Supporting information for

Natural Variations of Tropical Width and Recent Trends

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This file contains one table, and figures S1 to S3. It also contains a more detailed description of the satellite data used.

Tables

Table 1. CMIP5 models used, including horizontal resolution and length of the control simulations.

Model	Resolution	Length of CTRL run (years)
ACCESS1.0	1.8°×1.2°	500
GFDL-ESM2M	2.5°×2°	500
GFDL-ESM2G	2.5°×2°	500
GISS-E2-R	2.5°×2°	550
MPI-ESM-LR	1.8°×1.8°	1000
BCC-CSM1.1	2.8°×2.8°	500
CNRM-CM5	1.4°×1.4°	700
CSIRO-Mk3.6	1.8°×1.8°	500
HadGEM2	1.8°×1.2°	337
IPSL-CM5A-LR	2.5°×1.2°	300
CCSM4	0.9°×°1.2	500
CESM1-BGC	0.9°×1.2°	500
MRI-CGCM3	1.2°×°1.1	500
CanESM2	2.8°×2.8°	400

Satellite data (description)

Both HIRS and AVHRR have been onboard the National Oceanic and Atmospheric Administration (NOAA) series of polar-orbiting satellites since 1978, measuring temperature and humidity in different vertical layers of the atmosphere. The two instruments were initially carried on the Television Infrared Observation Satellite (TIROS-N), and then on NOAA-6 through NOAA-19. In recent years they are also on board the meteorological operational satellite program (MetOp) series operated by the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT).

We use 2.5°×2.5° monthly means of Outgoing Longwave Radiation (OLR) from the Advanced Very High Resolution Radiometer (AVHRR) covering the period (1979-2013). In order to complement for the limitations of the AVHRR dataset we also use the 1°×1° daily mean of Outgoing Longwave Radiation (OLR) derived from the High Resolution Infrared Radiation Sounder (HIRS) operational since 1978 on board NOAA TIROS-N series and MetOp satellites (Lee at al. 2007). It should be noted that artifacts of geostationary data boundary can be found in the HIRS data in years prior 1995, which is due to lack of adequate data quality control in GridSat CDR v02r01 product.

The HIRS instrument has twenty channels, among which channel 12 (centered at 6.7 micron) observes the upper tropospheric humidity. We use BT from channel 12 as an additional dataset to analyse the subtropical edge. Channel 12 BTs observed from different satellites have been inter-calibrated to a reference satellite, for which

NOAA-12 is designated (Shi and Bates, 2011). The HIRS data have been processed to remove cloudy pixels (Jackson, 2003). The cloud-cleared observations are mapped to 2.5º x 2.5º latitude/longitude grids and put together as monthly datasets.

Besides satellite data we also use four reanalyses products, including NCEP/NCAR (R1) (Kalnay and et al. 1996), NCEP-DOE (R2) (Kanamitsu et al. 2002), ERA-Interim (Dee et al. 2011), and JRA-55 (Kobayashi et al. 2015).

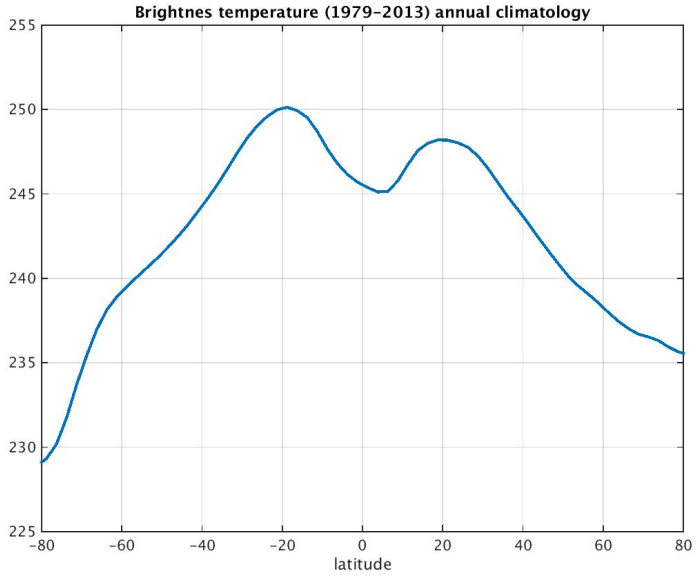

Figure S1. Zonal mean climatological brightness temperature (units in K).

