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Supplement of

Advancing precipitation prediction using a new-generation storm-resolving model framework – SIMA-MPAS (V1.0): a case study over the western United States

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Supplementary Materials

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Figure S1: Topography differences between SIMA-MPAS (3km) and WRF (4km).
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Figure S9: Mean daily total precipitation and the large-scale precipitation from the results of SIMA-MPAS 60-3km and SIMA-MPAS 60 km.

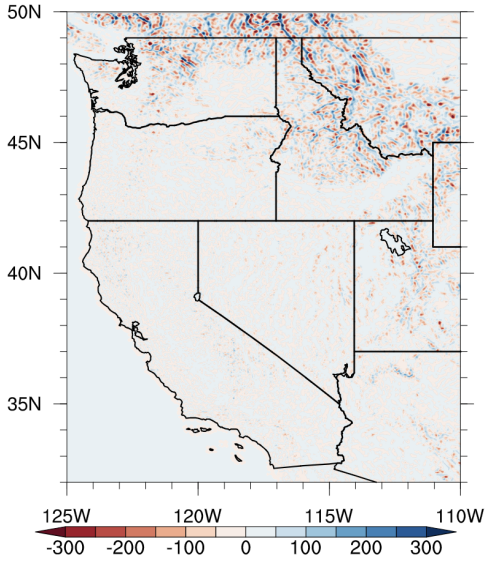

Figure S1: Topography differences (unit: m) between SIMA-MPAS (3km) and WRF (4km) (both regridded at the same resolution of 4km) over the western US region.

