

Team Joint Report

May 15 (Thu) 2025

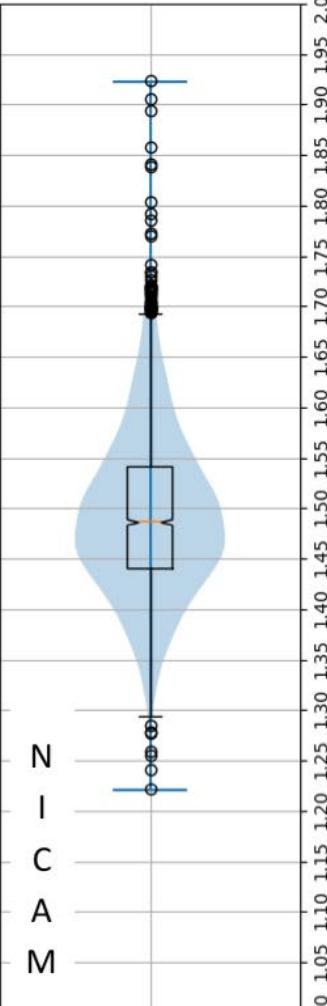
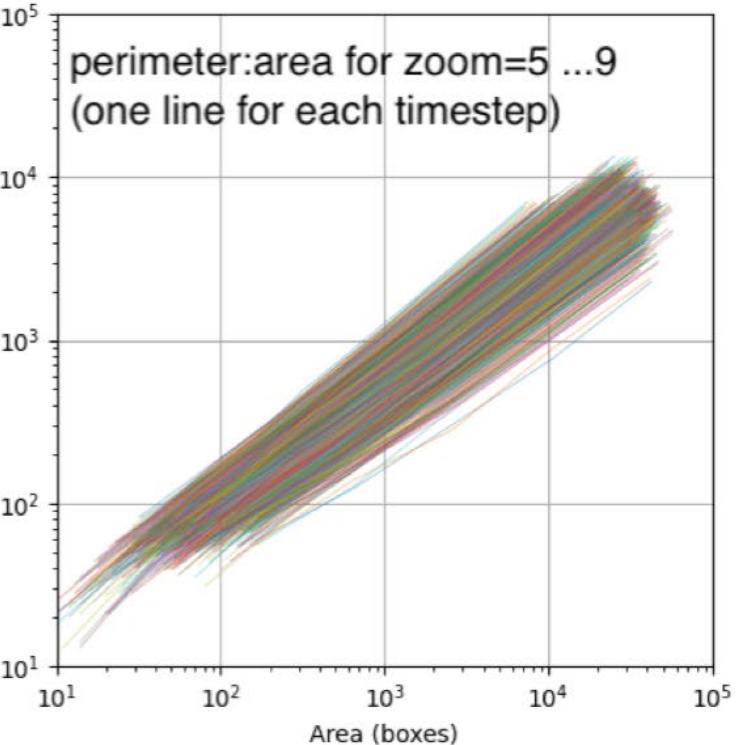
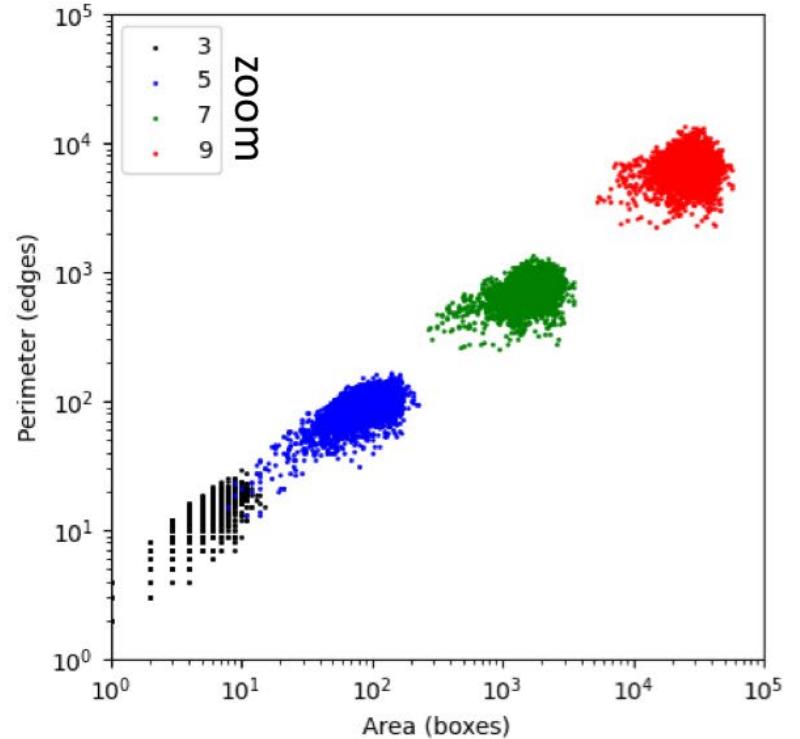
Masaki Satoh, Tomoki Ohno, Chihiro Kodama, Shao-Yi Lee,
Kohei Yamasaki, Chao-An Chen, Kosei Ohara, Masahiro
Watanabe, Ray KUO, Shao-Yu Tseng, Yu-Hsuan Fan, Pin-
Yu Chao, Hisashi YASHIRO, Shuhei Matsugishi, Chie
Yokoyama, Takahashi Kotaro, Aihisa KAMIJO

