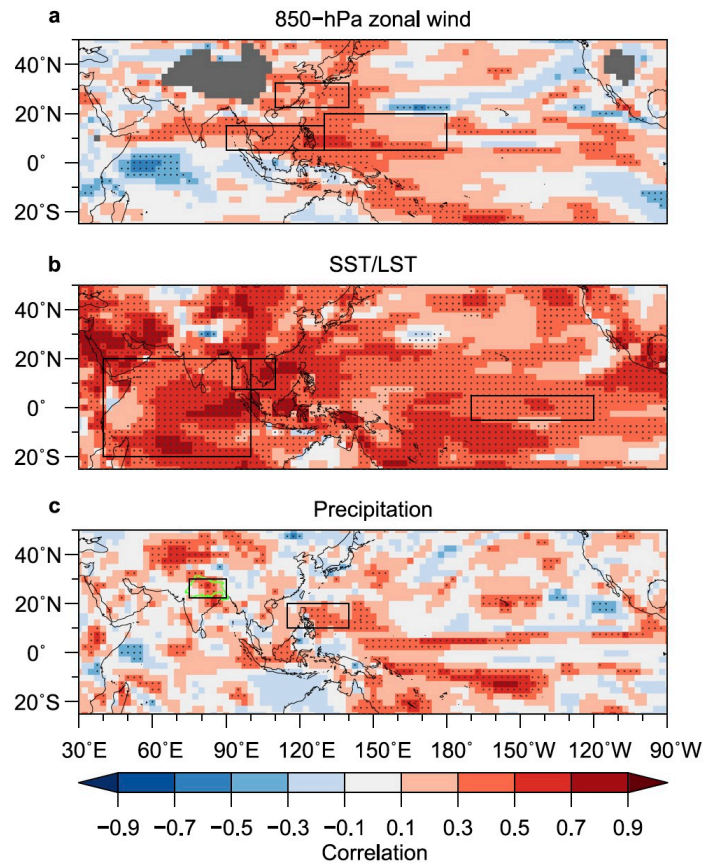

Analysis
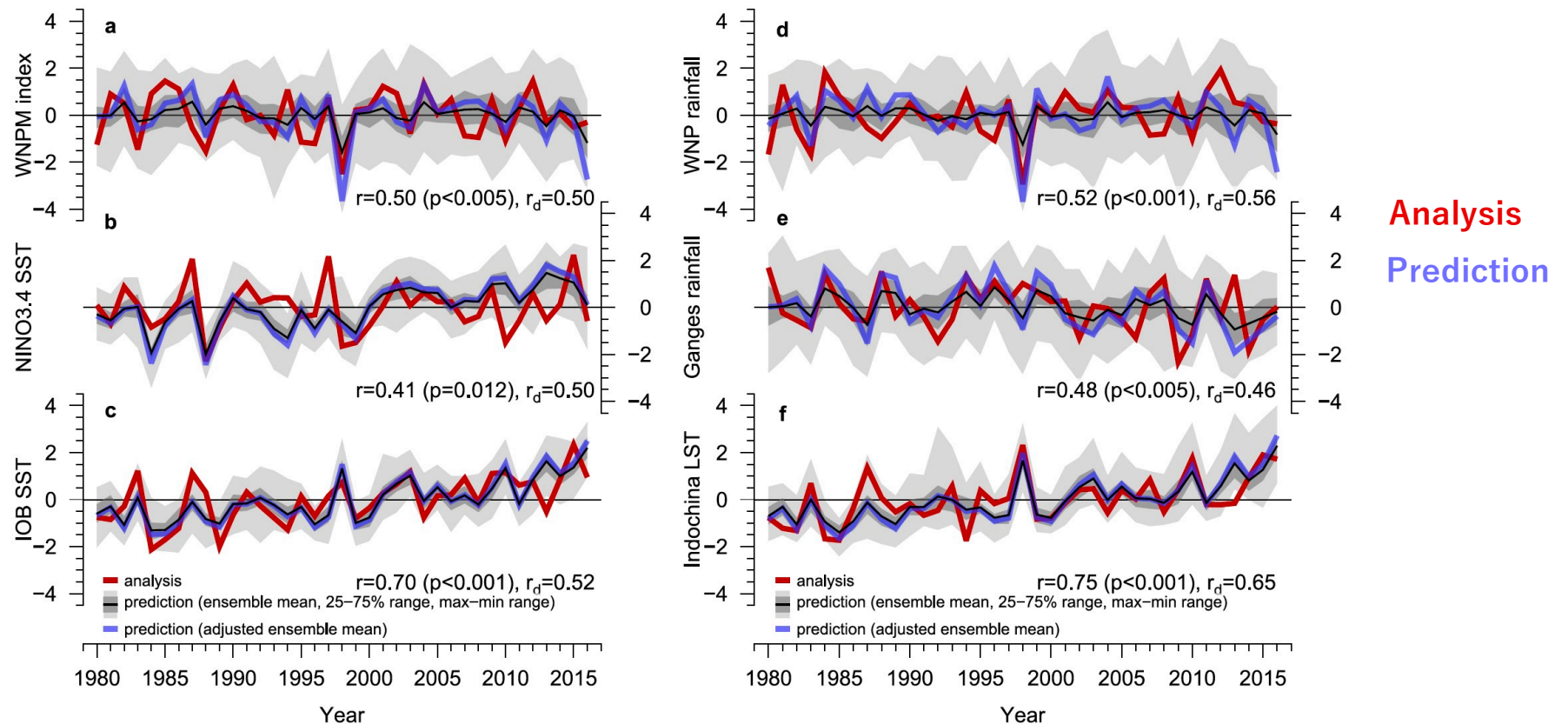
Prediction

*All indices were normalized.

Takaya et al. (2021)

# Asian summer monsoon prediction one year ahead

Correlation for the second summer

The spatial pattern of the correlation score for 850-hPa zonal wind resembles that of the dominant ASM mode.

SST/LST skill is high in a broad area, in particular, Mainland Southeast Asia and Indonesia.

