California Niño/Nina

Chaoxia Yuan, Toshio Yamagata
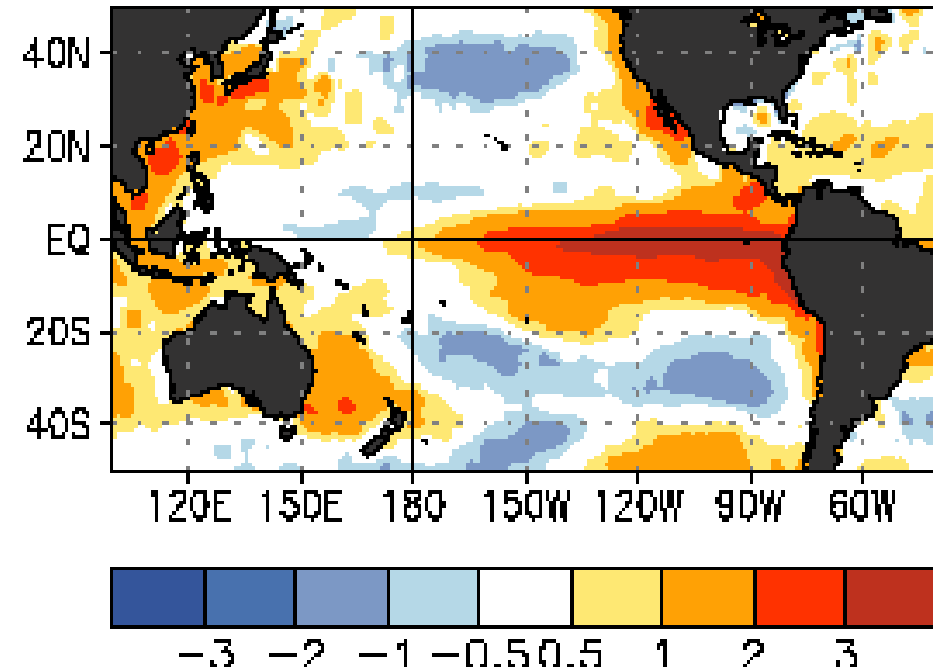
Presenter: Jing-Jia Luo (jingjia_luo@hotmail.com)

Institute for Climate and Application Research (ICAR), Nanjing Uni. of Information Science and Technology, Nanjing, China
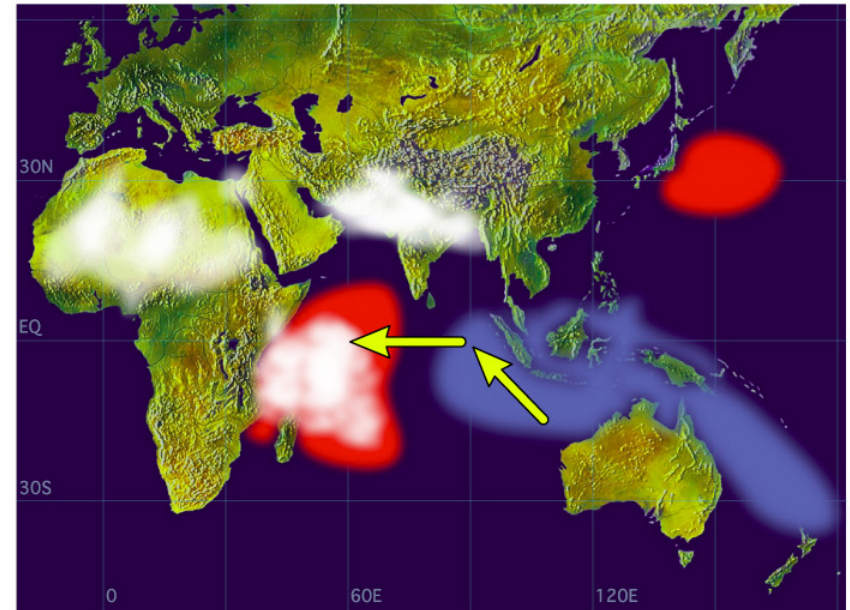
Tropical Large-scale Air-Sea Coupled Modes
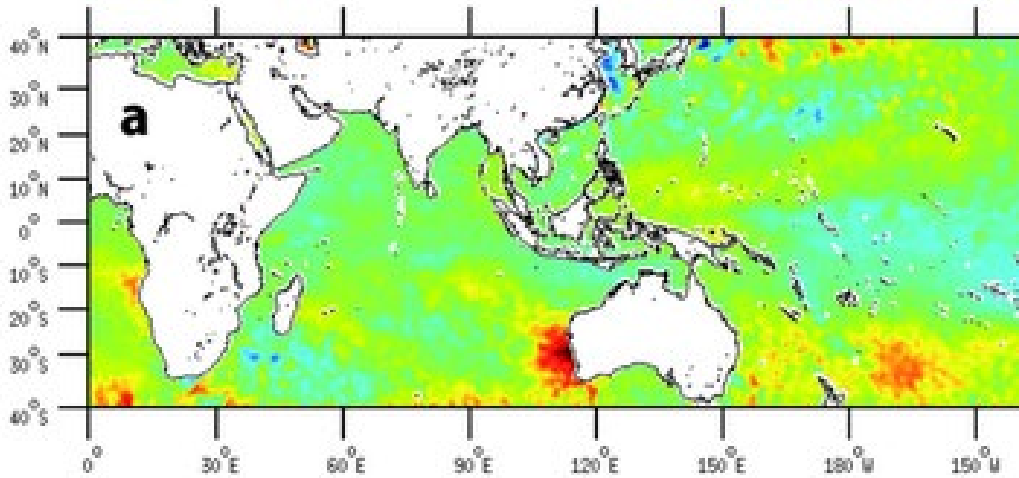
ENSO

IOD

Positive Dipole Mode

http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/ensocycle/ensocycle.shtml

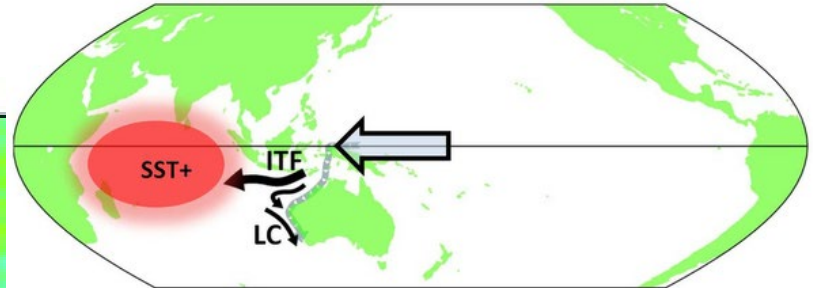http://www.jamstec.go.jp/aplinfo/sintexf/e/iod/about_iod.html
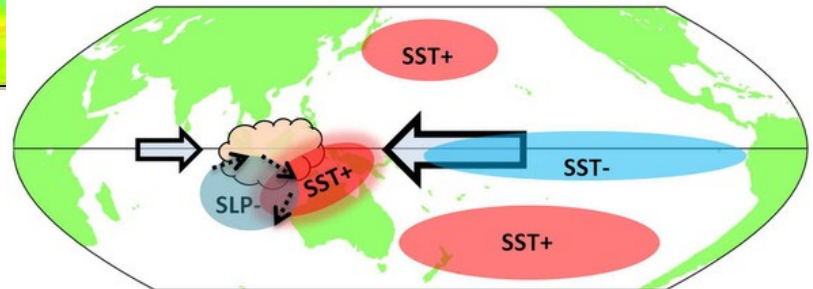
Ningaloo Niño
(Feng et al. 2013)

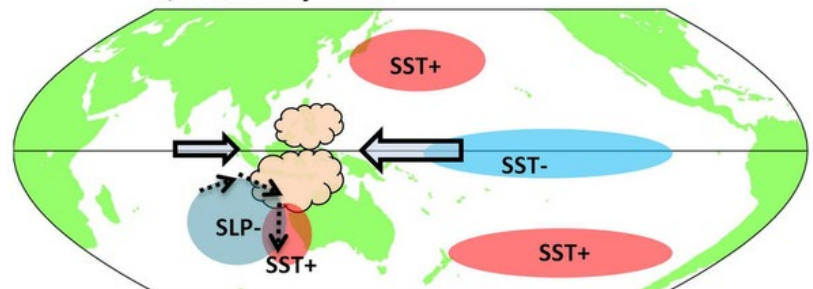SST anomalies during 21 Feb to 6 March 2011