Name: a short title

A brief description

here is a template

Cloud fractal dimension in NICAM

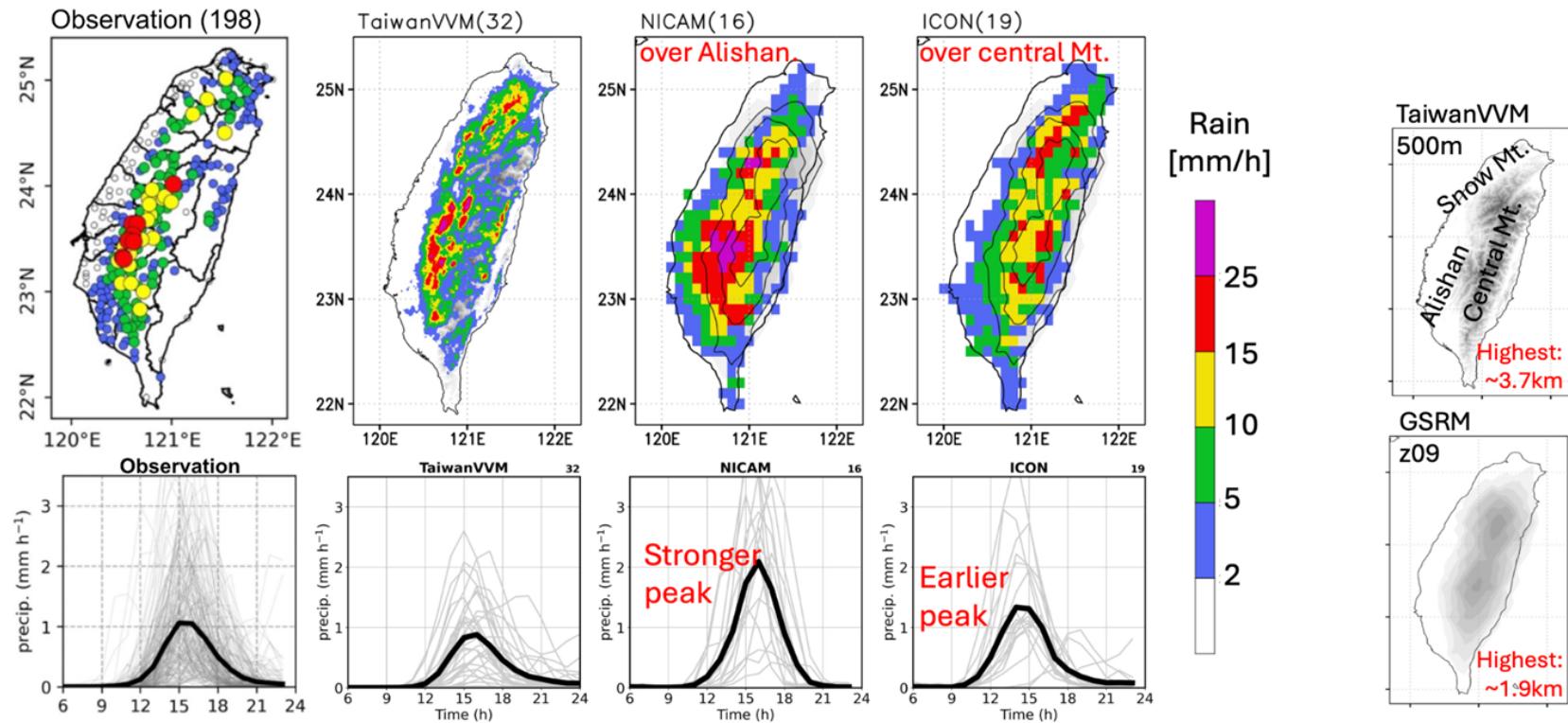


Found dimension D of approximately 1.49
over (120-150E, 20-50N)

Evaluation of the Orographically Locked Diurnal Convection over Taiwan during Summer in GSRMs.

Shao-Yu Tseng (National Taiwan University)

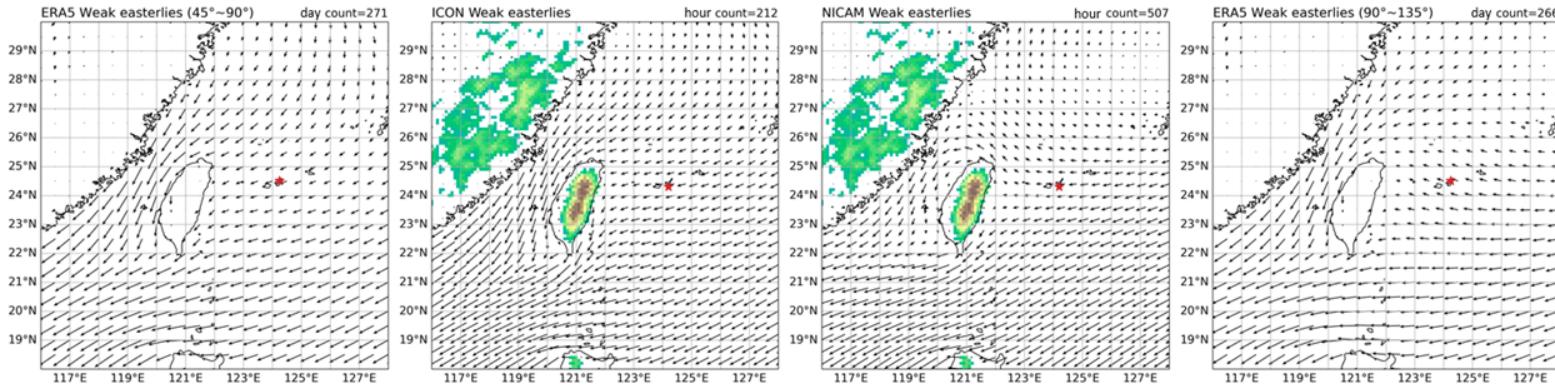
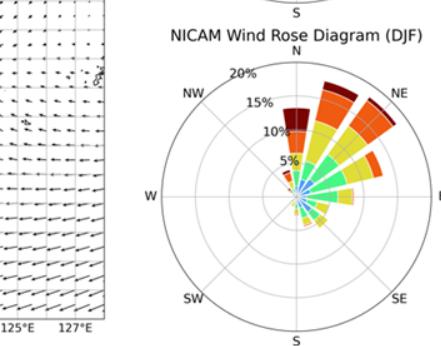
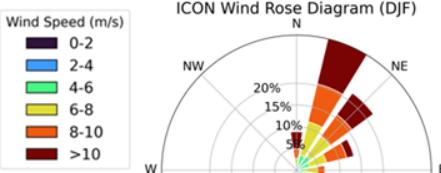
The NICAM simulation shows similar rainfall hotspots to the observations but with excessively strong intensity. In the ICON simulation, the hotspots are located over the Central Mt. and Snow Mt. ranges, with similar intensity but an earlier peak.



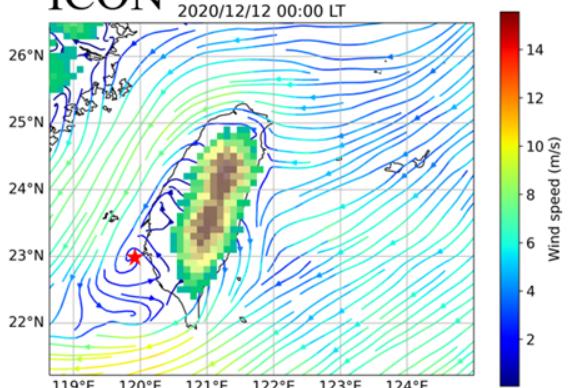
Interaction of Weak Easterlies with Taiwan's Topography and Lee Vortex Formation in winter

Yu-Hsuan Fan (National Taiwan University)

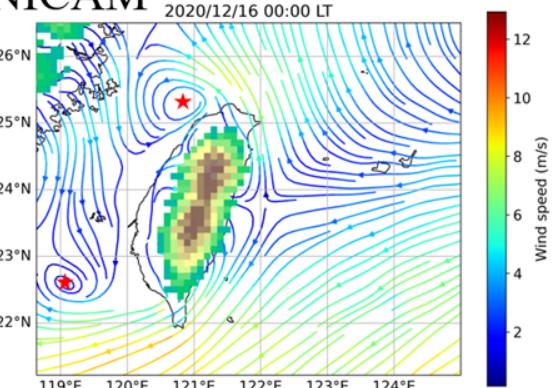
- NICAM simulates wind fields similar to the ERA5 composite for weak easterlies (90° to 135°), and snapshots show a two-lee-vortex structure comparable to the results from TaiwanVVM.
- ICON simulates stronger winds, with a lee vortex forming near southwestern Taiwan.



