



Supplement of

A new metrics framework for quantifying and intercomparing atmospheric rivers in observations, reanalyses, and climate models

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supplementary material

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Fig. S4. Time slice of AR tags detected using TE algorithm on (a) E3SM-LR and (b) E3SM-HR data on 1984-01-01T00

Fig. S5. AR frequency over global oceans for CMIP5 and CMIP6 models used in this study.

Table S1. List of climate models used in this study and their horizontal resolution.

| Institute | model name | horizontal resolution |
|---------------------|---------------|-----------------------|
| NCAR, United States | CCSM4 | 1.25° X 0.938° |
| IPSL, France | IPSL-CM5A-LR | 3.75° X 1.875° |
| IPSL, France | IPSL-CM5B-LR | 3.75° X 1.875° |
| CCCma, Canada | CanESM2 | 2.8° X 2.9° |
| CSIRO, Australia | CSIRO-MK3-6-0 | 1.9°X1. 9° |
| BCCR, Norway | NorESM1-M | 2° X 2° |
| BCC, China | BCC-CSM2-MR | 1.125° X 1.125° |
| MRI, Japan | MRI-ESM2-0 | 1.125° X 1.125° |

Table S2. Grids info for E3SM LR and HR model

| model | Spatial resolution | # of columns | Vertical levels |
|---------|--------------------|--------------|-----------------|
| E3SM-LR | 110km | 48,602 | 72 |
| E3SM-HR | 25km | 777,602 | 72 |

Table S3. Lat-lon boundaries for geographic regions in Fig. 1

| Region | S. Africa | Australia | New Zealand | S. America | Alaska | California | Baja | N. Europe | UK | Europe |
|-----------------|----------------------|--------------------------|------------------------|----------------------|----------------------|----------------------|----------------------|-------------------------|-------------------------|---------------------------|
| Boundary | 21-35.5°S 11-20°E | 23-35.5°S 112.8-120°E | 34-46.5°S 166-179°E | 30-56°S 68-76°W | 42-51°N 119-126°W | 34-42°N 119-126°W | 20-34°N 105-119°W | 53-70°N 3.5-20°E | 49.8-60°N 10°W - 2°E | 35-49.8°N 10°W - 3.5°E |
| Region | W. Africa | Greenland | Antarctica | E. Asia | Pacific NW | N. Pacific | S. Pacific | N. Atlantic | S. Atlantic | Indian Ocean |
| Boundary | 10-35°N 5-19°W | 59.5- 67°N 40-52°W | 60-76°S 57-95°W | 31-43°N 125-142°E | 42-51°N 119-126°W | 0-67°N 99°E-98°W | 0-70°S 142°E-70°W | 0-75°N 80°W- 10°E | 0-70°S 70°W-20°E | 0-70°S 30-120°E |

Table S4. Effective sample size (N_e) for the spatial pattern correlation of AR frequency for each ocean basin

| | N. Pacific | S. Pacific | N. Atlantic | S. Atlantic | Indian Ocean |
|-------------------------|-------------------|-------------------|--------------------|--------------------|---------------------|
| N_e | 16 | 27 | 14 | 15 | 19 |