Remote forcing related to La Niña

+

Local air-sea interaction

a, May 2010

b, December 2010

c, February 2011

Ningaloo Niño

(Kataoka et al. 2013)
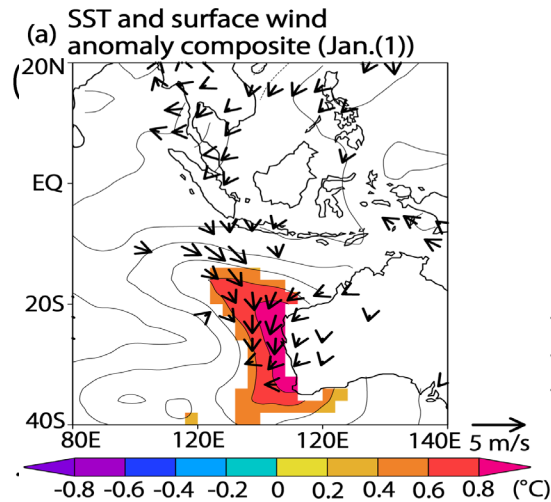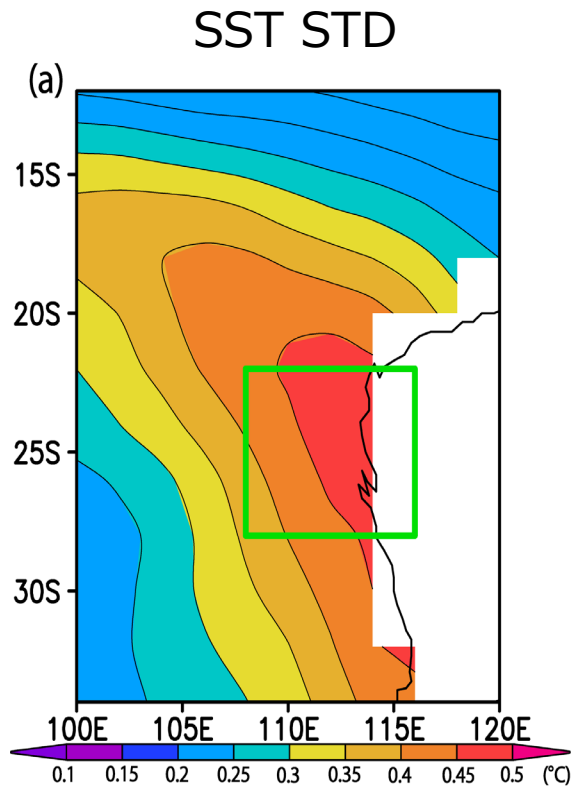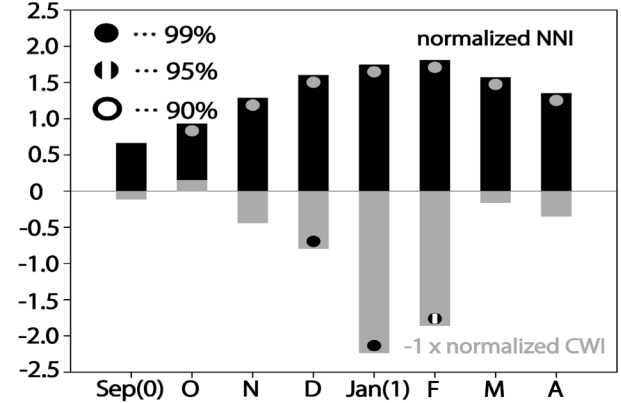
SST STD

Locally amplified Niño

Non-locally amplified Niño

Coastal Bjerknes Feedback

Along-shore surface wind (ASW)

SST ← Upwelling

ASW becomes weaker (stronger)

Upwelling becomes weaker (stronger)

SST becomes higher (lower)

SLP becomes lower (higher)

ASW is weaken (strengthen)

