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The model outputs included here should enable the reproduction of the tables and figures[1] in:

Pornampai Narenpitak, and Christopher S. Bretherton, 2018: Understanding negative subtropical shallow cumulus cloud feedbacks in a near-global aquaplanet model using limited-area cloud-resolving simulations. Submitted to Journal of Advances in Modeling Earth Systems (JAMES).

The archive contains two directories. Below is the brief description of each:

(1) **LASAM_statistics**: The domain-mean outputs from the limited-area cloud-resolving simulations (LASAM) in a NetCDF format.

Detail descriptions of the LASAM simulations can be found on Page 2. A table listing which simulations are used to reproduce each table and figure can be found on Page 4.

In general, the following abbreviations mean:
“ctl” – control SST (CTL)
“p4s” – +4K SST (4K)
“ec” – control SST plus enhanced boundary-layer clear-sky radiative cooling (CTL+ΔRc)
“ew” – +4K SST minus enhanced boundary-layer clear-sky radiative cooling (4K-ΔRc)

(1.1) **Auxiliary 2D LASAM outputs** for self-aggregation comparison:
2D outputs of six LASAM simulations are also included for those who are interested in comparing the self-aggregation patterns of the shallow cumulus clouds, and their sensitivity to domain size, SST and horizontal winds. Descriptions of the simulations can be found at the end of a table on Page 6.

(2) **NGAqua_quartile_bins**: The quartile-averages binned by the daily-mean column relative humidity of the subtropics of near-global aquaplanet cloud-resolving model (NGAqua) in a NetCDF format.

The data included is from two NGAqua simulations:
- “nopert” is the control simulation, and
- “4K” is the simulation with +4K SST warming.

Detail descriptions of the variable names and units can be found on Page 7.

[1] With exception for Figure 4, which requires large 3D output files to show the presented cloud fields, and Figure 14, which is a schematic diagram.

Detail descriptions of the LASAM simulations

Each Matlab script lists the LASAM simulations necessary to reproduce the corresponding figure. The following describes the setup of each simulation with more detail:

(1.1)4km resolution

i. MPDATA advection scheme (steady)

- Nudged simulations with time scale of 1 day (rt1)

  Q1 simulations: CTL, 4K, CTL+ΔRc, 4K-ΔRc, CTL+ΔRH, and 4K-ΔRH, respectively

  - ctl_NGAqua_sub_steady_bin1of4_q1uv_16_*_rt1.nc
  - p4s_NGAqua_sub_steady_bin1of4_q1uv_16_*_rt1.nc
  - ctl_NGAqua_sub_ec_steady_bin1of4_q1uv_16_*_rt1.nc
  - p4s_NGAqua_sub_ew_steady_bin1of4_q1uv_16_*_rt1.nc
  - ctl_NGAqua_sub_steady_bin1of4_q1uv_16_p4sFTRH_*_rt1.nc
  - p4s_NGAqua_sub_steady_bin1of4_q1uv_16_ctlFTRH_*_rt1.nc

  Q2 simulations: CTL, 4K, CTL+ΔRc, and 4K-ΔRc, respectively

  - ctl_NGAqua_sub_steady_bin2of4_q2uv_16_*_rt1.nc
  - p4s_NGAqua_sub_steady_bin2of4_q2uv_16_*_rt1.nc
  - ctl_NGAqua_sub_ec_steady_bin2of4_q2uv_16_*_rt1.nc
  - p4s_NGAqua_sub_ew_steady_bin2of4_q2uv_16_*_rt1.nc

  Q3 simulations: CTL and 4K, respectively

  - ctl_NGAqua_sub_steady_bin3of4_q3uv_16_*_rt1.nc
  - p4s_NGAqua_sub_steady_bin3of4_q3uv_16_*_rt1.nc

  Q4 simulations: CTL and 4K, respectively

  - ctl_NGAqua_sub_steady_bin4of4_q4uv_16_*_rt1.nc
  - p4s_NGAqua_sub_steady_bin4of4_q4uv_16_*_rt1.nc

  Notes:

  (1) * means "onev_srfwndspd_phSD_scam_init_pfix_nocor".