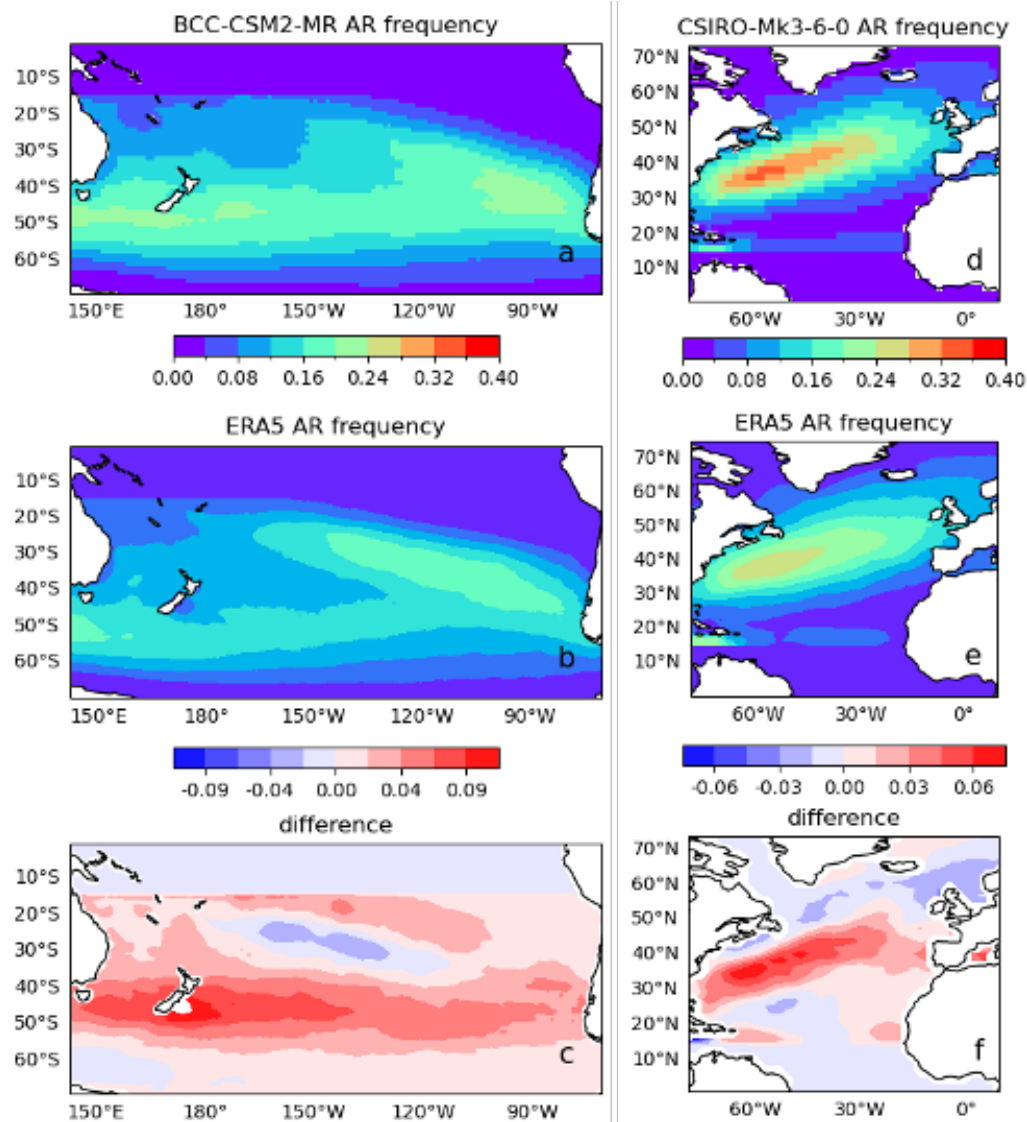


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ERA5 1979-01-01T00



BCC 1979-01-01T00

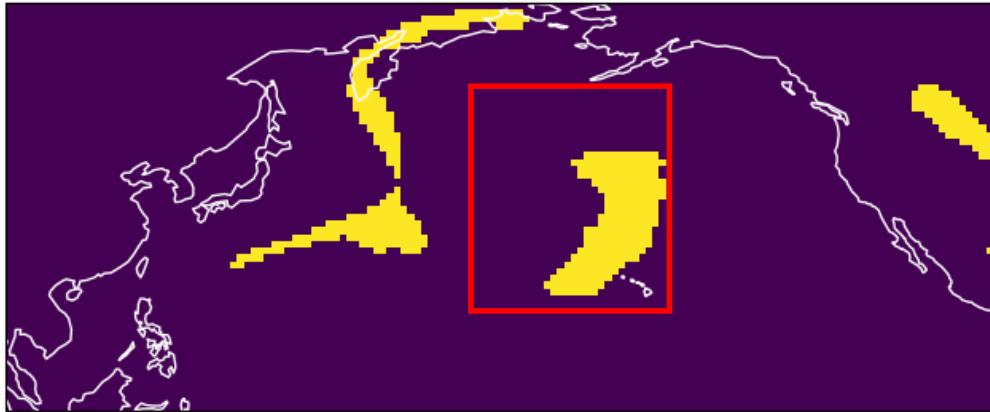


Fig. S2. Time slice of AR tags detected using TE algorithm on (a) ERA5 and (b) BCC-CSM2 data on 1979-01-01T00