Positive feedback

http://oceanservice.noaa.gov/facts/upwelling.html
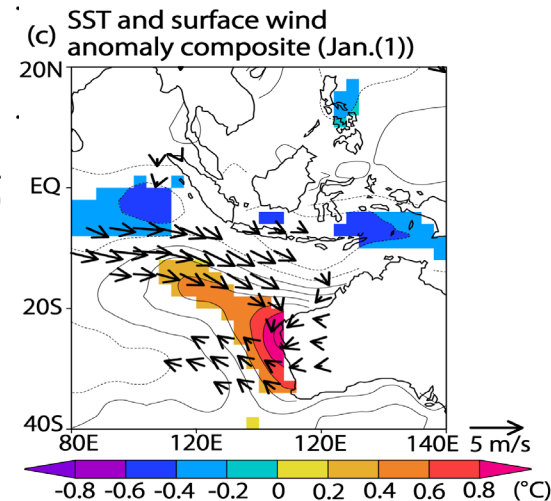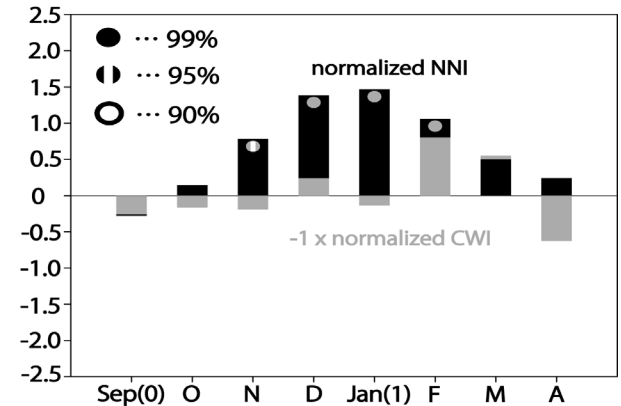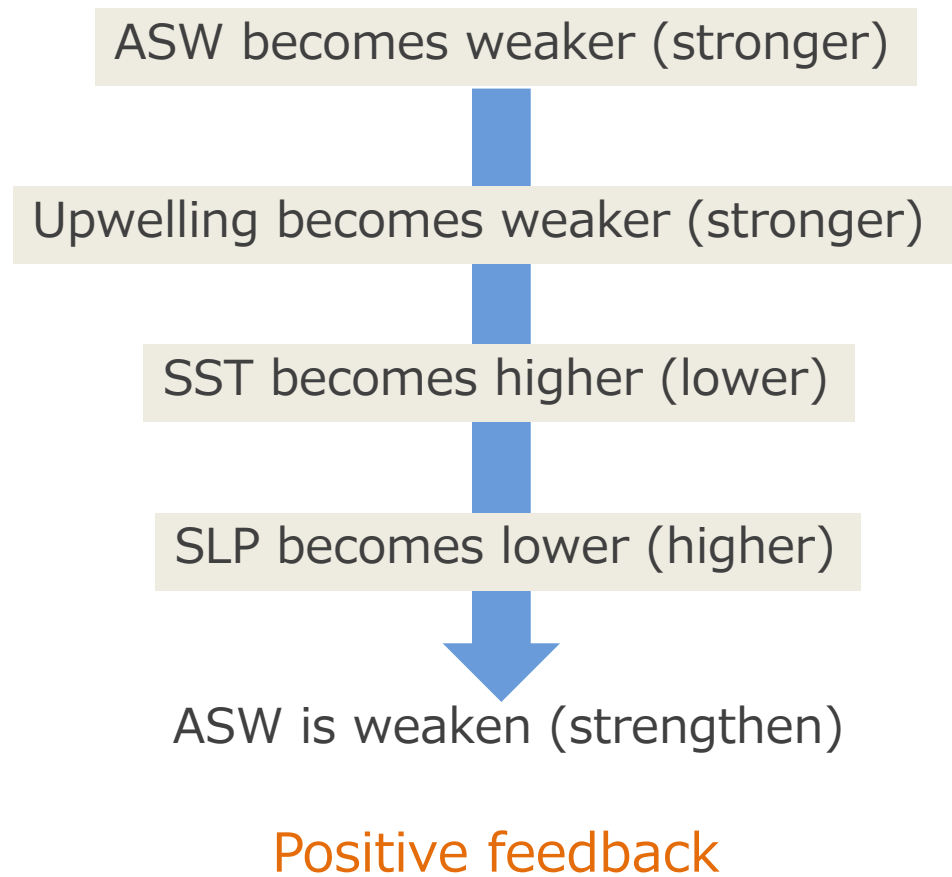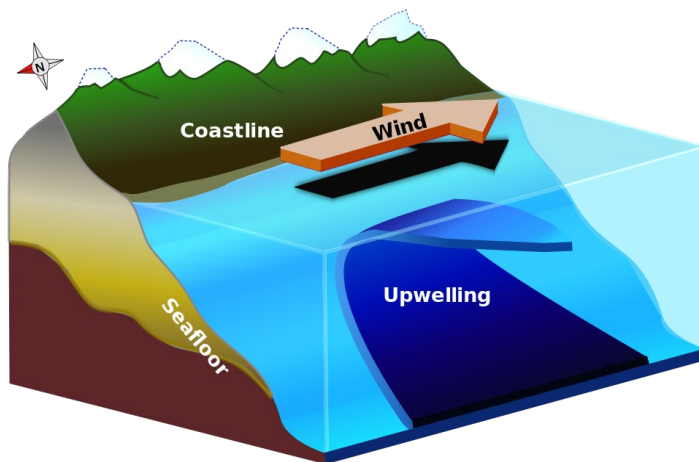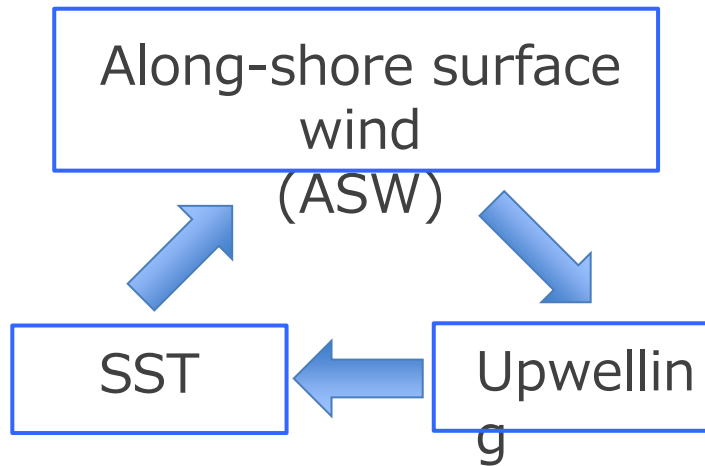
Standard Deviation of North Pacific SSTA (1982-2018)
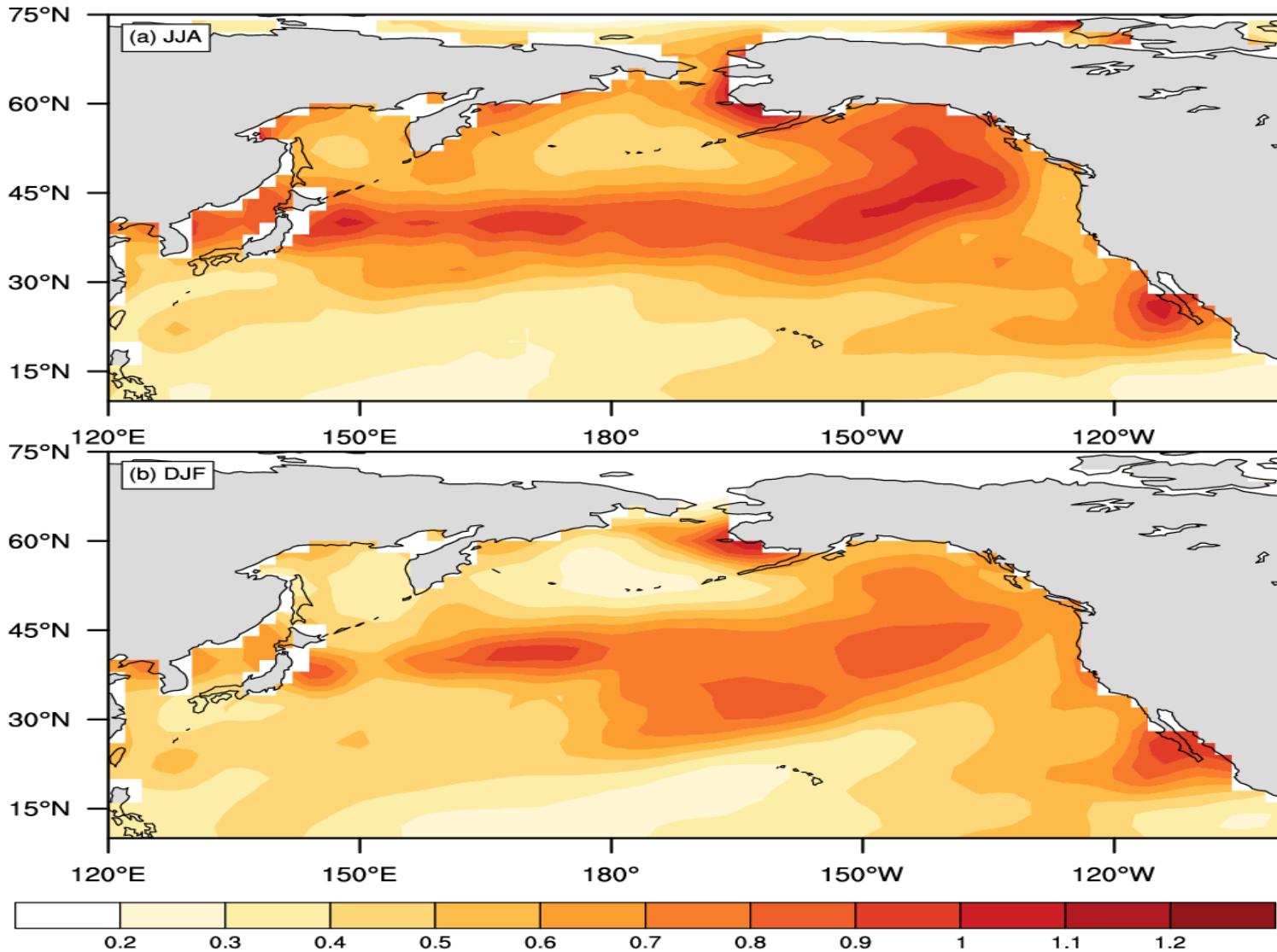
Normal State of the Coastal Ocean near California
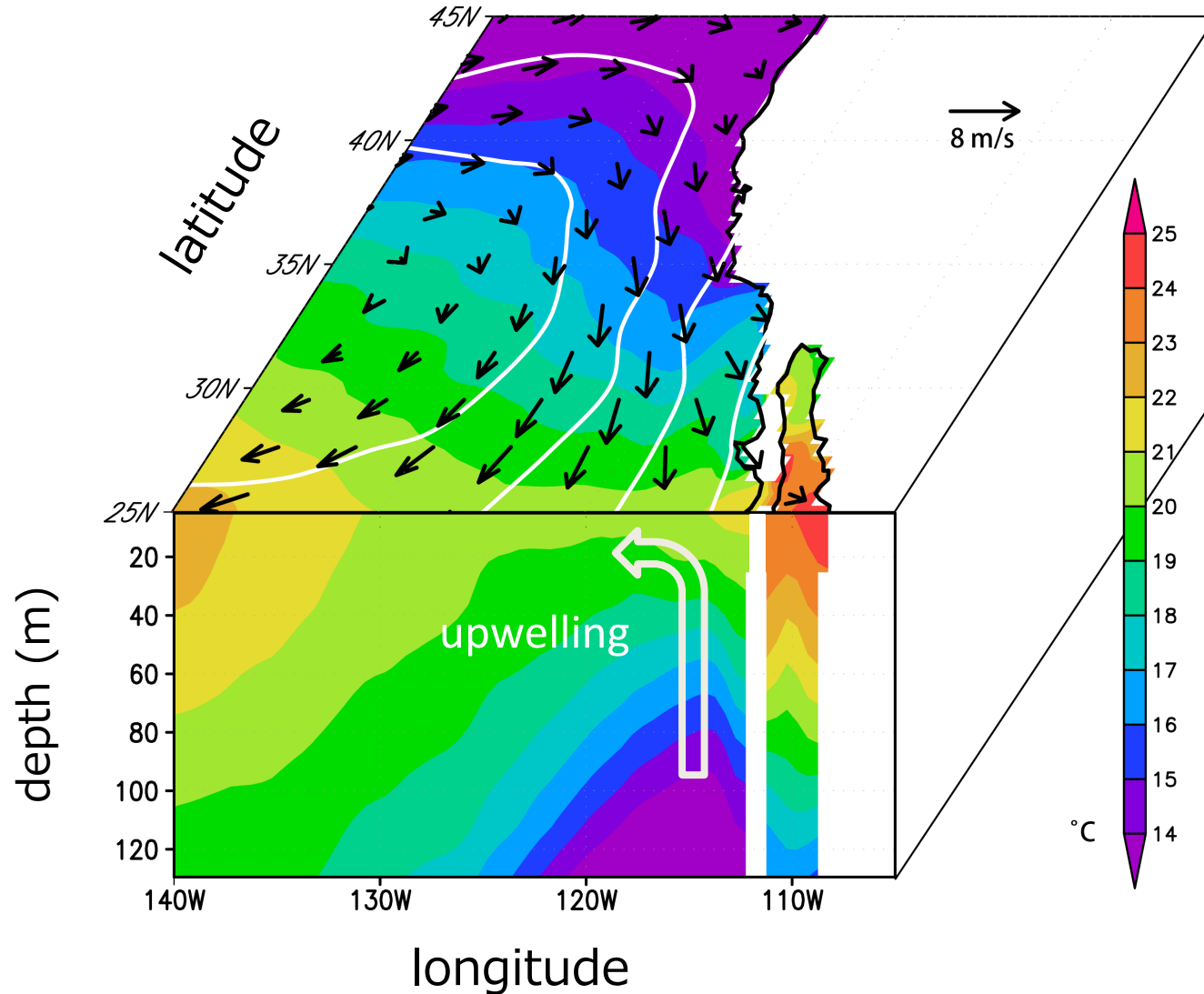
Interannual Variability of SSTs