  (2) "16" in the file names refer to the domain size, e.g. 64 km x 64 km or 16 x 16 grids.

  (3) For Q1 with a larger domain size, i.e. 256 km x 256 km (64 x 64 grids), change "16" to "64".

- Unnudged below 2.5 km (rt1_nondg)

  Q1 simulations: CTL, 4K, CTL+ΔRc, and 4K-ΔRc, respectively

  - ctl_NGAqua_sub_steady_bin1of4_q1uv_16_*_rt1_nondg.nc
  - p4s_NGAqua_sub_steady_bin1of4_q1uv_16_*_rt1_nondg.nc

- ctl_NGAqua_sub_ec_steady_bin1of4_q1uv_16_*_rt1_nondg.nc
- p4s_NGAqua_sub_ew_steady_bin1of4_q1uv_16_*_rt1_nondg.nc

Notes:
(1) * means "onev_srfwndspd_phSD_scam_init_pfix_nocor".

ii. UM5 advection scheme

- Nudged simulations with time scale of 1 day (rt1)

Q1 simulations: CTL, 4K, CTL+ΔRc, and 4K-ΔRc, respectively

- ctl_NGAqua_sub_um5_bin1of4_q1uv_16_*_rt1.nc
- p4s_NGAqua_sub_um5_bin1of4_q1uv_16_*_rt1.nc
- ctl_NGAqua_sub_um5_ec_bin1of4_q1uv_16_*_rt1.nc
- p4s_NGAqua_sub_um5_ew_bin1of4_q1uv_16_*_rt1.nc

Notes:
(1) * means "onev_srfwndspd_phSD_scam_init_pfix_nocor".

(1.1)100x100x40 m resolution

i. MPDATA advection scheme

- Nudged simulations with time scale of 1 day

Q1 simulations: CTL, 4K, CTL+ΔRc, and 4K-ΔRc, respectively

- ctl_NGAqua_sub_100x100x40m_bin1of4_q1uv_64_*_rt1.nc
- p4s_NGAqua_sub_100x100x40m _bin1of4_q1uv_64_*_rt1.nc
- ctl_NGAqua_sub_100x100x40m _ec_bin1of4_q1uv_64_*_rt1.nc
- p4s_NGAqua_sub_100x100x40m _ew_bin1of4_q1uv_64_*_rt1.nc

- Unnudged below 2.5 km

Q1 simulations: CTL, 4K, CTL+ΔRc, and 4K-ΔRc, respectively

- ctl_NGAqua_sub_100x100x40m_bin1of4_q1uv_64_*_rt1_nondg.nc
- p4s_NGAqua_sub_100x100x40m _bin1of4_q1uv_64_*_rt1_nondg.nc
- ctl_NGAqua_sub_100x100x40m _ec_bin1of4_q1uv_64_*_rt1_nondg.nc
- p4s_NGAqua_sub_100x100x40m _ew_bin1of4_q1uv_64_*_rt1_nondg.nc

ii. UM5 advection scheme, CTL Q1, nudged with 1-day timescale

- ctl_NGAqua_sub_um5_100x100x40m_bin1of4_q1uv_64_*_rt1.nc

Notes:
(1) * means "onev_srfwndspd_phSD _pfix_nocor".