Tropical expansion in the two hemispheres

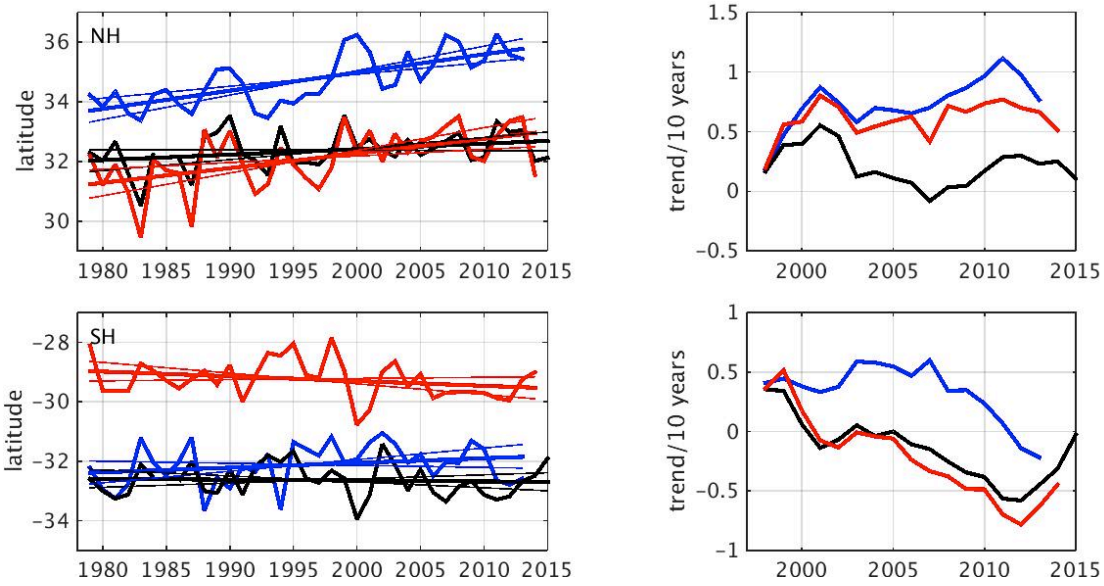

Figure S2. Same as Figure 1, but for the Northern (top) and the Southern (bottom) Hemisphere.

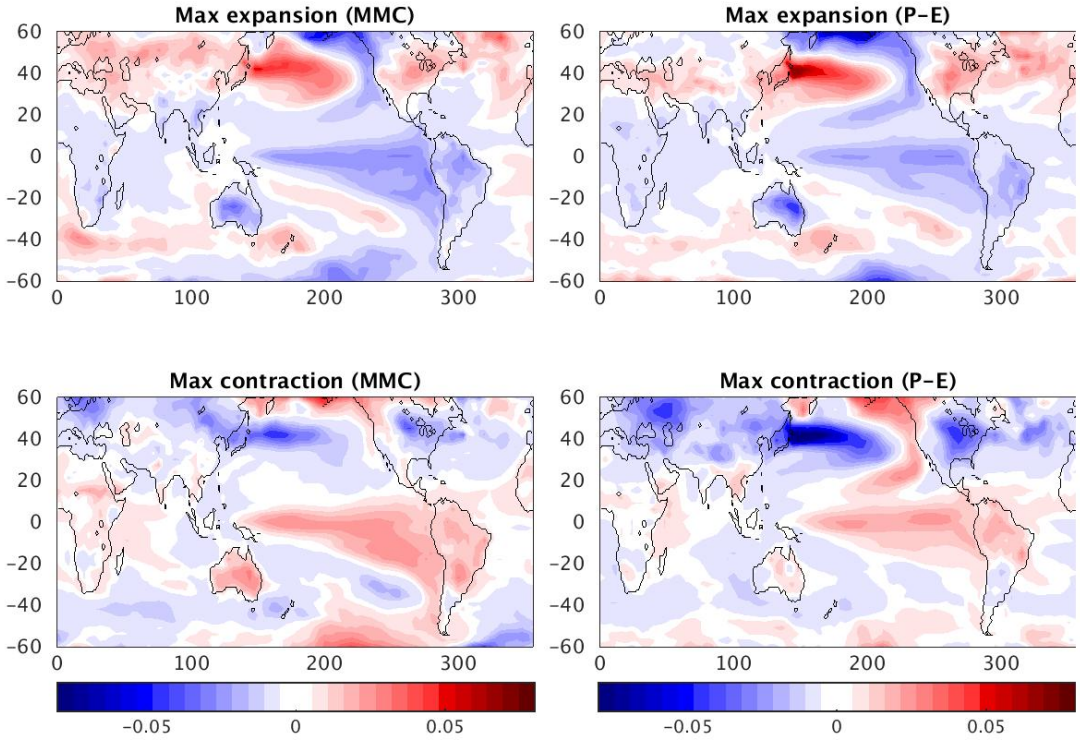

Figure S3. Ensemble mean (14 CMIP5 models) SST annual trend associated with the 20-year maximum expansion (left) and contraction (right) as given by MMC and P-E. Units are K year^{-1}.