

# Large-scale atmospheric response to warm SST anomalies in the North Pacific in the 2021-22 winter

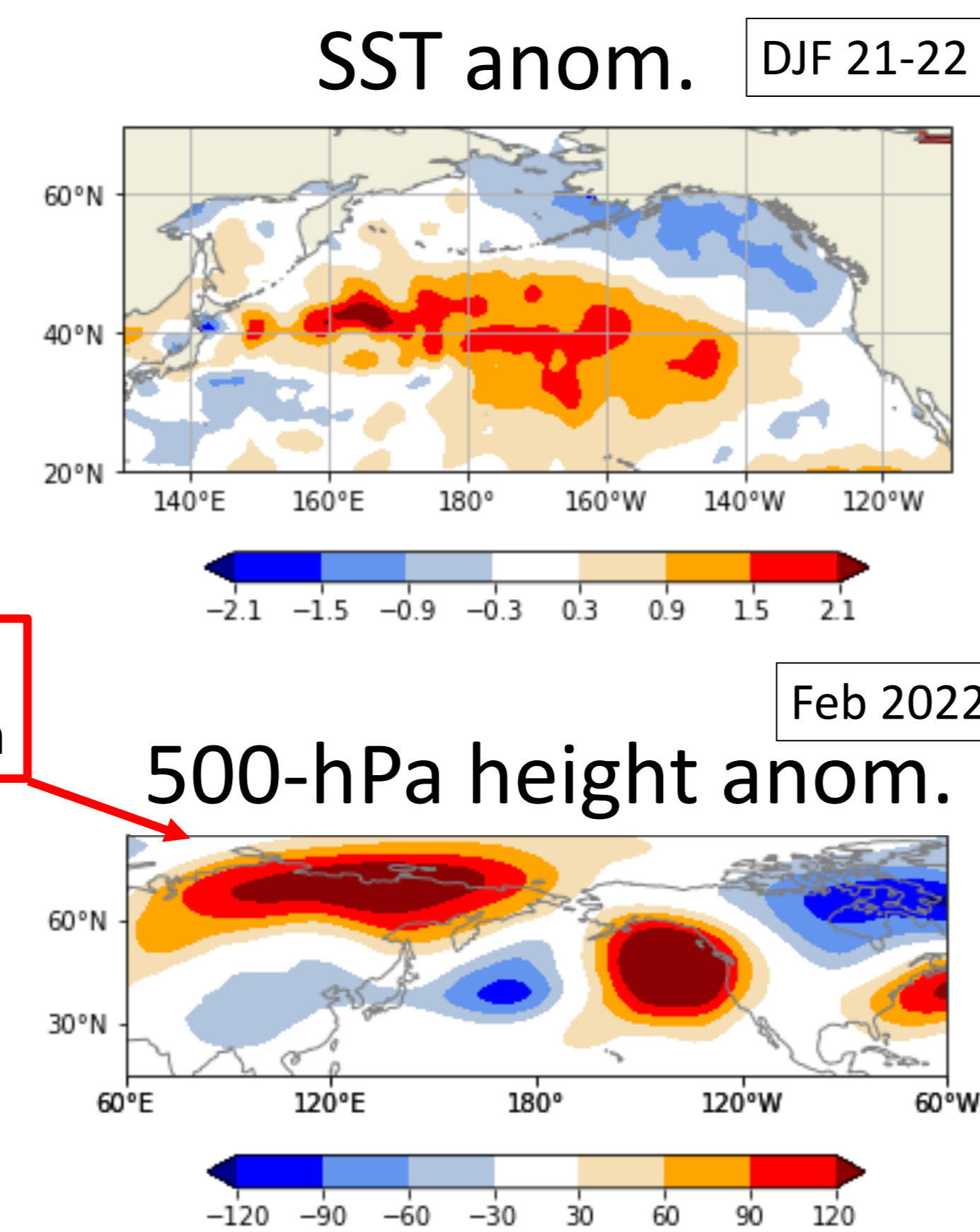
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## Conclusions

- Warm SST anomalies over N. Pacific might cause blocking increase over NW Pacific and WP pattern in February 2022.
- The increase is simulated only in 50-km AGCM, not in 100-km AGCM.  
 → **Blocking response may depend on model resolution.**
- The warm SST might also cool the polar stratosphere through weakening of the planetary wave propagation into the stratosphere by blocking.