Standard Variations
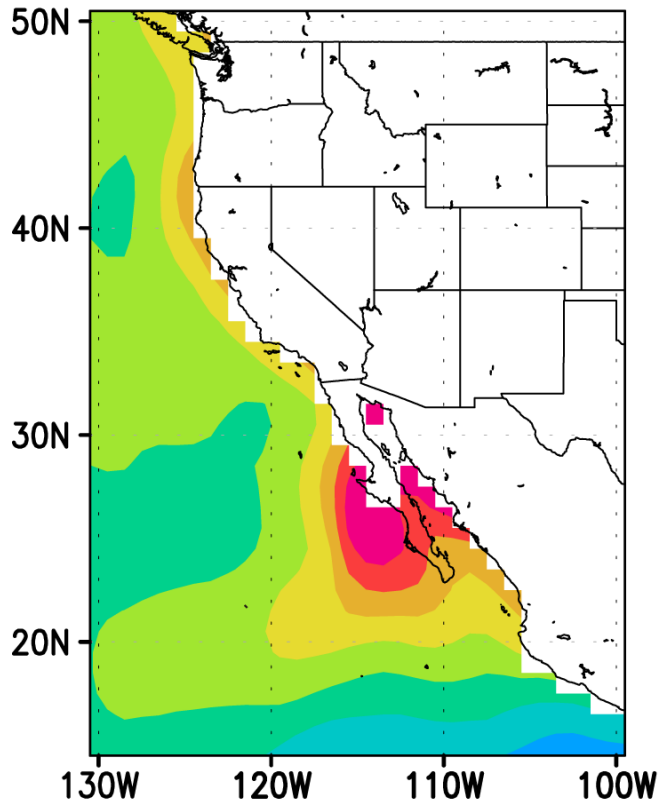
EOF Mode 1 (~47%)
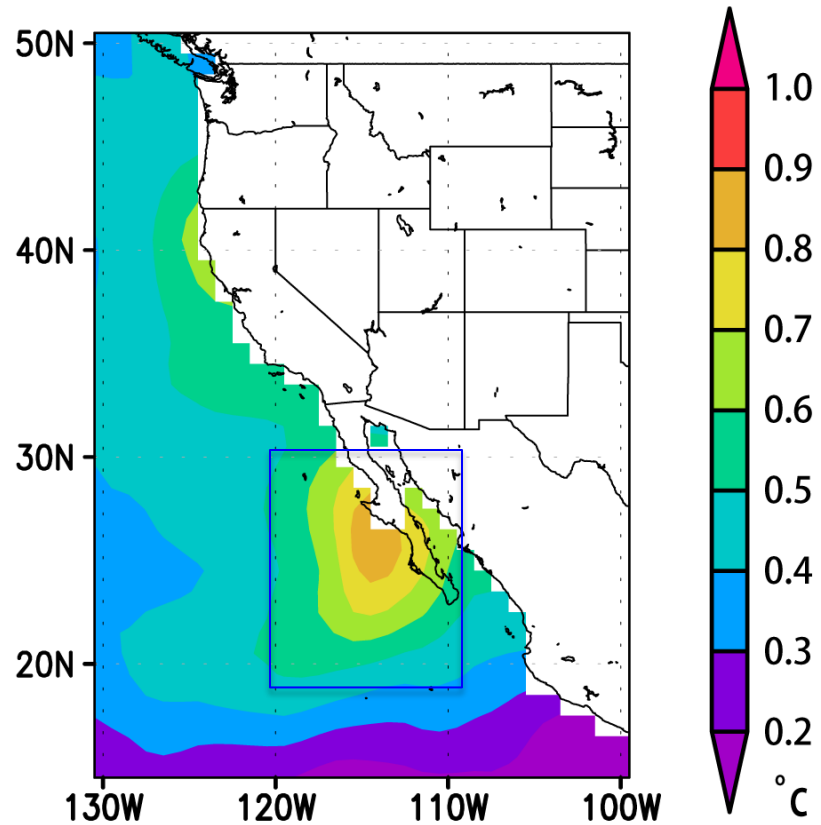
(OISST, 1982.1-2011.12)

Data

- OISST (1x1, 1982.1 ~ 2011.12)

- NCEP/NCAR reanalysis 1 (2.5x2.5, 1982.1 ~ 2011.12)

- GODAS reanalysis (1x0.3, 1982.1 ~ 2011.12;)

- OAFlux (1x1, 1983.7 ~ 2009.12)

- ISCCP (2.5x2.5, 1983.7 ~ 2009.12)

- GPCP (2.5x2.5, 1982.1 ~2011.12)

- SODA (0.5x0.5, 1981.1 ~ 2010.12)

- Pacific Fisheries Environmental Labor Indices (1982.1~2011.12)

Standard Positions of Upwelling Index Calculations
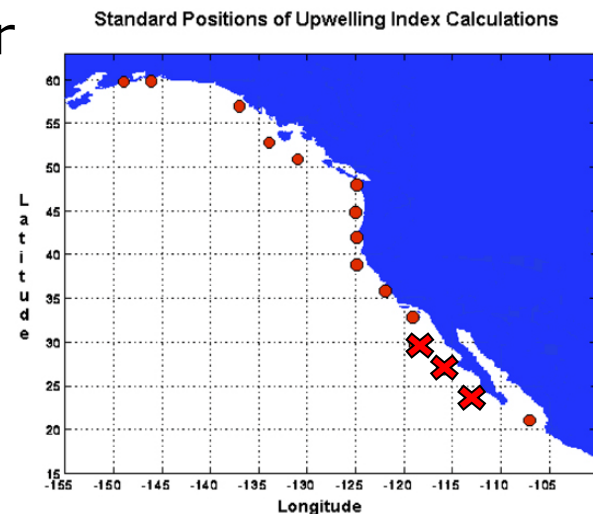
Seasonally-stratified standard deviation of CA Niño index

: CA Nino index

: without ENSO (CA - ENSO)
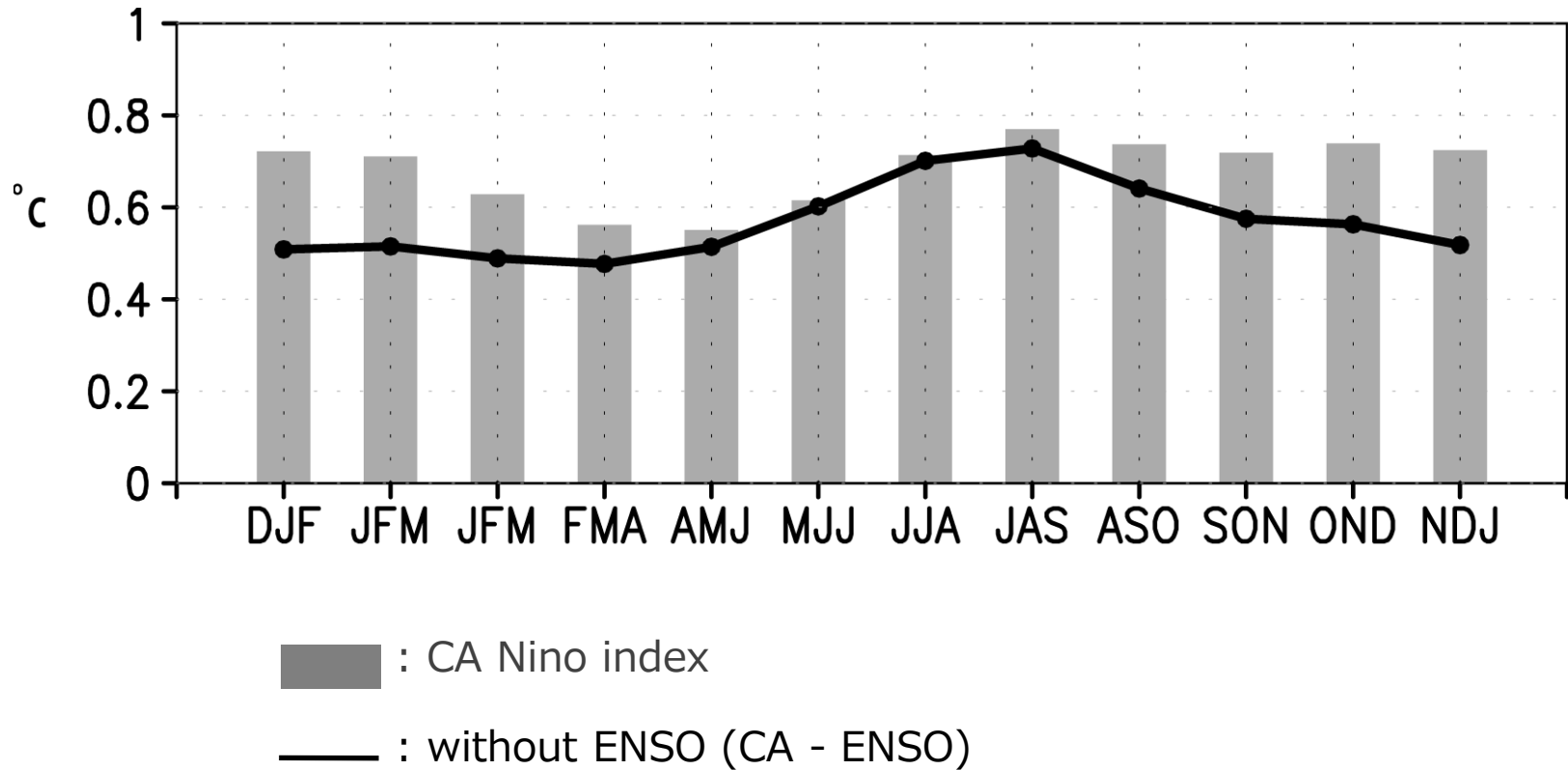
Lead-lag correlations with JAS CA Niño index