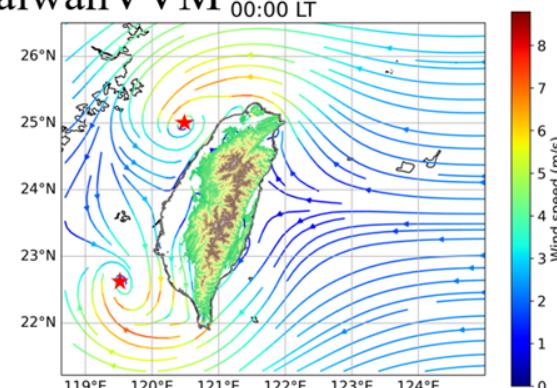
ICON



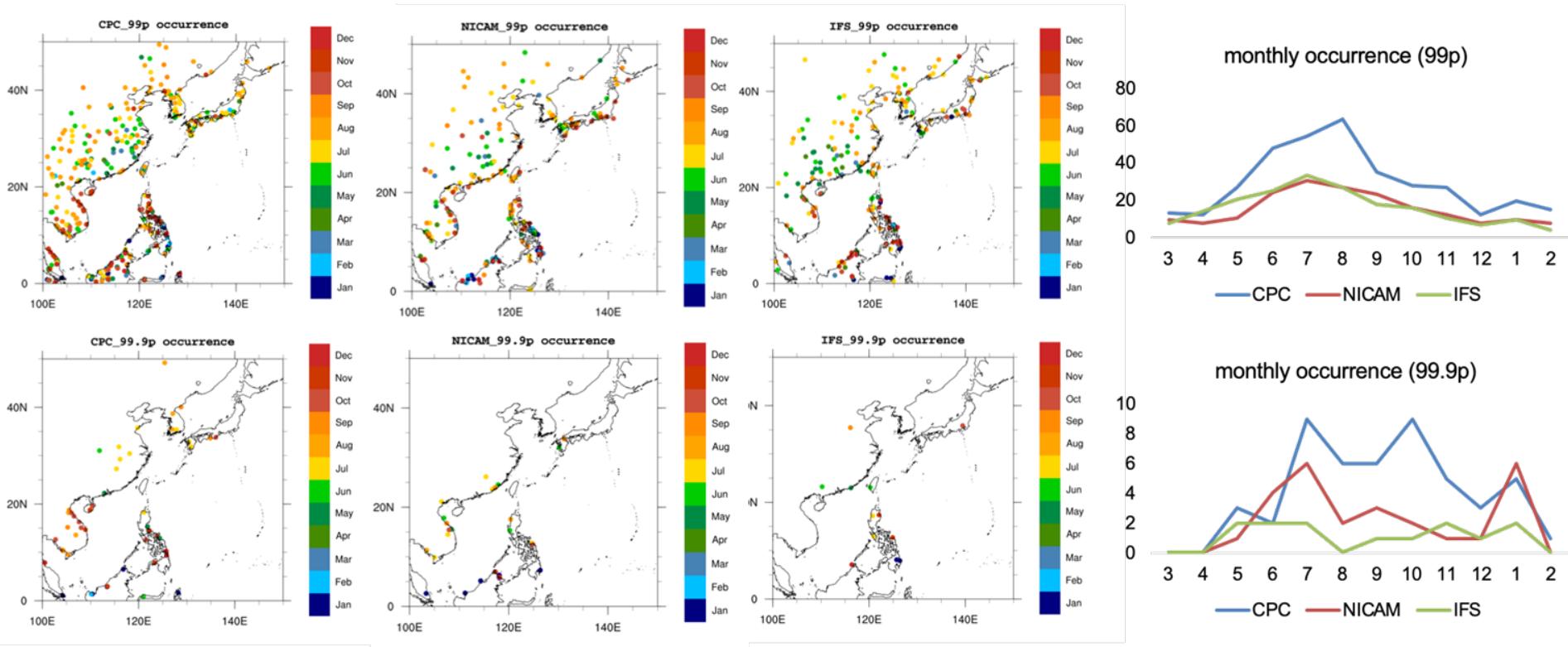
NICAM



TaiwanVVM



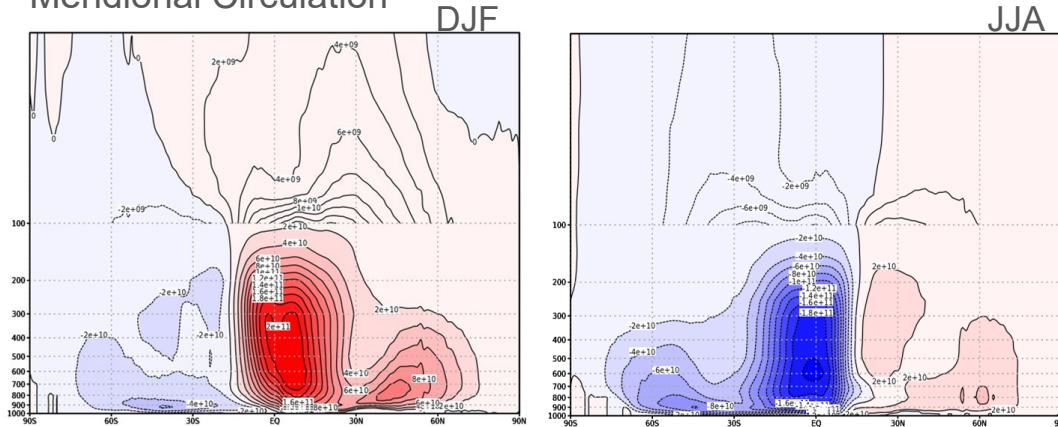
Pin-Yu Chao: Occurrence of Extreme Precipitation Event in WNP



NICAM demonstrates closer alignment with observations in both the number and location of the most extreme precipitation events (events under 99.9p threshold) over the WNP region.

Kosei OHARA: Meridional Circulation and Energy Cycle

Meridional Circulation

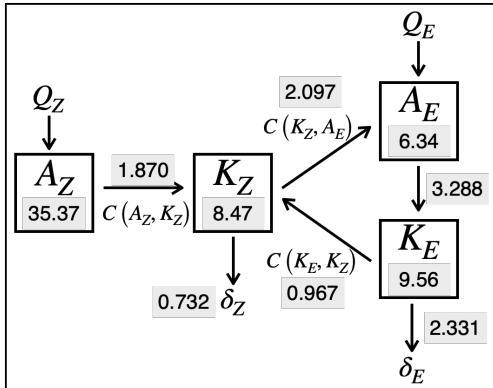


mass streamfunction of meridional circulation based on isentropic analysis

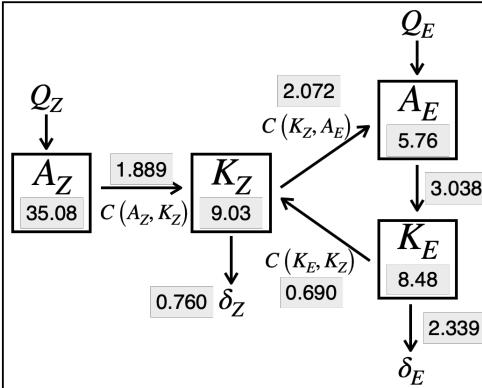
Hadley circulation and Extratropical Direct (ETD) circulation are clearly shown in the winter hemisphere