## 1. Introduction

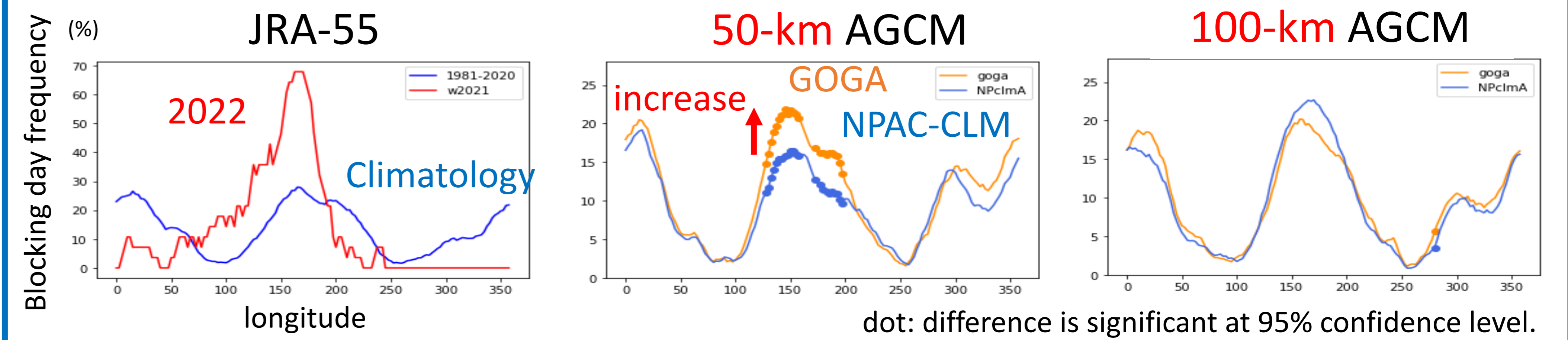
- Warming of sea surface temperature (SST) was found over the North Pacific in the 21-22 winter.
- Western Pacific pattern occurred in Feb 2022 accompanied by blocking increase.
- The aims of this study:
  - Evaluating potential impact of N. Pacific SST/sea ice anomalies on the atmosphere based on AGCM.
  - Investigating how the atmospheric responses depend on the AGCM resolution.



## 2. AGCM time-slice experiments

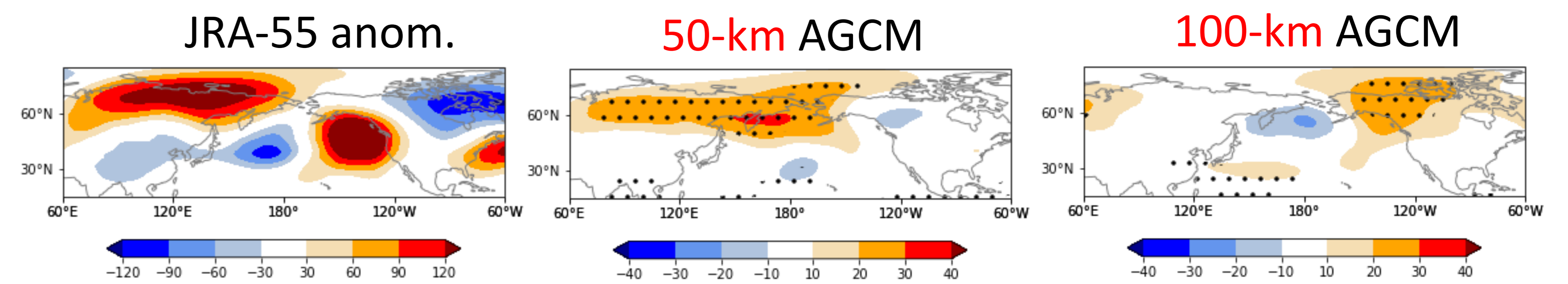
- Used AGCM: AFES v4.3
- Resolution: 100km and 50km
- Ensemble members: 100 members
- Periods: Sep. 2021 ~ Feb. 2022
- GOGA experiment
  - Observed SSTs prescribed globally
- NPAC-CLM experiment
  - Observed SSTs over tropics, while climatological SSTs over N. Pacific