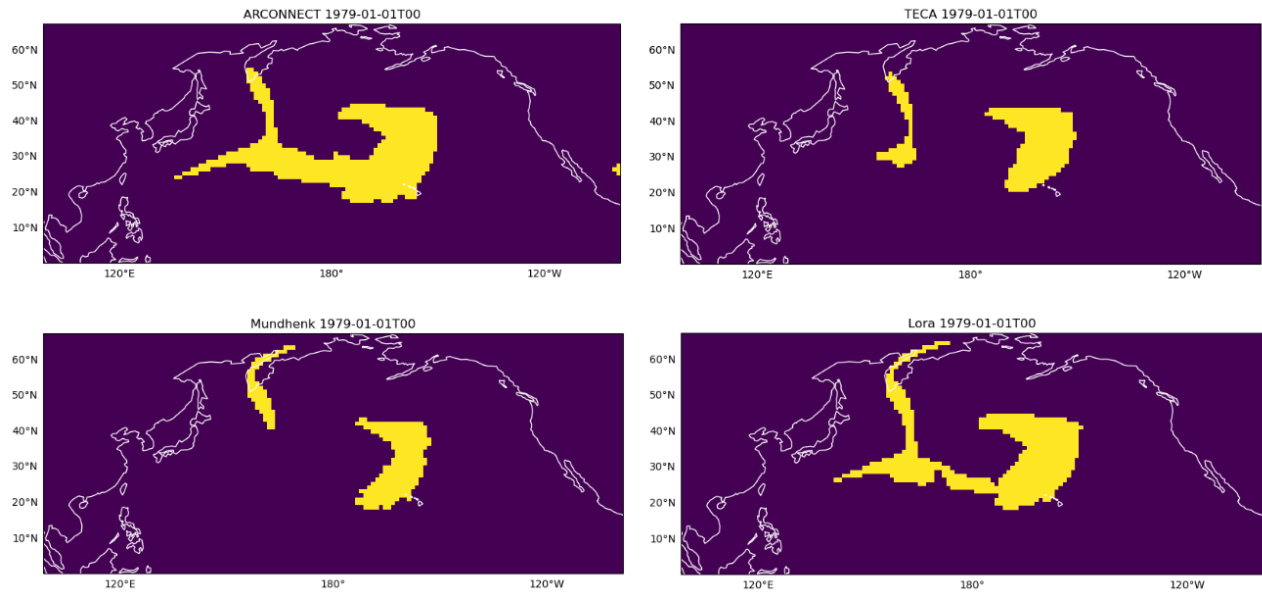


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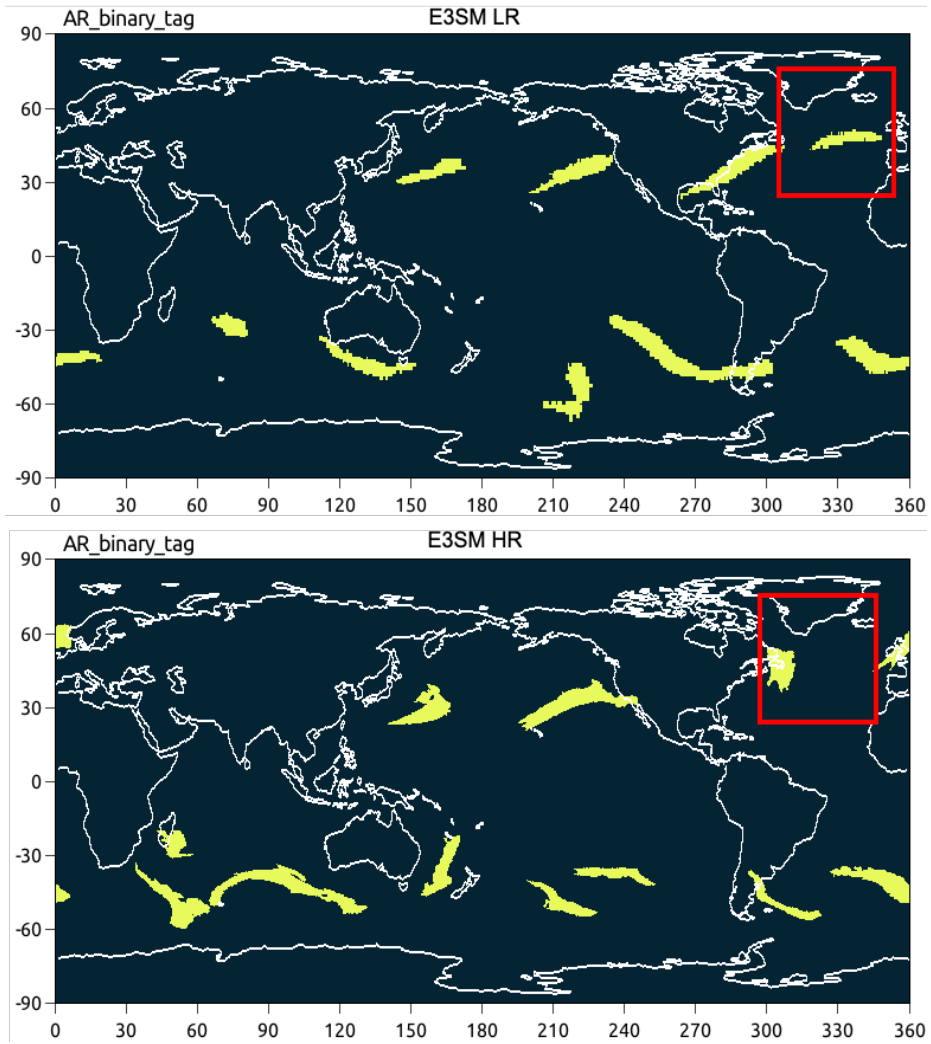