Precipitation skill is relatively high in the tropical WNP, Maritime Continent, and the Ganges basin.

The results indicate that the ASM is predictable one year ahead.

Takaya et al. (2021)

Asian summer monsoon prediction one year ahead

**IPOC mode and its second summer prediction
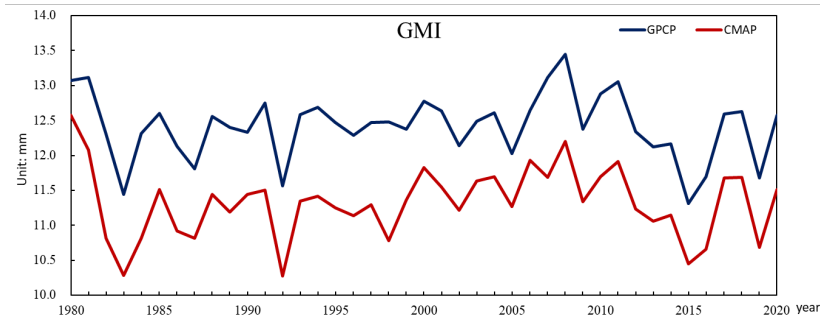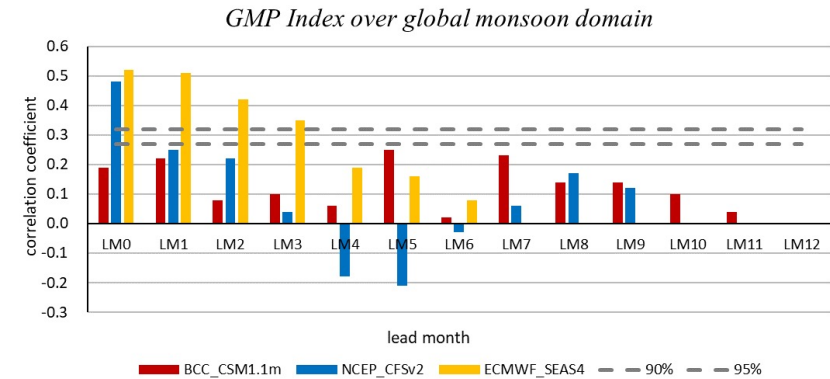（Composites for summers after El Nino）**
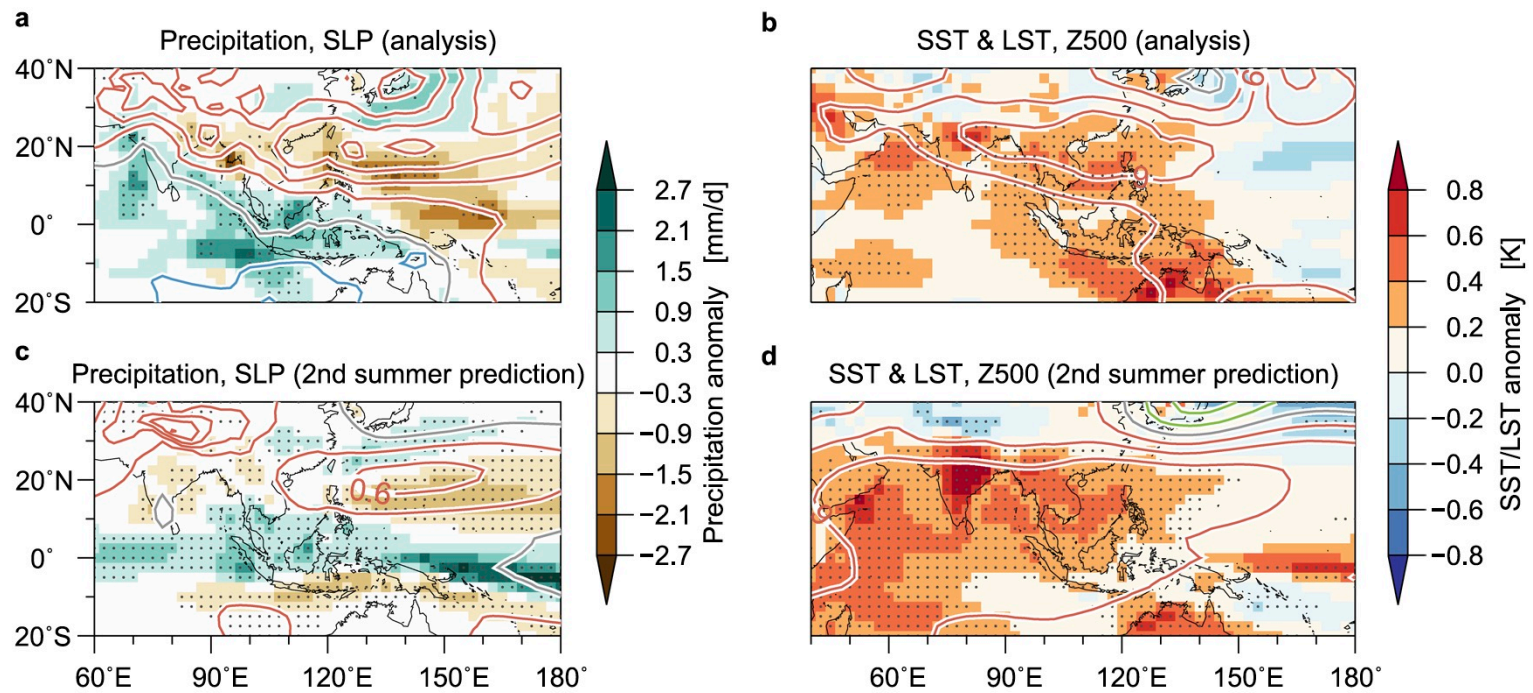
Takaya et al. (2021)