a) CA
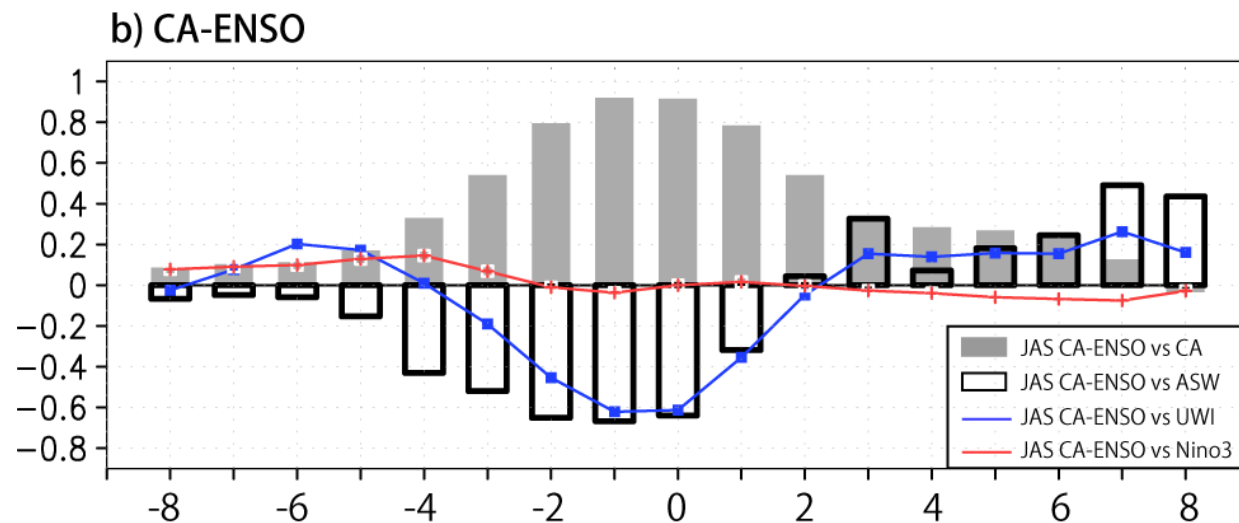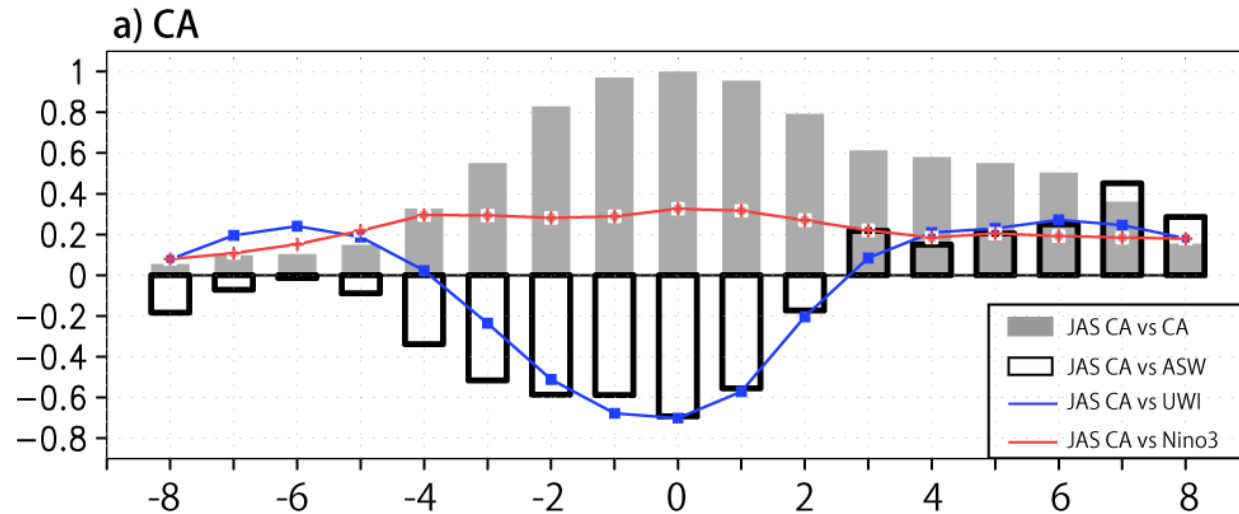
b) CA-ENSO

The coastal Bjerknes feedback plays the dominant role on generation of CA in boreal summer

Lead-lag correlations between JAS CA-ENSO and SST, SLP & W10m
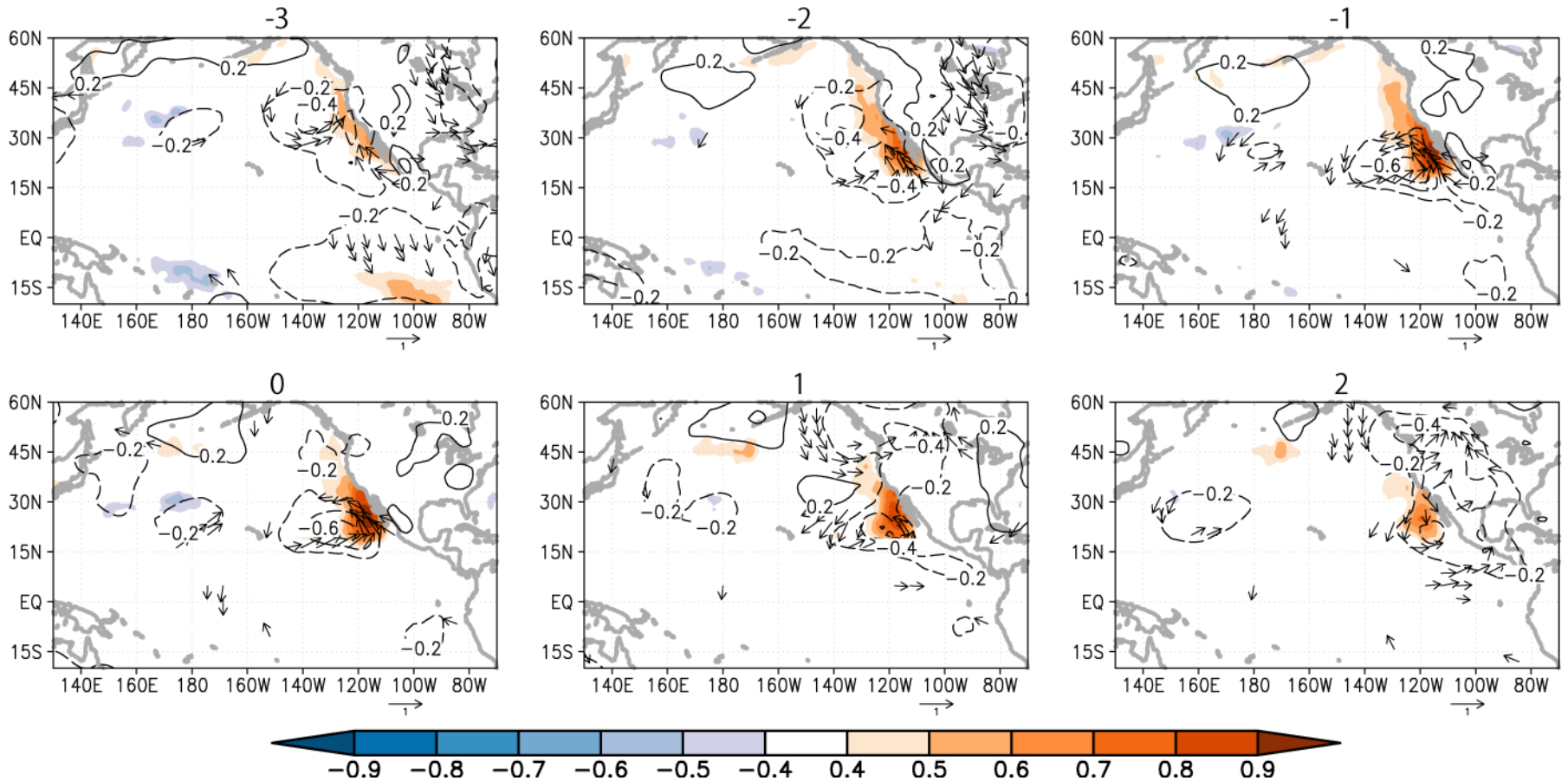
SST: shading at 95% significance level; SLP: contour; W10m: vector at 95% significance level