LASAM simulations used to reproduce each table and figure

Simulations (Ordered Alphabetically)	Used for Figures (or Tables):
Domain-mean outputs	
ctl_NGAqua_sub_100x100x40m_bin1of4_q1uv_64_onev_srfwndspd_phSD_pfix_nocor_rt1.nc	7, 9, 10, 11, 12, 13, Table 4
ctl_NGAqua_sub_100x100x40m_bin1of4_q1uv_64_onev_srfwndspd_phSD_pfix_nocor_rt1_nondg.nc	7, 11, 12, 13, Table 4
ctl_NGAqua_sub_100x100x40m_ec_bin1of4_q1uv_64_onev_srfwndspd_phSD_pfix_nocor_rt1.nc	7, 10, 12, 13, Table 4
ctl_NGAqua_sub_100x100x40m_ec_bin1of4_q1uv_64_onev_srfwndspd_phSD_pfix_nocor_rt1_nondg.nc	7, 12, 13, Table 4
ctl_NGAqua_sub_ec_steady_bin1of4_q1uv_16_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc	3, 5, 6, 7, 12, 13, Table 4
ctl_NGAqua_sub_ec_steady_bin1of4_q1uv_16_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1_nondg.nc	7, 12, 13, Table 4
ctl_NGAqua_sub_ec_steady_bin1of4_q1uv_64_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc	For those who are interested in a large-domain CTL+ΔRc run.
ctl_NGAqua_sub_ec_steady_bin2of4_q2uv_16_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc	5, Supporting Information (SI)
ctl_NGAqua_sub_steady_bin1of4_64_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc (Q1 simulations with NGAqua subtropics-mean horizontal winds instead of Q1-mean horizontal winds with 64x64 grid columns or 256 km x 256 km)	For those who are interested in self-aggregation sensitivity to horizontal winds.
ctl_NGAqua_sub_steady_bin1of4_q1uv_16_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc	3, 5, 6, 7, 8, 9, 11, 12, 13, Table 4
ctl_NGAqua_sub_steady_bin1of4_q1uv_16_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1_nondg.nc	7, 11, 12, 13, Table 4
ctl_NGAqua_sub_steady_bin1of4_q1uv_16_p4sFTRH_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc	7, Table 4
ctl_NGAqua_sub_steady_bin1of4_q1uv_64_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc	8
ctl_NGAqua_sub_steady_bin2of4_q2uv_16_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc	5, SI
ctl_NGAqua_sub_steady_bin3of4_q3uv_16_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc	SI
ctl_NGAqua_sub_steady_bin4of4_q4uv_16_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc	SI

ctl_NGAqua_sub_um5_100x100x40m_bin1of4_q1uv_64_onev_srfwndspd_phSD_pfix_nocor_rt1.nc	9
ctl_NGAqua_sub_um5_bin1of4_q1uv_16_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc	7, 9, 10, 12, 13, Table 4
ctl_NGAqua_sub_um5_ec_bin1of4_q1uv_16_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc	7, 10, 12, 13, Table 4
p4s_NGAqua_sub_100x100x40m_bin1of4_q1uv_64_onev_srfwndspd_phSD_pfix_nocor_rt1.nc	7, 10, 11, 12, 13, Table 4
p4s_NGAqua_sub_100x100x40m_bin1of4_q1uv_64_onev_srfwndspd_phSD_pfix_nocor_rt1_nondg.nc	7, 11, 12, 13, Table 4
p4s_NGAqua_sub_100x100x40m_ew_bin1of4_q1uv_64_onev_srfwndspd_phSD_pfix_nocor_rt1.nc	7, 10, 12, 13, Table 4
p4s_NGAqua_sub_100x100x40m_ew_bin1of4_q1uv_64_onev_srfwndspd_phSD_pfix_nocor_rt1_nondg.nc	7, 12, 13, Table 4
p4s_NGAqua_sub_ew_steady_bin1of4_q1uv_16_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc	3, 5, 6, 7, 12, 13, Table 4
p4s_NGAqua_sub_ew_steady_bin1of4_q1uv_16_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1_nondg.nc	7, 12, 13, Table 4
p4s_NGAqua_sub_ew_steady_bin1of4_q1uv_64_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc	For those who are interested in a large-domain 4K-ΔRc run.
p4s_NGAqua_sub_ew_steady_bin2of4_q2uv_16_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc	5, SI
p4s_NGAqua_sub_steady_bin1of4_64_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc (Q1 simulations with NGAqua subtropics-mean horizontal winds instead of Q1-mean horizontal winds with 64x64 grid columns or 256 km x 256 km)	For those who are interested in self-aggregation sensitivity to horizontal winds.
p4s_NGAqua_sub_steady_bin1of4_q1uv_16_ctlFTRH_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc	7, Table 4
p4s_NGAqua_sub_steady_bin1of4_q1uv_16_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc	3, 5, 6, 7, 8, 11, 12, 13, Table 4
p4s_NGAqua_sub_steady_bin1of4_q1uv_16_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1_nondg.nc	7, 11, 12, 13, Table 4
p4s_NGAqua_sub_steady_bin1of4_q1uv_64_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc	8
p4s_NGAqua_sub_steady_bin2of4_q2uv_16_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc	5, SI
p4s_NGAqua_sub_steady_bin3of4_q3uv_16_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc	SI
p4s_NGAqua_sub_steady_bin4of4_q4uv_16_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc	SI