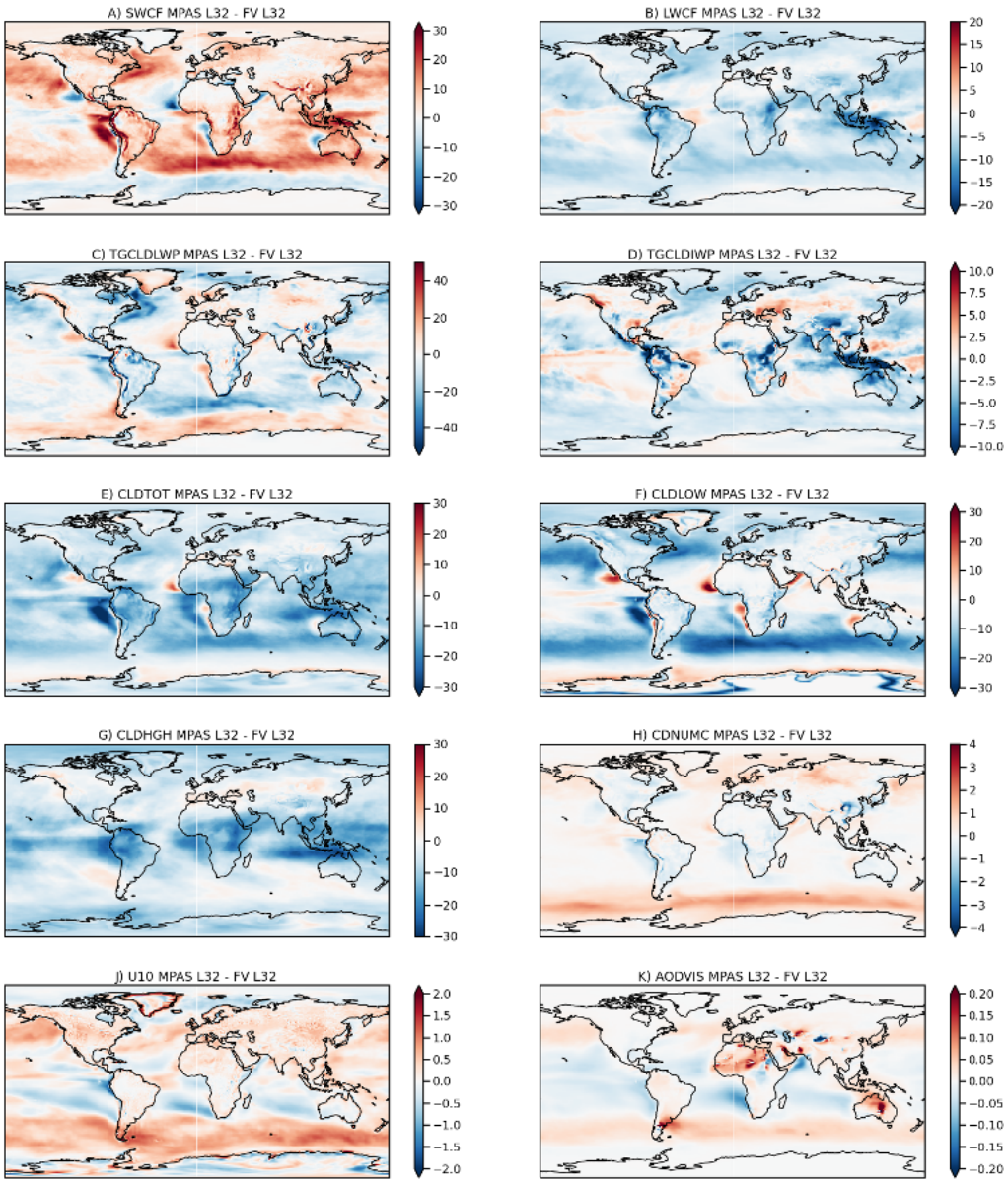

Figure S2: Spatial differences between MPAS and FV at L32 for A) shortwave cloud forcing (SWCF), B) longwave cloud forcing (LWCF), C) cloud liquid water path (GGCLDLWP), D) cloud ice water path (TGCLDIWP), E) total cloud (CLDTOT), F) low cloud(CLDLOW), G) high cloud (CLDHGH), H) droplet concentration (CDNUMC), J) 10m wind speed (U10), K) aerosol optical depth 550 nm (AODVIS).