Energy Cycle

NICAM DJF



NICAM JJA



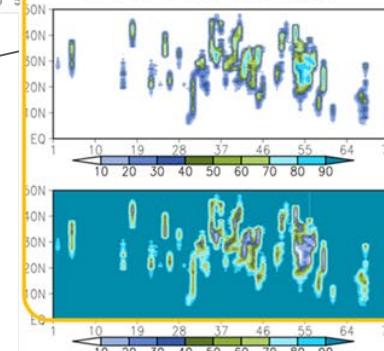
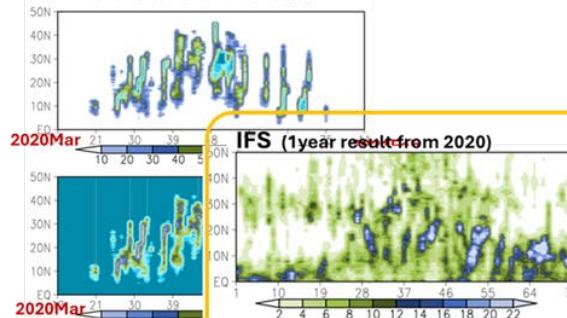
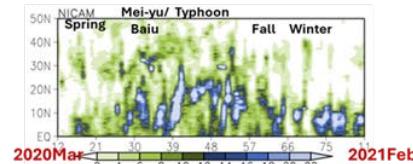
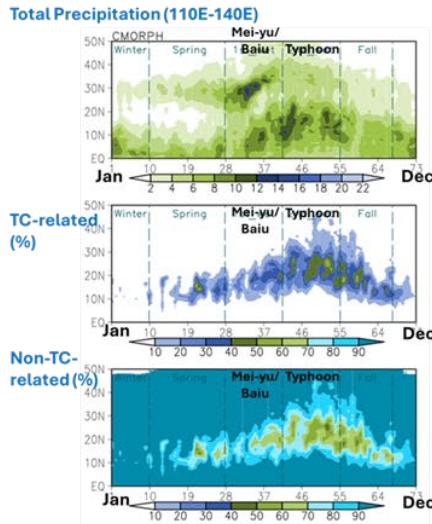
Energy ... 10^5 J/m^2
the others ... W/m^2

$A_e \rightarrow K_e$ conversion rate is larger than in JRA-3Q
... more intense ageostrophic wind

Difference of A_z between two seasons is very small compared to JRA-3Q

more statistical analysis is needed,
but this appears to be unrealistic

Seasonal Precipitation of the East Asian Monsoon Related to Tropical Cyclones

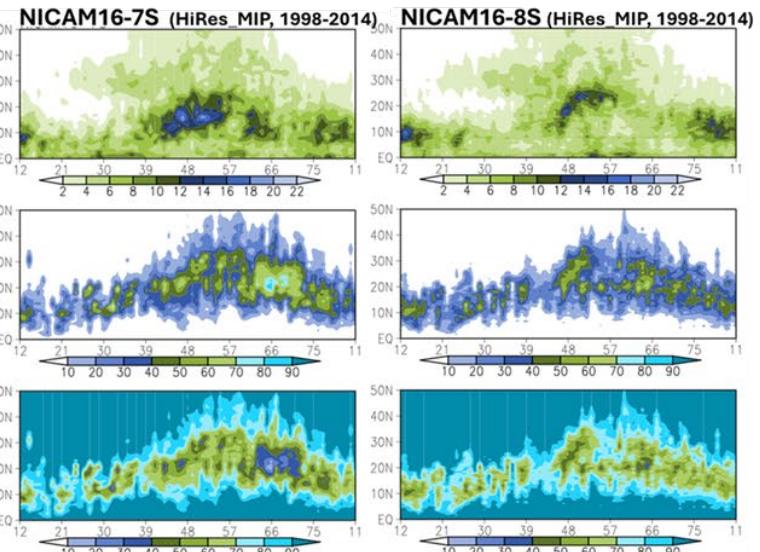


Single-year results:

Models tend to perform too much precipitation in total precipitation, as well as the proportion of precipitation contributed by TC.

Multi-year climatology in NICAM16-7S and NICAM16-8S :

Although models perform higher amount in total precipitation, the proportion of precipitation types is comparable to observations.



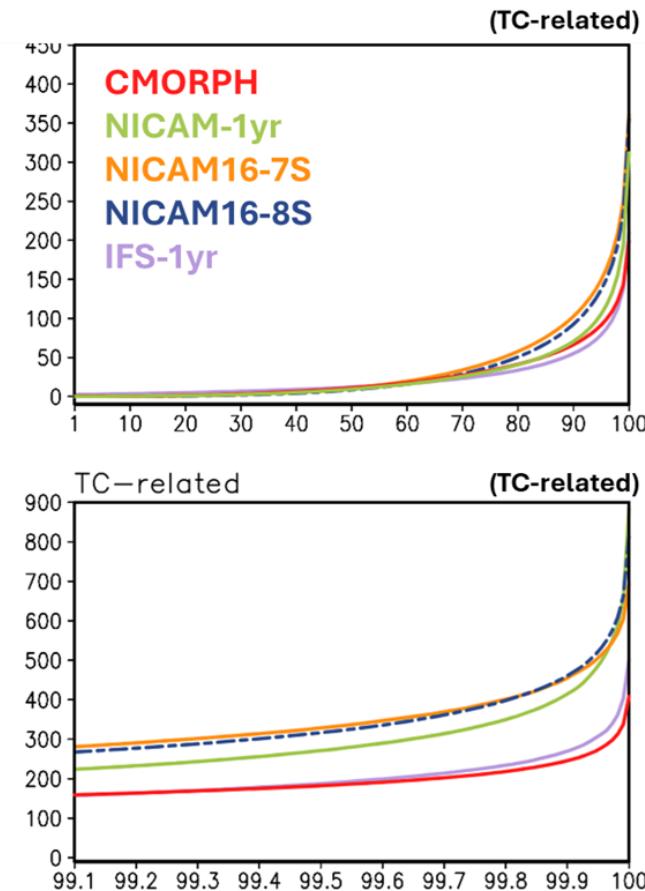
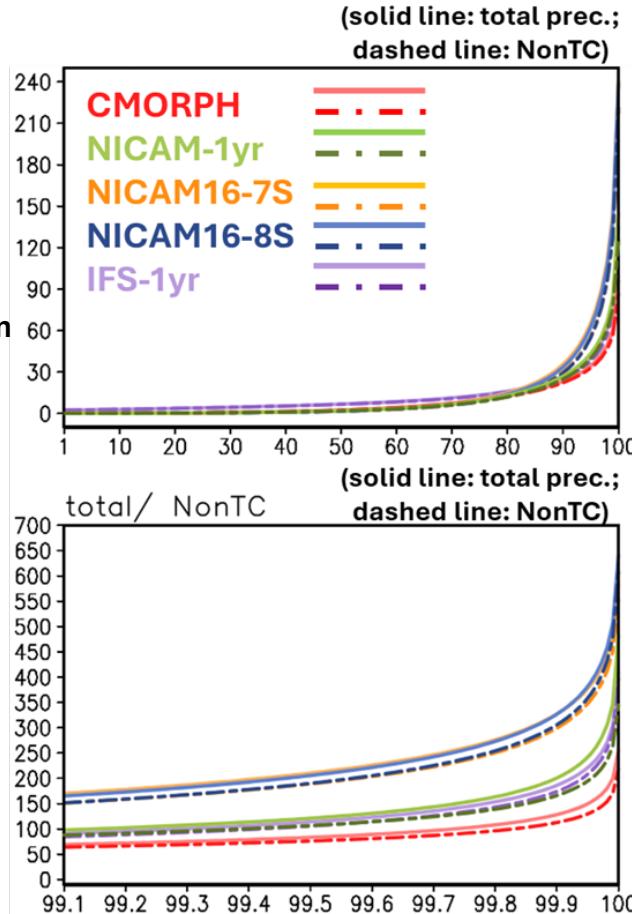
Extreme Precipitation of the East Asian Monsoon Related to Tropical Cyclones