p4s_NGAqua_sub_um5_bin1of4_q1uv_16_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc	7, 10, 12, 13, Table 4
p4s_NGAqua_sub_um5_ew_bin1of4_q1uv_16_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1.nc	7, 10, 12 ,13, Table 4
2D outputs	
ctl_NGAqua_sub_steady_bin1of4_64_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1_32.nc (Q1 simulations with NGAqua subtropics-mean horizontal winds instead of Q1-mean horizontal winds with 64x64 grid columns or 256 km x 256 km)	For those who are interested in self-aggregation sensitivity to horizontal winds.
ctl_NGAqua_sub_steady_bin1of4_q1uv_16_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1_16.nc	8d
ctl_NGAqua_sub_steady_bin1of4_q1uv_64_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1_32.nc	8d
p4s_NGAqua_sub_steady_bin1of4_64_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1_32.nc (Q1 simulations with NGAqua subtropics-mean horizontal winds instead of Q1-mean horizontal winds with 64x64 grid columns or 256 km x 256 km)	For those who are interested in self-aggregation sensitivity to horizontal winds.
p4s_NGAqua_sub_steady_bin1of4_q1uv_16_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1_16.nc	8d
p4s_NGAqua_sub_steady_bin1of4_q1uv_64_onev_srfwndspd_phSD_scam_init_pfix_nocor_rt1_32.nc	8d

Detail descriptions of the variables from NGAqua quartile averages

Variables	Variable Names	Variable Units	Used for Figures (or Tables):
CLD	Total cloud fraction	%	2
CRH	Column relative humidity	%	2
CWP	Cloud water path	g/m2	2, 5
HADVQ	Large-scale horizontal advection of moisture	kg/kg/day	3
HADVS	Large-scale horizontal advection of temperature	K/day	3
LHF	Surface latent heat flux	W/m2	Table 2
LOWCLD[2]	Low cloud fraction	%	2, 5
LWCRE	Longwave cloud radiative effect	W/m2	2
Prec	Surface precipitation	mm/day	2, 8
PW	Precipitable water	mm	8
QN	Cloud condensates (liquid + ice)	g/kg	1, 6
QP	Precipitation (rain + snow + graupel)	g/kg	
QRAD	Full-sky radiative cooling	K/day	6
QT	Total water mixing ratio	g/kg	1, 3
QV	Water vapor mixing ratio	g/kg	
RH	Relative humidity	%	6
SHF	Surface sensible heat flux	W/m2	Table 2
SLI	Liquid-ice static energy	K	1, 6
SWCRE	Shortwave cloud radiative effect	W/m2	2, 5
TABS	Temperature	K	
U	Zonal wind velocity	m/s	3
V	Meridional wind	m/s	3
W	Vertical wind velocity	m/s	1, 3

[2] Note that for Figure 2, mid- and high-cloud fraction = total cloud fraction – low cloud fraction.

Note that the pressure (p) and height (z) profiles of NGAqua are the same as those in LASAM 4-km resolution simulations, so they are not included.