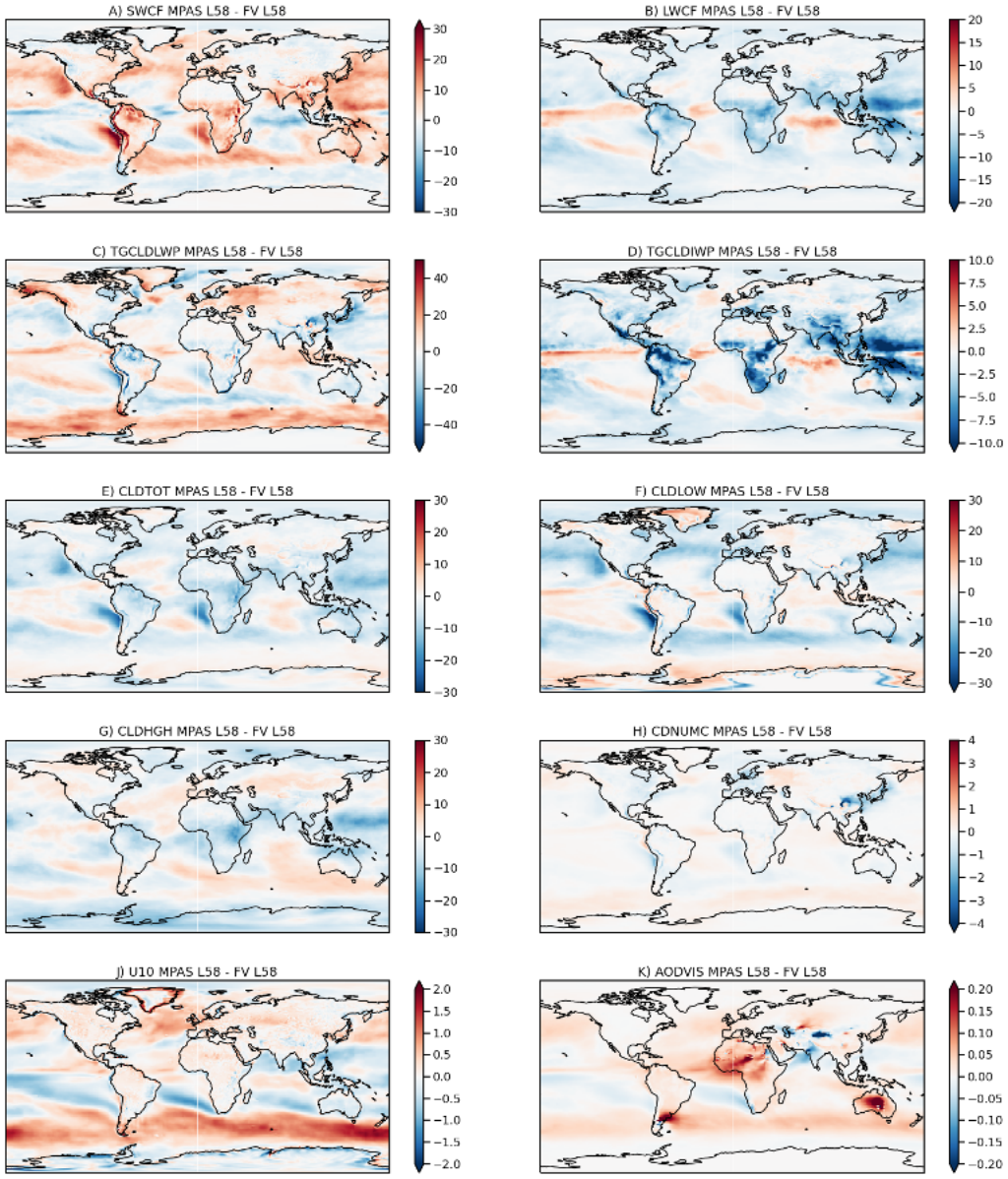

Figure S3: Spatial differences between MPAS and FV at L58 for A) shortwave cloud forcing (SWCF), B) longwave cloud forcing (LWCF), C) cloud liquid water path (GGCLDLWP), D) cloud ice water path (TGCLDIWP), E) total cloud (CLDTOT), F) low cloud(CLDLOW), G) high cloud (CLDHGH), H) droplet concentration (CDNUMC), J) 10m wind speed (U10), K) aerosol optical depth 550 nm (AODVIS).

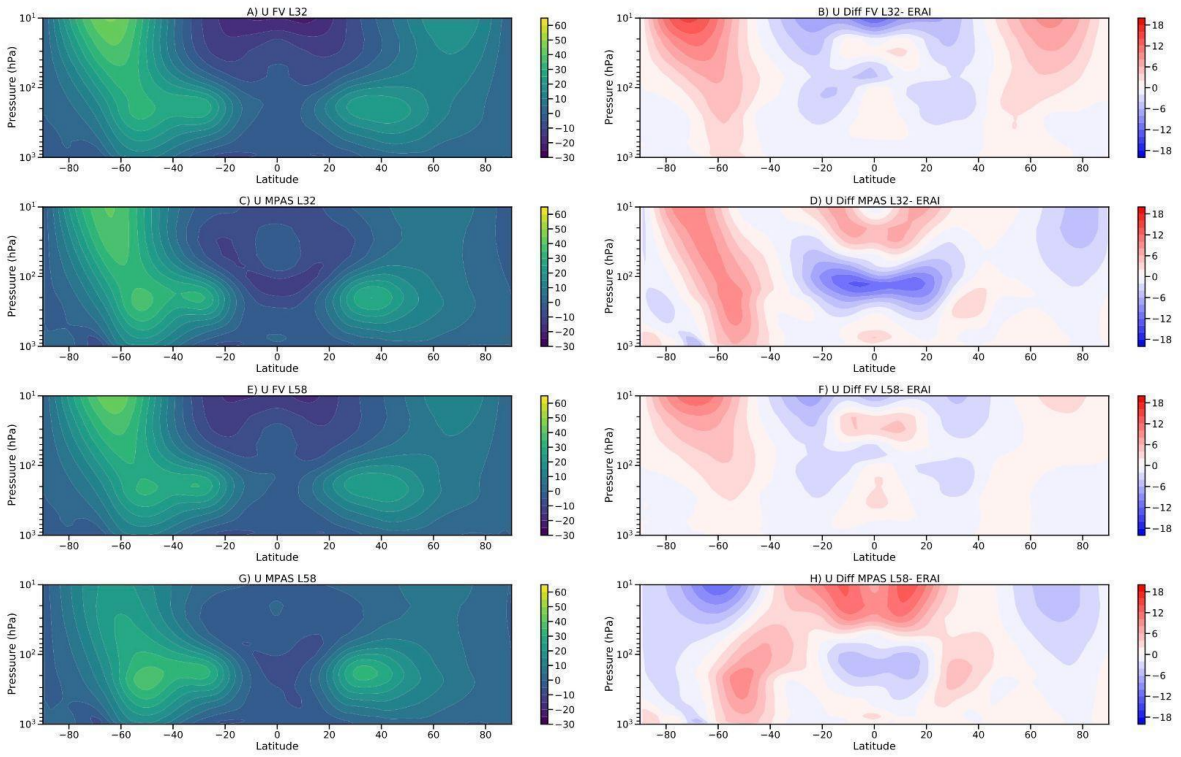

Figure S4: Climatological annual mean zonal wind (U) from 4 model configurations discussed in the text with two different dynamical cores and vertical resolutions: Finite Volume 32 Levels (A, B) and 58 Levels (E, F) as well as MPAS 32 levels (C, D) and 58 levels (G, H). The right column shows differences between the simulation and ERA-Interim reanalysis climatology.