1-100
percentile

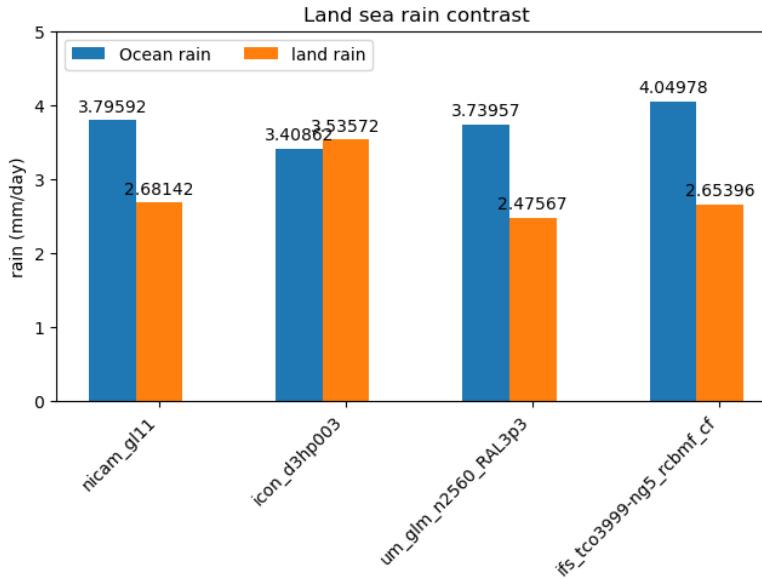
Evaluation of Extreme precipitation from the percentile perspective:
NICAM matches observations in moderate heavy rainfall distribution.

Extreme precipitation

For the most extreme precipitation, most models tends to overestimate the intensity.



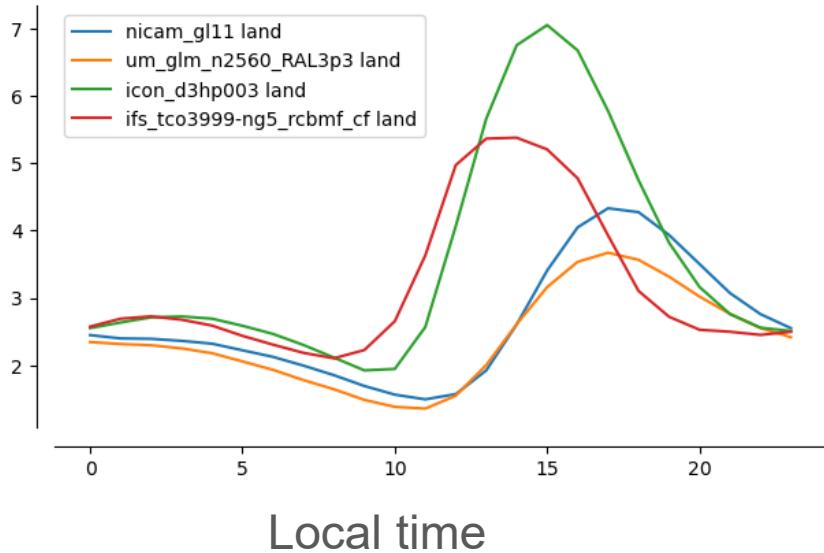
Land/Sea contrast, Diurnal cycle of Precipitation