Lead-lag correlations between JAS CA-ENSO and Z & T at 25N
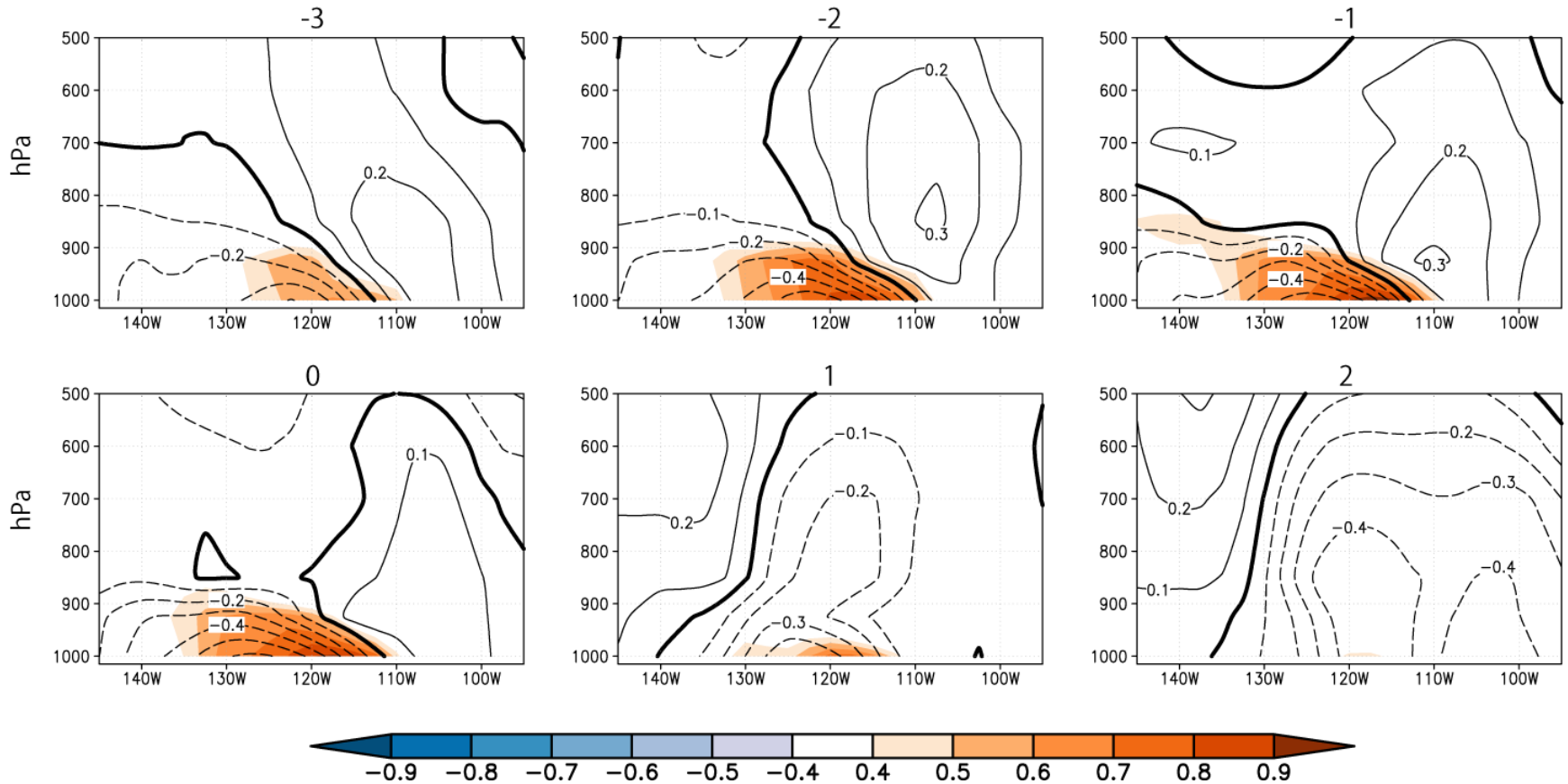
T: shading at 95% significance level; Z: contour

Lead-lag correlations between JAS CA-ENSO and net surface & latent heat fluxes
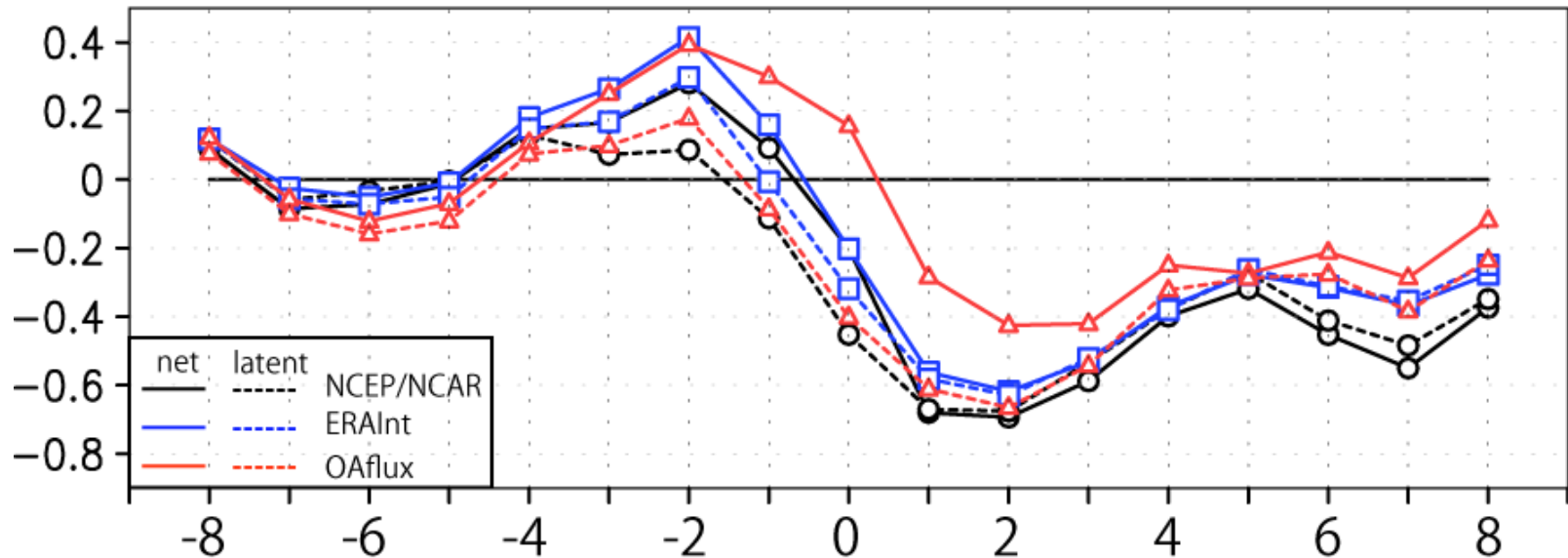
The net surface thermal forcing may play the secondary role on generation of CA in boreal summer