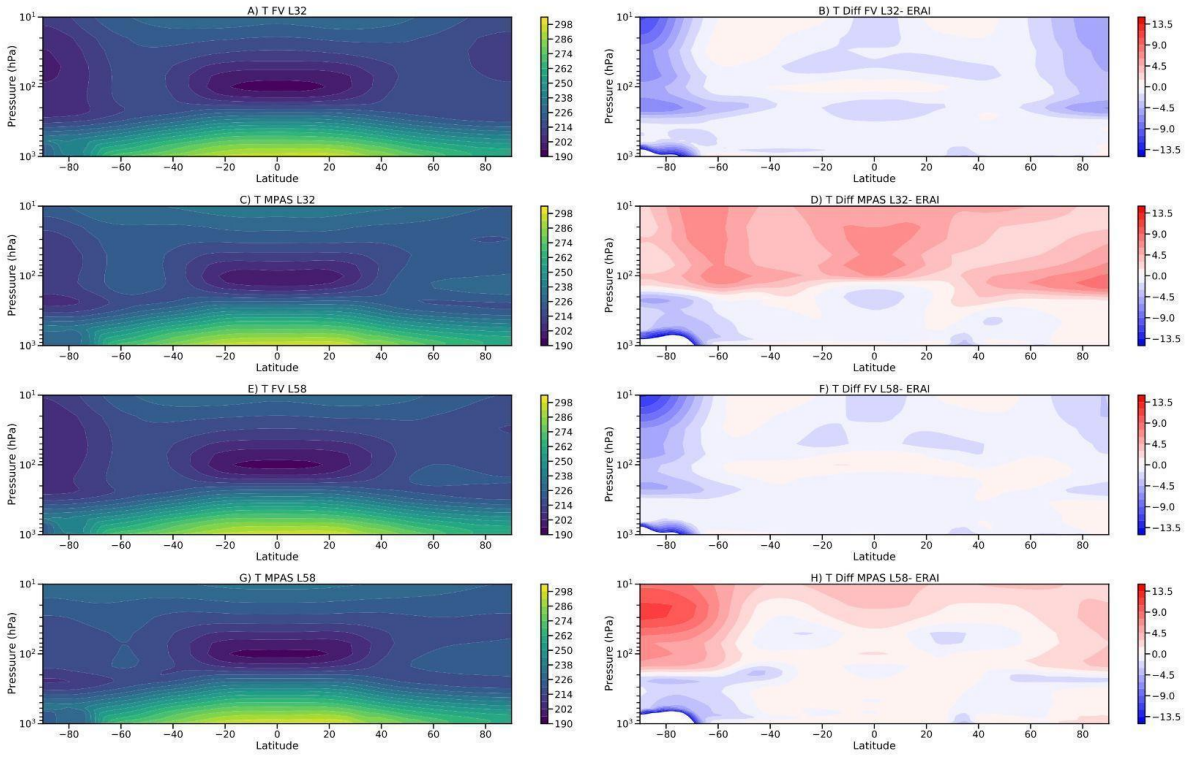

Figure S5: As for figure S1, but for the climatological annual zonal mean temperature. 4 model configurations are discussed in the text with two different dynamical cores and vertical resolutions: Finite Volume 32 Levels (A, B) and 58 Levels (E, F) as well as MPAS 32 levels (C, D) and 58 levels (G, H). The right column shows differences between the simulation and ERA-Interim reanalysis climatology.