Tropical ($\pm 30\text{deg}$) precipitation

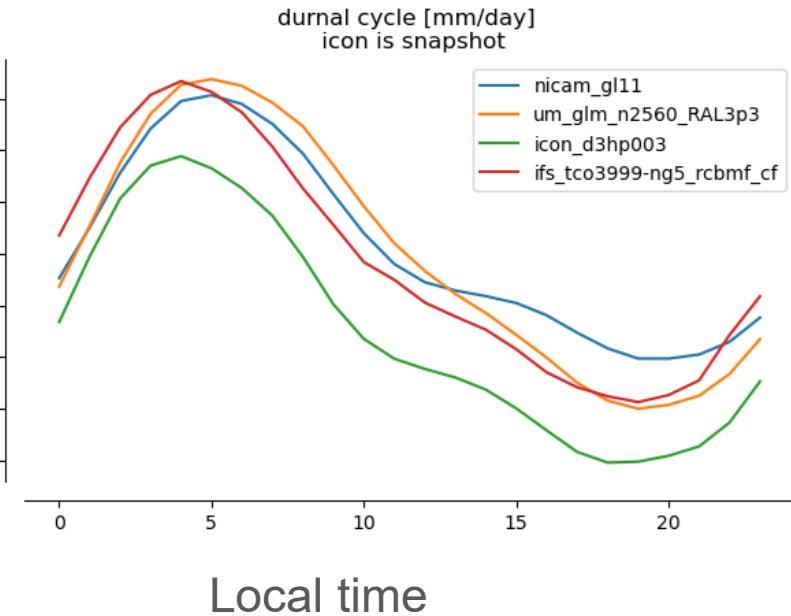
Shuhei Matsugishi

Land/Sea contrast, Diurnal cycle of Precipitation

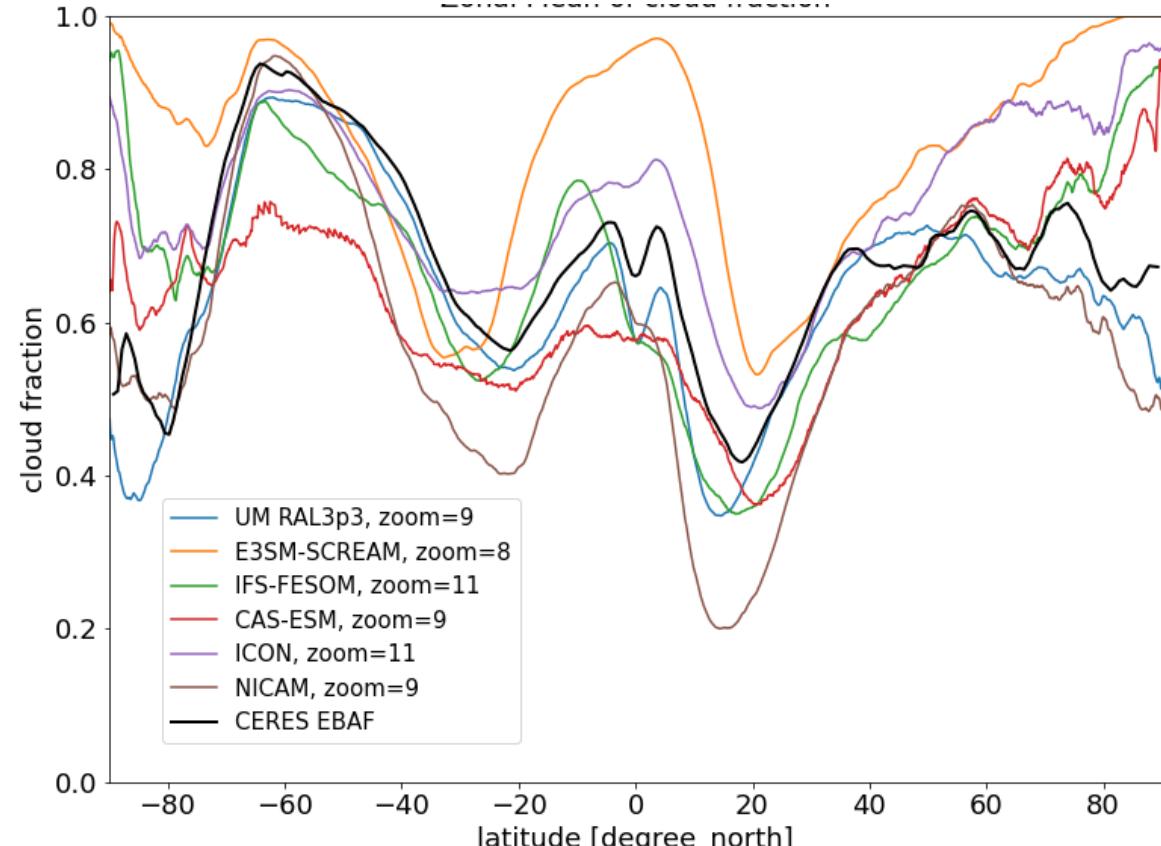


Tropical ($\pm 30\text{deg}$) precipitation

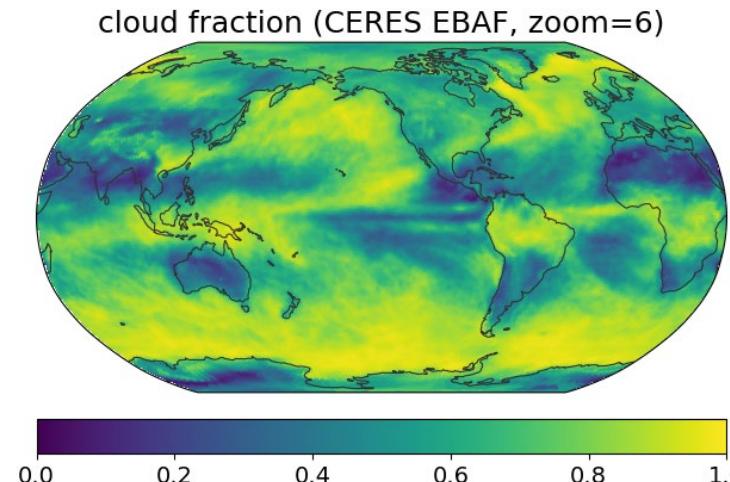
Shuhei Matsugishi



Model spread of cloud fraction (Kohei Yamasaki)



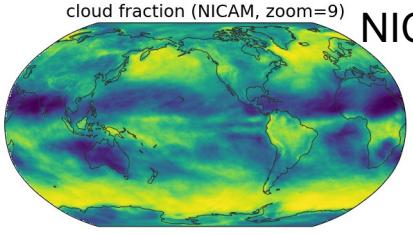
zonal mean cloud fraction (March 2020)



CERES EBAF
(March 2020)

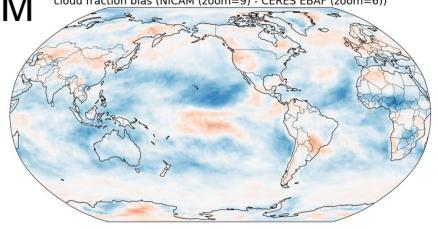
Global distribution of cloud fraction (Kohei Yamasaki)

cloud fraction (NICAM, zoom=9)

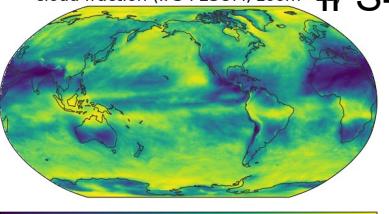


NICAM

cloud fraction bias (NICAM (zoom=9) - CERES EBAF (zoom=6))

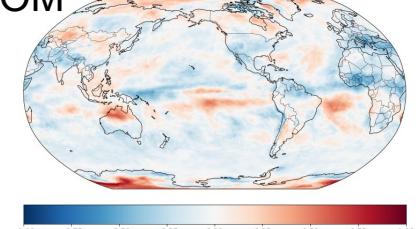


cloud fraction (IFS-FESOM, zoom=11)

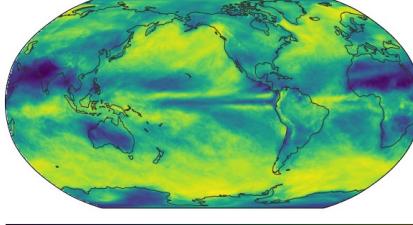


IFS-FESOM

cloud fraction bias (IFS-FESOM (zoom=11) - CERES EBAF (zoom=6))

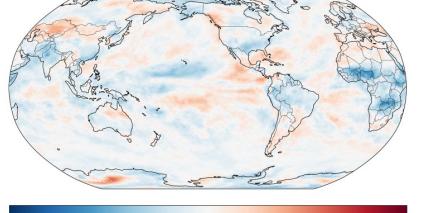


cloud fraction (UM RAL3p3, zoom=9)

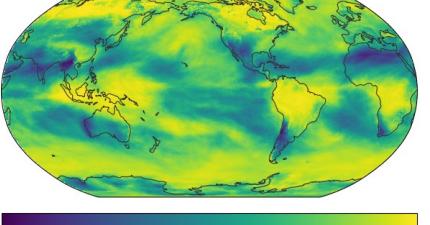


UM RAL3p3

cloud fraction bias (UM RAL3p3 (zoom=9) - CERES EBAF (zoom=6))

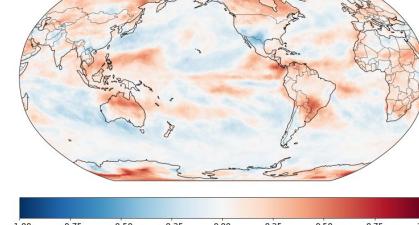


cloud fraction (ICON, zoom=11)

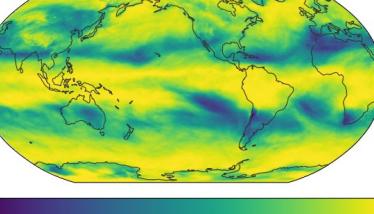


ICON

cloud fraction bias (ICON (zoom=11) - CERES EBAF (zoom=6))

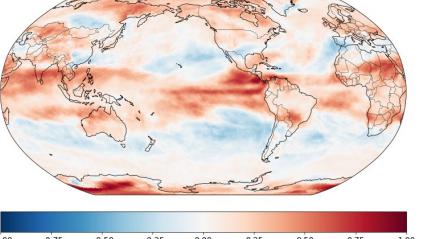


cloud fraction (E3SM-SCREAM, zoom=8)

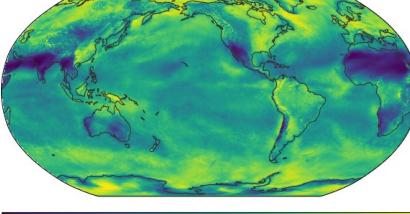


SCREAM

cloud fraction bias (E3SM-SCREAM (zoom=8) - CERES EBAF (zoom=6))

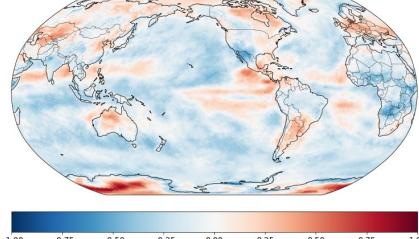


cloud fraction (CAS-ESM, zoom=9)