Mixed-layer Heat Budget Analysis

$$\frac{\partial T_m}{\partial t} = \frac{Q_{net} - q_d}{\rho c_p H} + res$$

California Niño
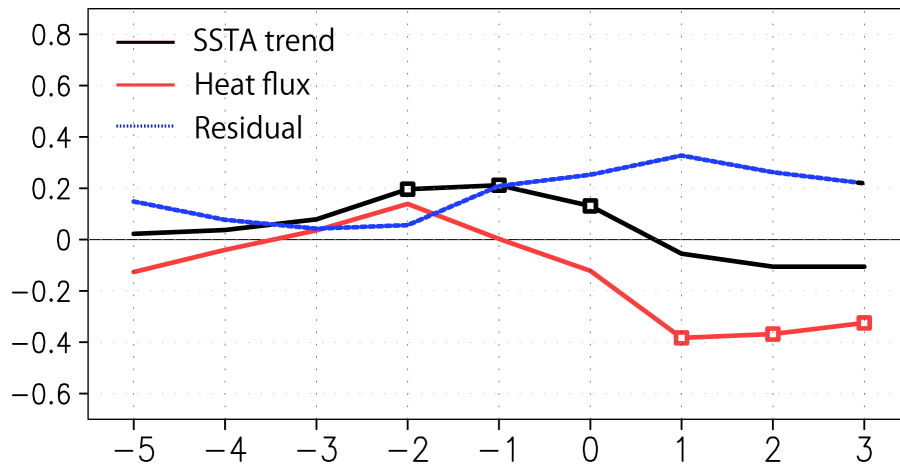
California Niña
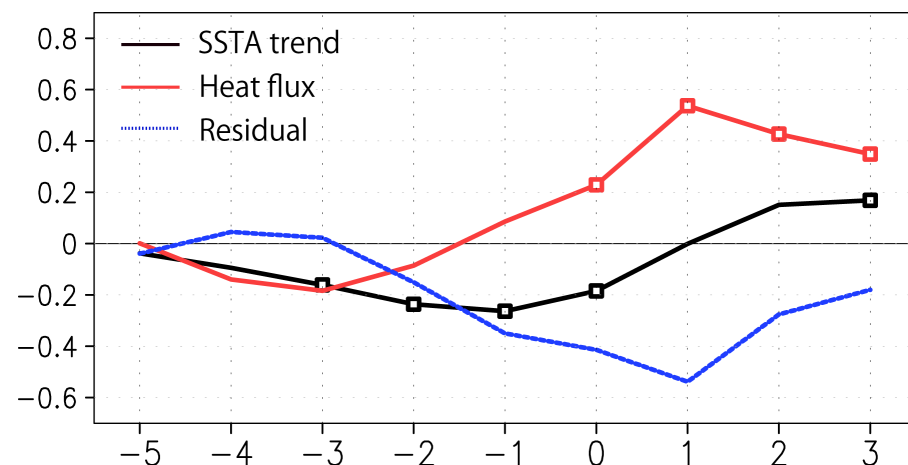
Lead-lag regression of SSH and 5m currents based on JAS CA-ENSO
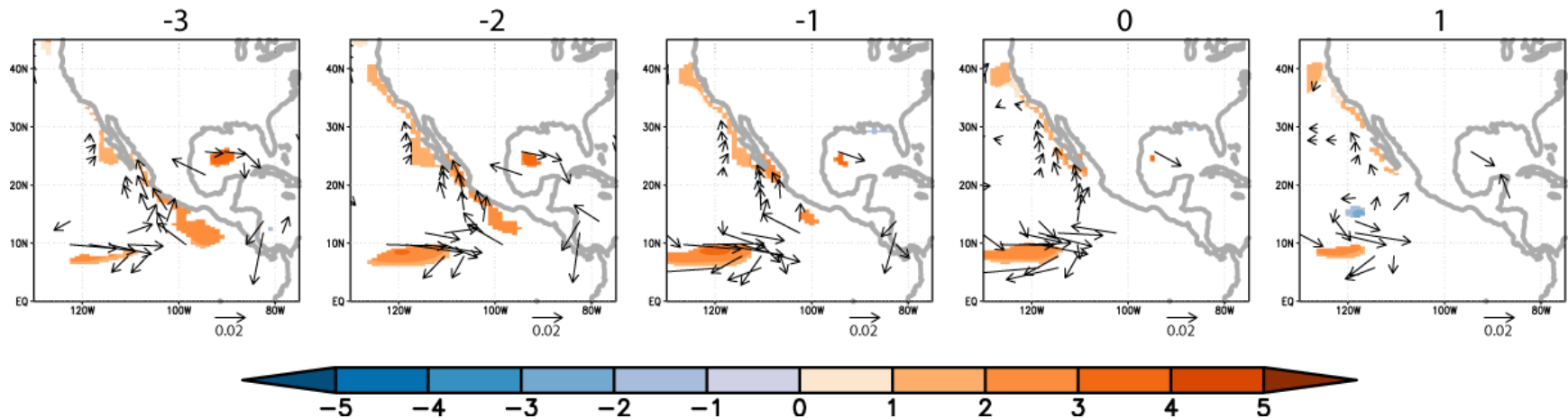
SSH: shading, mm; current: vector, m s^{-1}; both at 95% significance level contour

Horizontal advection anomalies may also contribute to CA in boreal summer

Regression of summer (JJA) precipitation and surface temperature on CA Niño index

(mm)