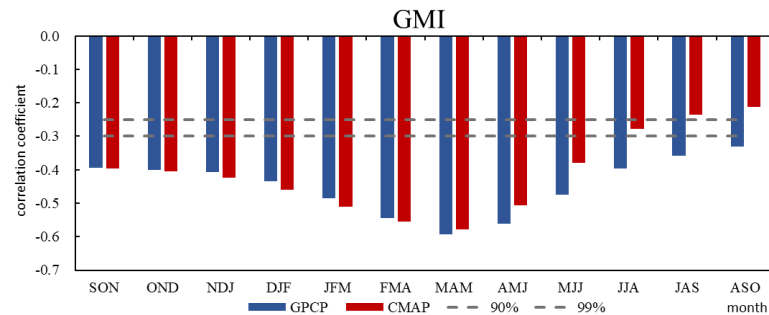# Global Monsoon Precipitation Index and its relationship with ENSO

contributed from Hong-Li Ren and Na Wang (CMA)

Comparison GM indices: GPCP vs CMAP

Correlation skills of GM index predicted in three models

Correlations between GM indices and Nino3.4 index

- GPCP and CMAP show a good consistency of Global Monsoon Precipitation Index, but with a systematic difference;
- GMI has a significant relationship with ENSO, particularly during its decaying time (boreal spring);
- The three operational models show different correlation skills for the global monsoon index at all lead times.