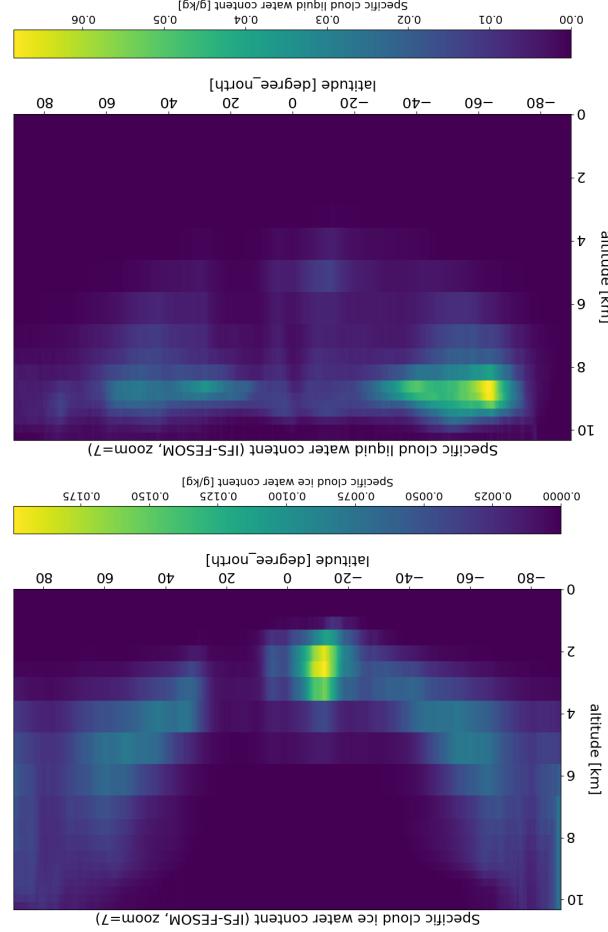


CAS-ESM

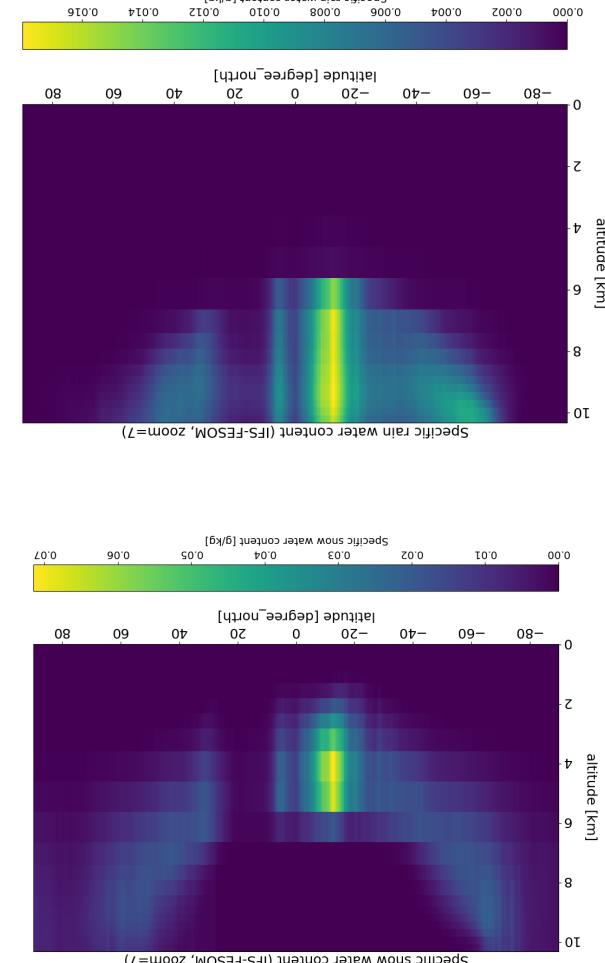
cloud fraction bias (CAS-ESM (zoom=9) - CERES EBAF (zoom=6))



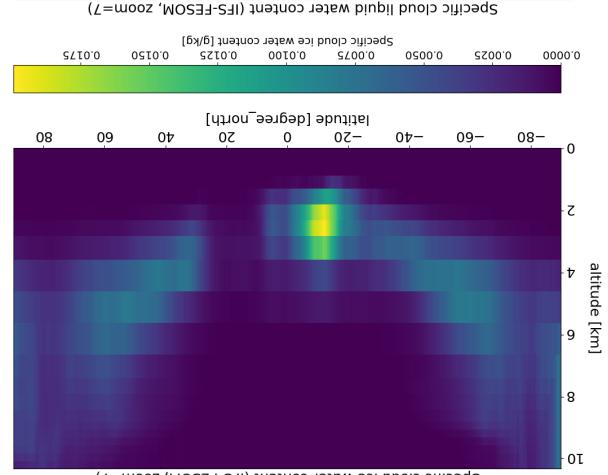
cloud water content of IFS-FESOM (Kohei Yamasaki)



liquid
water
content



rain
snow



ice

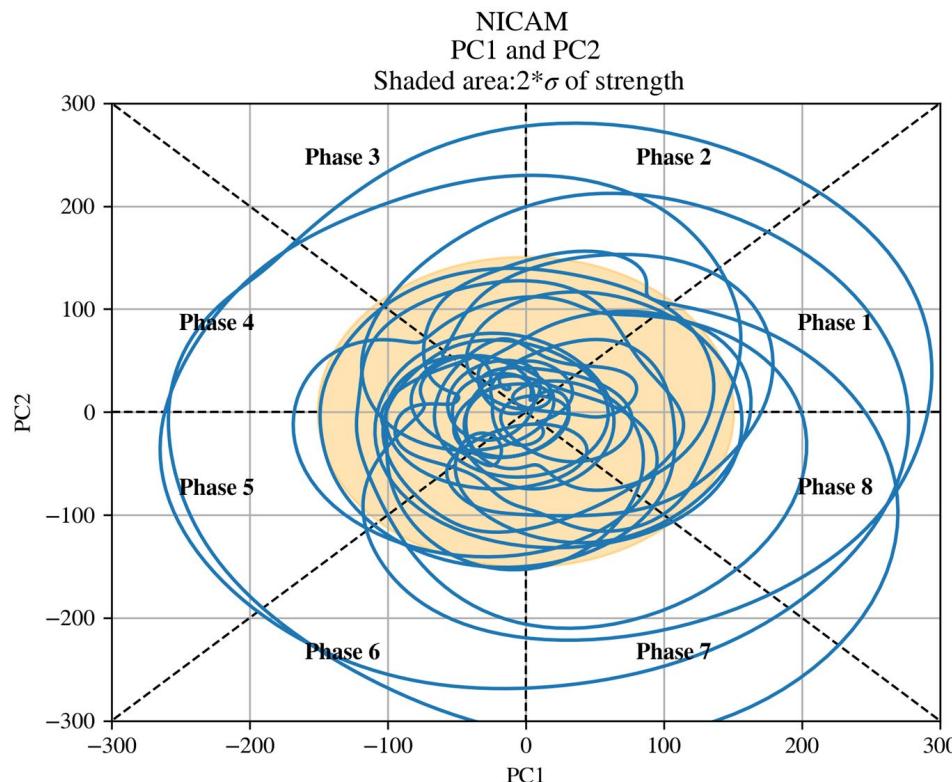
PC1PC2 phase space of Kelvin wave in NICAM