contour: ˚C
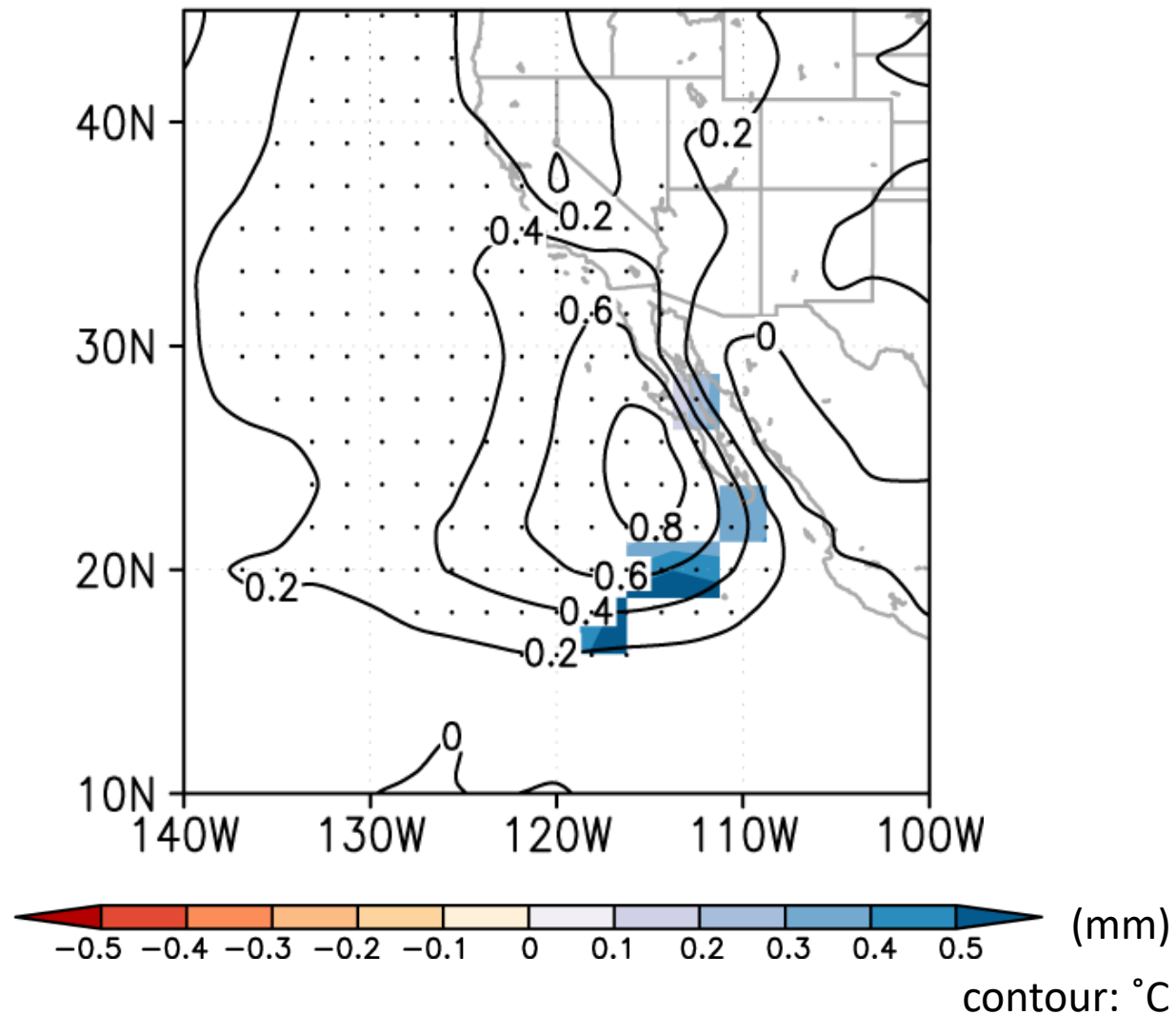
California Niño SSTA prediction (SINTEX-F, 9-member, 1982-2018)
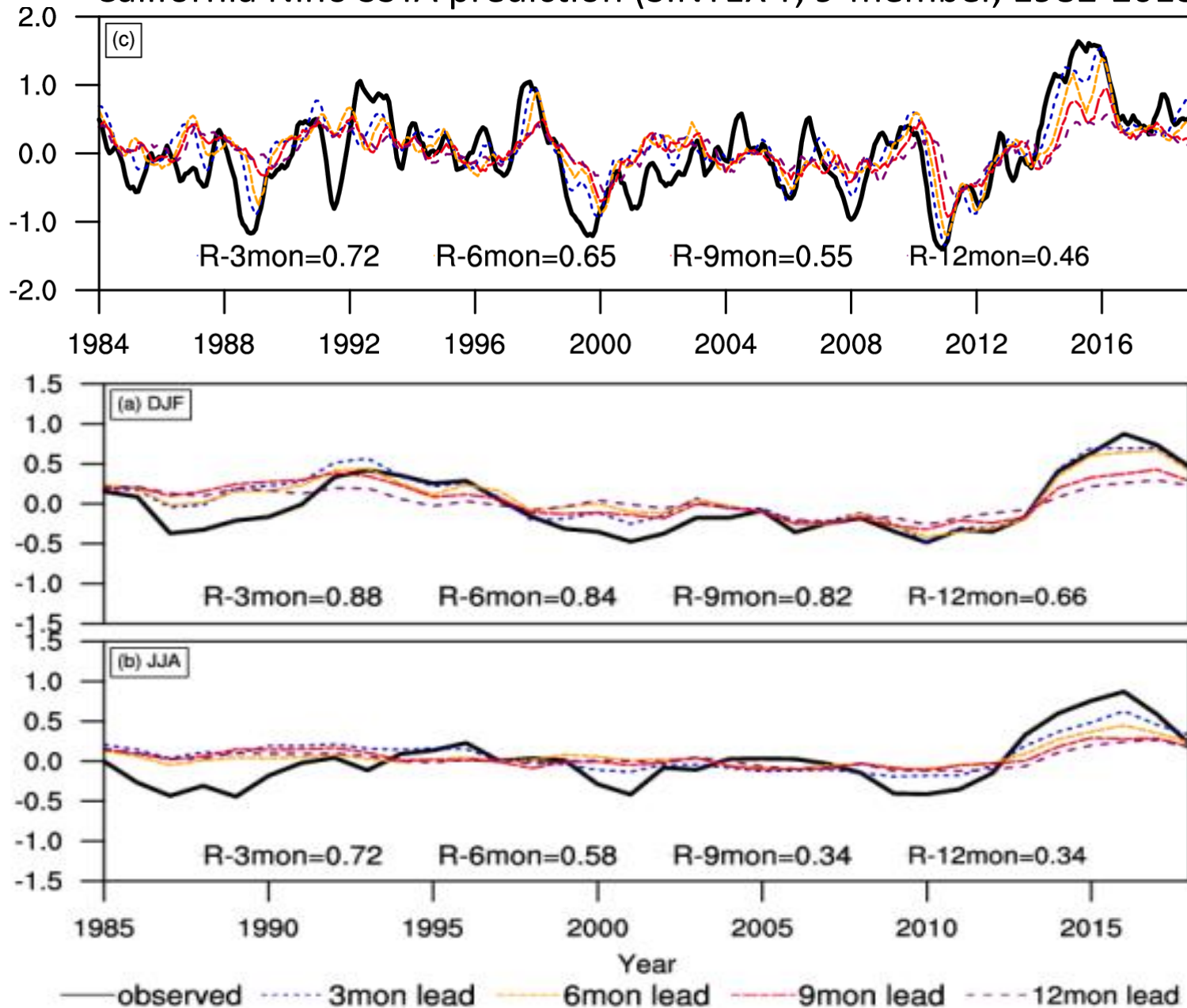
ACC prediction skill
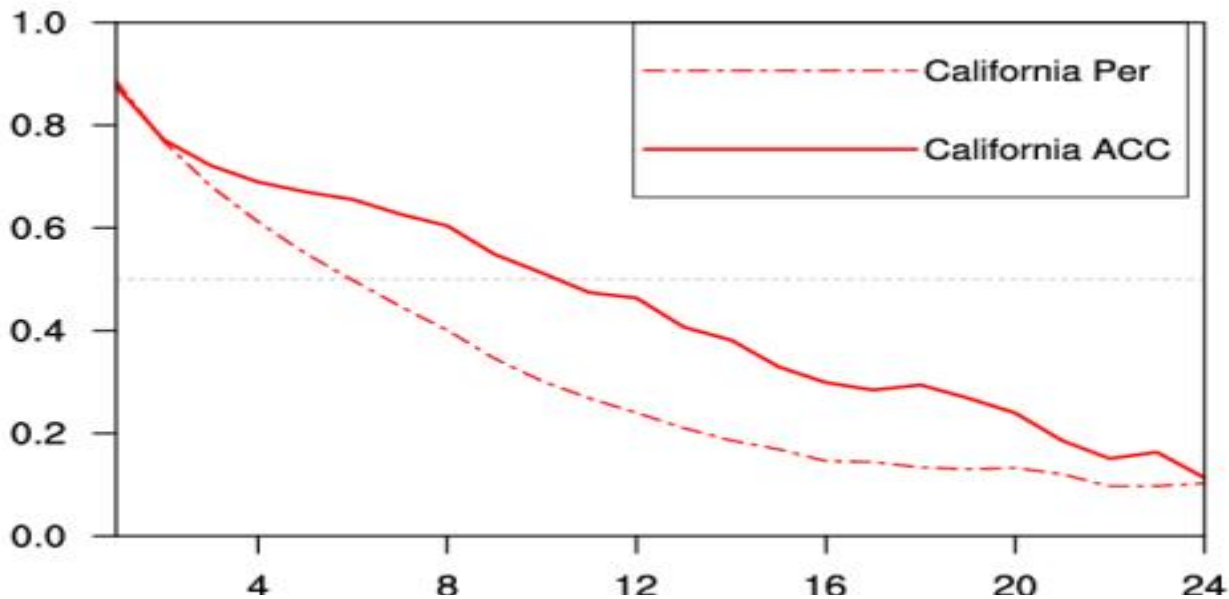
All months
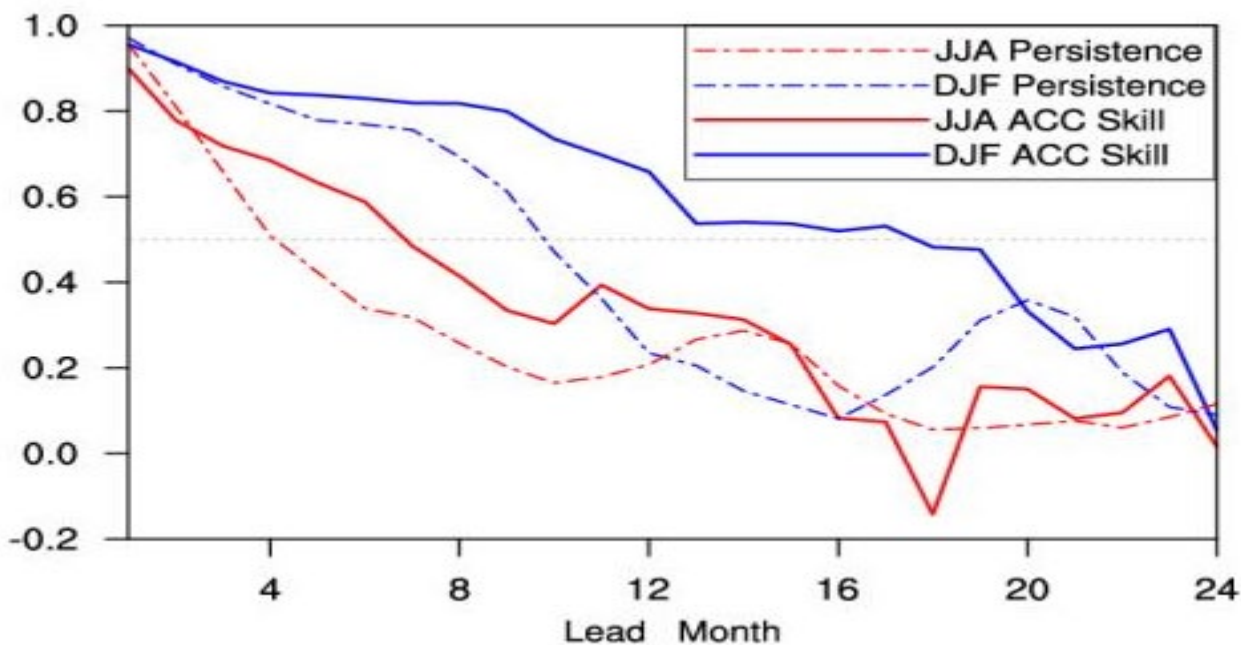
Concluding Remarks

- CA Niño is an intrinsic coupled mode and generated mainly by the coastal Bjerknes feedback in boreal summer.

- CA Niño can be independent to ENSO and has significant impacts on SST, the surface air temperature in the coastal continent and the summer precipitations in Baja California.

- Successful prediction of CA Niño may benefit marine industrial management and associated economic activities

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Tenure and Post-Doc positions at ICAR, Nanjing

Institute for Climate and Application Research (ICAR) at Nanjing University of Information Science and Technology (NUIST) was recently established and now opens positions for climate dynamics, modelling, prediction, and application. Nanjing is one of the most developed cities in China, and has attracted more and more international residents.

Climate Dynamics

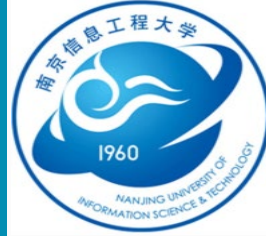Conduct researches on the physical causes of climate change related to natural variability or human influences, the causes of Asian climate anomalies, and the impact of ocean-atmosphere-land-ice interaction on the climate system.

Climate Modelling

Improve and upgrade climate model, including air-sea-land-ice multi-layer coupling physical model and ecological chemistry model, regional model and quasi-uniform grids model, according to the research objects, purposes and needs of national development.

Climate Prediction

Develop data assimilation technology, dynamical downscaling scheme and statistical-artificial intelligence forecasting techniques for the ICAR climate model. Establish a multi-method integrated climate prediction system; Conduct sub-seasonal, seasonal, interannual and interdecadal seamless climate prediction experiments.

Climate Application

Apply the climate research and forecasting results (including climate disaster prediction and warning information) to government, social and industrial services，realize the economic transformation of the scientific and technological achievements.

ICAR/NUIST will offer attractive package to selected candidates.

For job application, please contact **icar@nuist.edu.cn.**

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