Seasonal forecasting of Tibetan Plateau precipitation : evaluation and correction

contributed from Hong-Li Ren and Lin Wang (CMA)

> Observation: GPCP
> Dynamical predictions: seven NMME models
-- CMC1-CanCM3
-- CMC2-CanCM4
-- COLA-RSMAS-CCSM3
-- COLA-RSMAS-CCSM4
-- GFDL-CM2p5-FLOR-B01
-- GFDL-CM2P1-aer04
-- GFDL-CM2p5-FLOR-A06
> Time domain: 1982-2019
> Correction: Stepwise pattern projection method

- NMME mean has more skills for precipitation predictions in DJF and MAM, but less skills for those in JJA and SON at 4-month lead;
- The precipitation predictions in NMME can be evidently improved through a correction with SPPM for MAM, JJA, and SON;
- Further studies are ongoing based on more observational data

uncorrected　　corrected
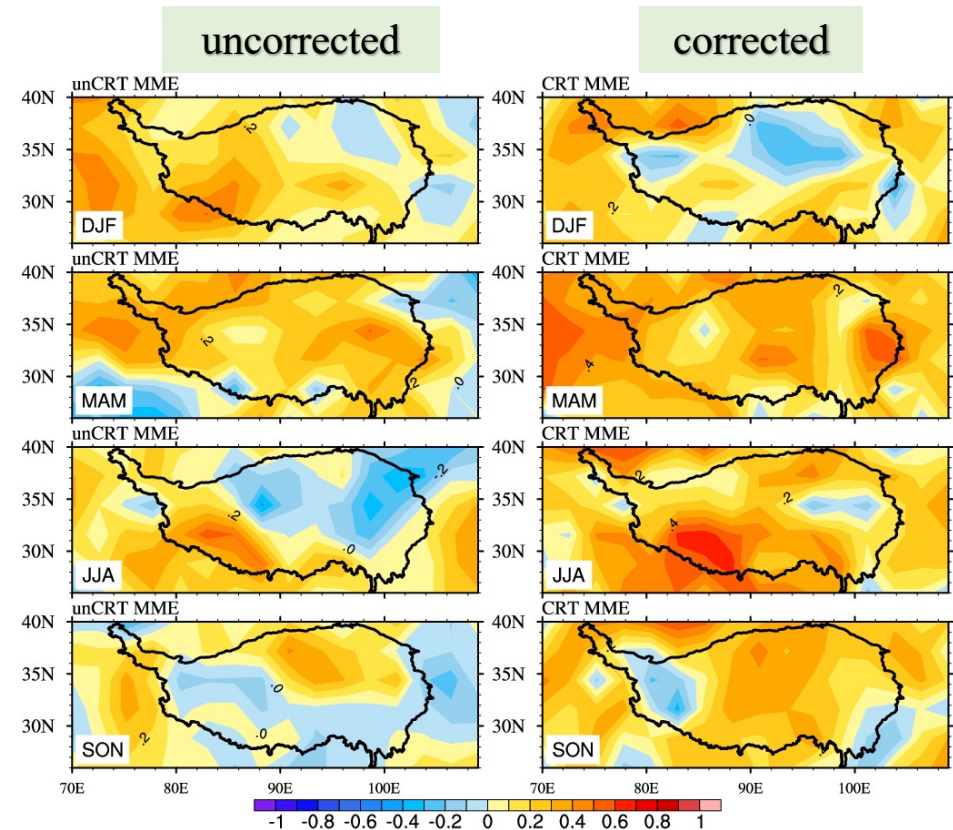
Correlation skills of TP precipitation predictions in NMME mean at 4-month lead for the four target seasons

Possible collaboration?

The CLIVAR plans to coordinate the Tropical Basin Interaction (TBI) experiments (Lead: Ingo Richter, JAMSTEC).

Motivation

Deeper understanding of TBI → sources of seasonal predictability

- causes for interdecadal TBI modulation
- reason for 2014/15 ENSO forecast failure
- contribution of external forcing to modulate TBI

Experiments

Pacemaker type climate simulations, hindcasts. SSTs in key basins (tropical Pacific, Atlantic and Indian Ocean) are restored to obs. and model climatology plus obs. anomaly.

So far, more than 15 modeling groups/individuals show their interest in the experiments.
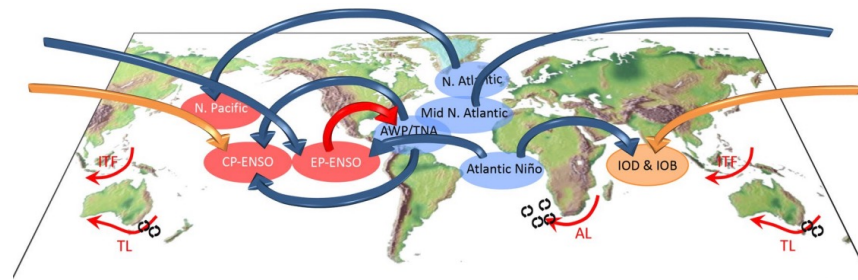
Source: Chunzai Wang (2019, *Clim. Dyn.*)