Fig. S4. Time slice of AR tags detected using TE algorithm on (a) E3SM-LR and (b) E3SM-HR data on 1984-01-01T00

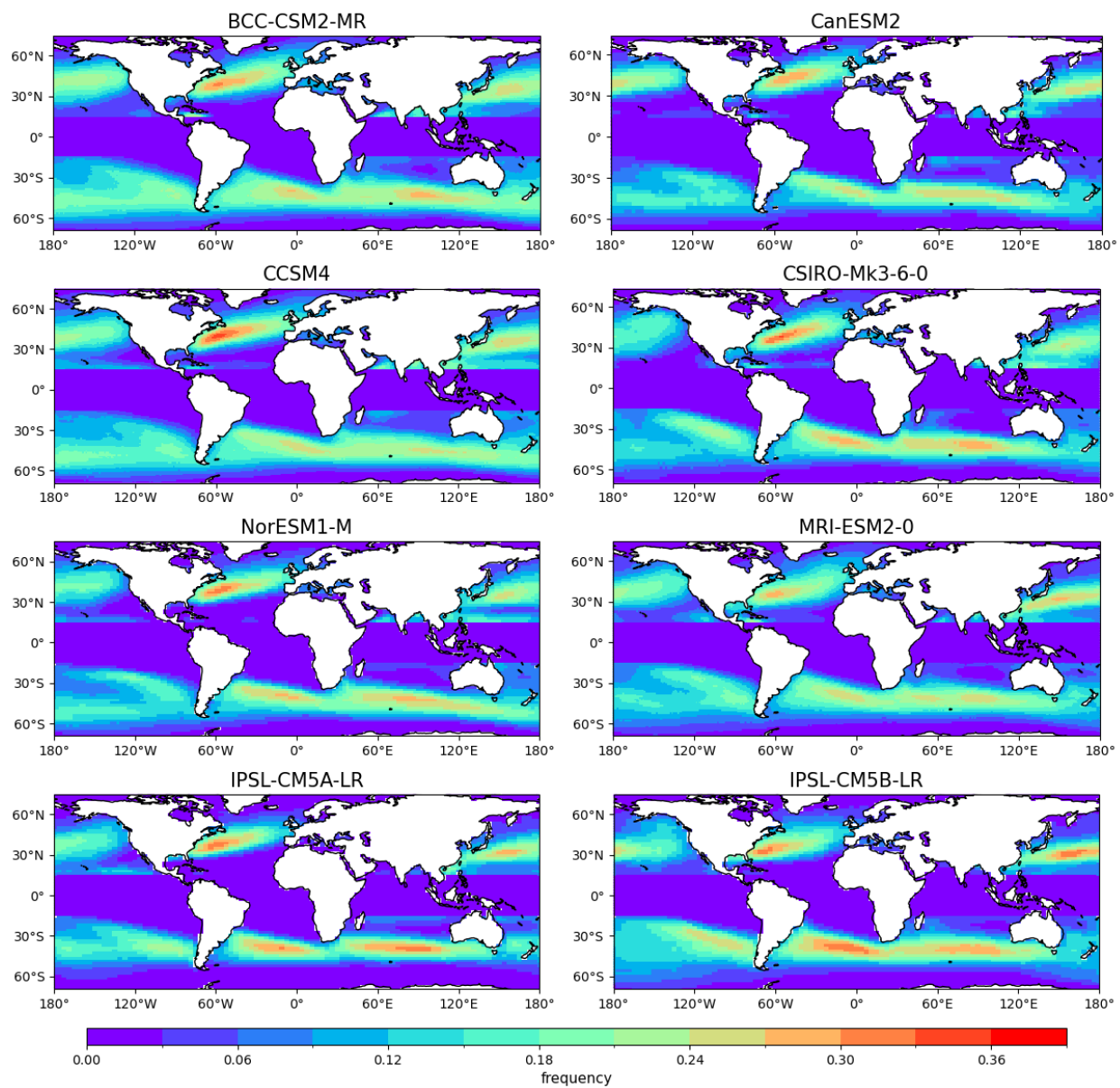


Fig. S5. AR frequency over global oceans for CMIP5 and CMIP6 models used in this study.