## 3. Blocking frequency in February 2022



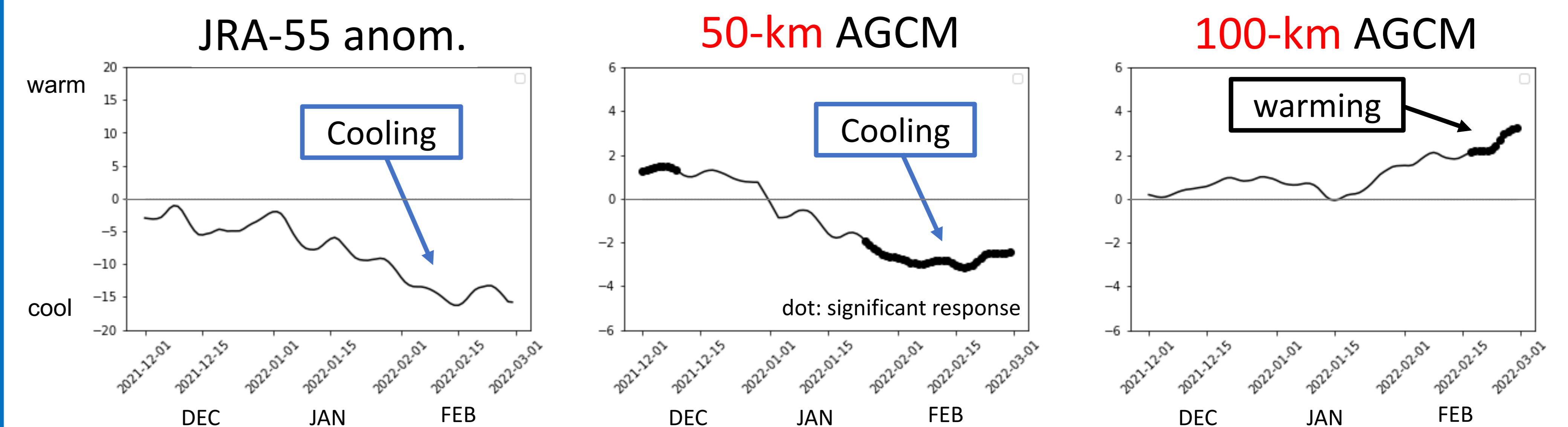
- Definition of blocking is Tibaldi & Moteni (1990)
- N. Pacific SST enhances blocking over the NW Pacific only in 50-km AGCM.
- Climatological frequencies in 50-km and 100-km do not change much.

## 4. Responses of 500-hPa height in February 2022



- Responses are evaluated by the ensemble-mean differences between GOGA and NPAC-CLM experiments.
- 500-hPa anticyclonic responses over NW. Pacific is consistent with JRA-55 in 50-km AGCM, but not in 100-km AGCM.

## 5. Responses of polar stratospheric temperatures



- Polar stratospheric cooling is simulated only in 50-km AGCM.
- Blocking over NW. Pacific weakens upward planetary wave propagation into the stratosphere through destructive interference between anomalous and climatological waves (not shown) (Nishii et al. 2010, GRL).