Ray Kuo

Pretty smooth, thanks to
high resolution of time in
NICAM

One circle: One period of
kelvin wave

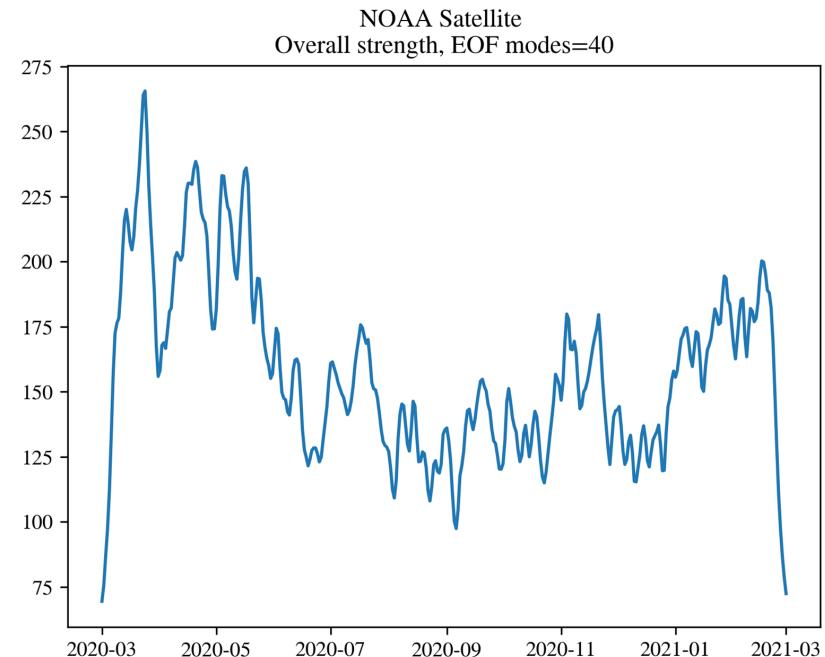
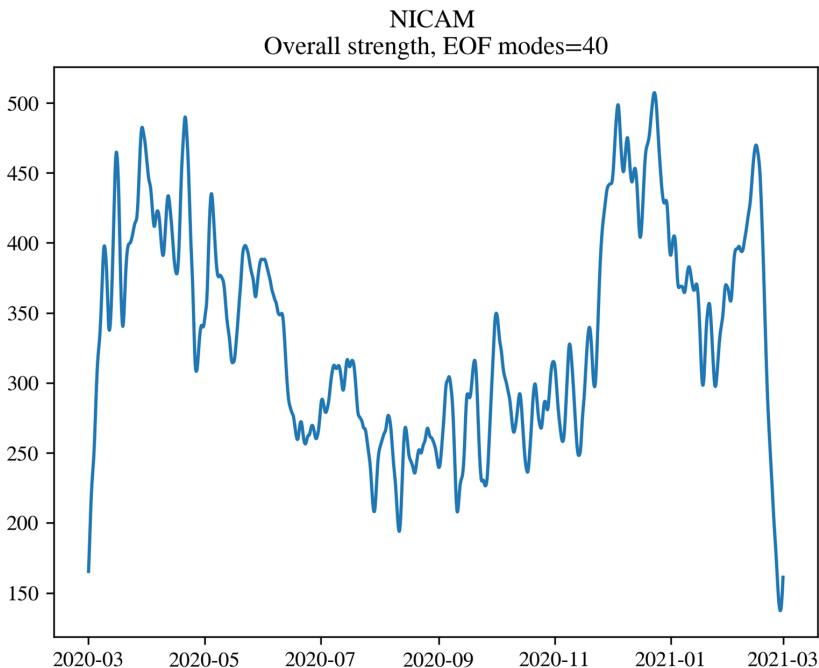
Strength: How far from
the origin (norm of the
vector)



Analysis of Kelvin waves in NICAM

Ray Kuo

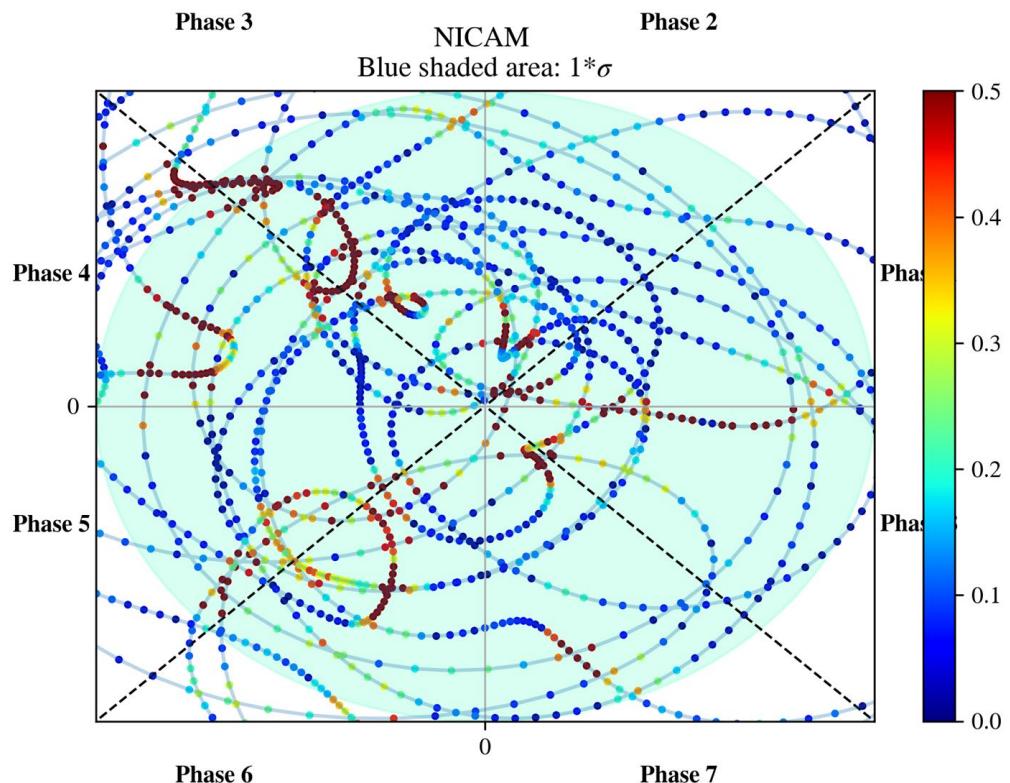
Seasonal cycle is good, but NICAM has weird decay in Feb.



Nonlinearity

Ray Kuo

it seems that the nonlinearity still need the strength large enough to trigger the linear wave outside the circle



Sub themes

- Climatology
- Tropical cyclones
- Intraseasonal variabilities & equatorial waves, or convective organization
- Extreme precipitation or winds
- Mid-latitude disturbances
- Land-atmosphere interactions
- Variability in mountainous regions and complex terrain
- Upscale phenomena: impacts of small-scale features (e.g., convection) on waves and the large-scale circulation (jets, monsoons, ITCZ, blocking, etc.)
- Data handling, visualization

Research Interests

Shao-Yu Tseng	Diurnal cycle of convection/precipitation over Taiwan
Yu-Hsuan Fan	Lee vortex over Taiwan, winter time
Ray KUO	MJO
Shao-Yi Lee	cloud fractal scale
Chao-An Chen monsoon	extreme precipitation, TC -related extreme precipitation, WNP-EA
Pin-Yu Chao	extreme precipitation tracking, tropical cyclone, front, MCS, ...
Ohara	energy cycle
Yamasaki	cloud and climatology
Takahashi	monsoon, seasonal change, precipitation,
Kamijo	AI, energy flux in different scale phenomena
Yokoyama precipitation	MCS tracking, MSC and environment, line-shaped stationary

Hacking issues

- Calculation of length of contour lines, for fractal dimension
- Some problems in Chunk? Overload of memories.
- Do not use .load() and .compute()

Hacking issues

- Calculation of length of contour lines, for fractal dimension