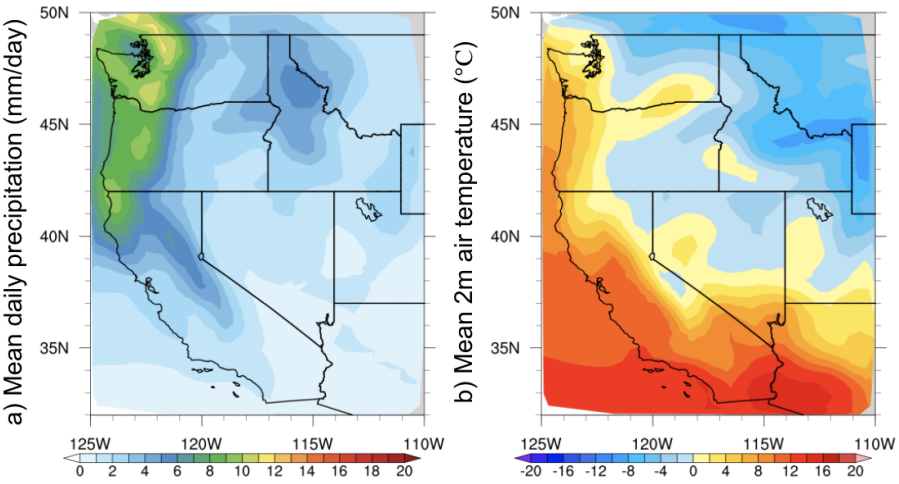

Figure S6: Mean daily precipitation (a) and 2m air temperature (b) in SIMA-MPAS (60km) (averaged over 2000-2002, Nov-March)

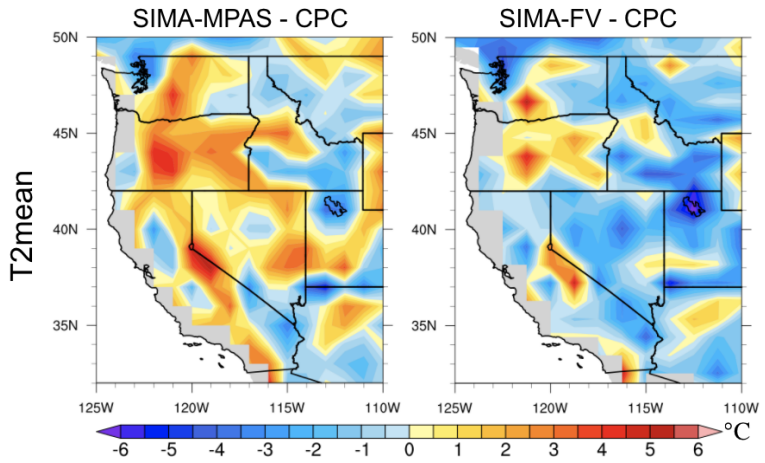

Figure S7: Mean 2m air temperature (T2mean) results from the SIMA-MPAS and SIMA-FV with F2000 climatology at ~1 degree grid resolution vs. the CPC observation data (Here, simulation results are the five-year mean for the season climatology from Nov. to March; The CPC observation is retrieved for the year 2000 from Nov. to March).

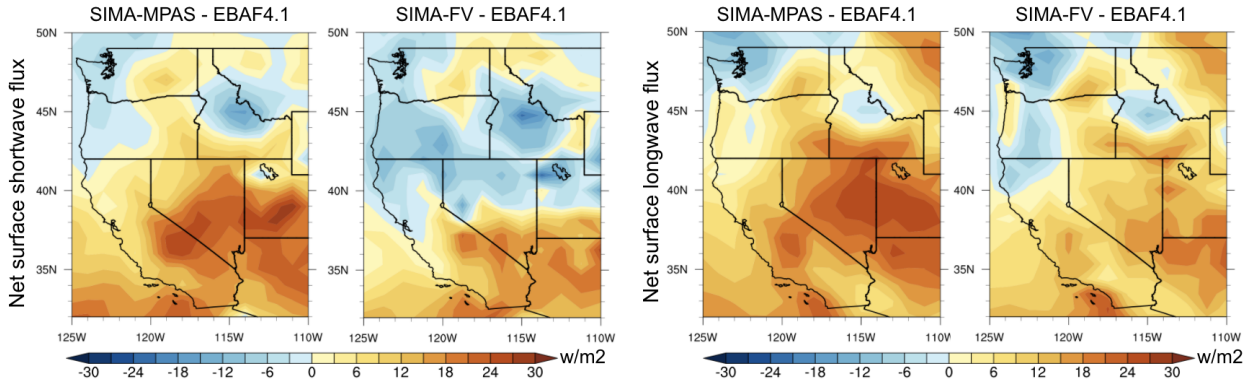

Figure S8: Mean net shortwave and longwave fluxes results from the SIMA-MPAS and SIMA-FV with F2000 climatology at ~1 degree grid resolution vs. the EBAF observational data (Here, simulation results are the five-year mean for the season climatology from Nov. to March; The EBAF 4.1 observation is retrieved for the year 2000 to 2001 for Nov. to March as the observation data is only available for the date from March 2000).

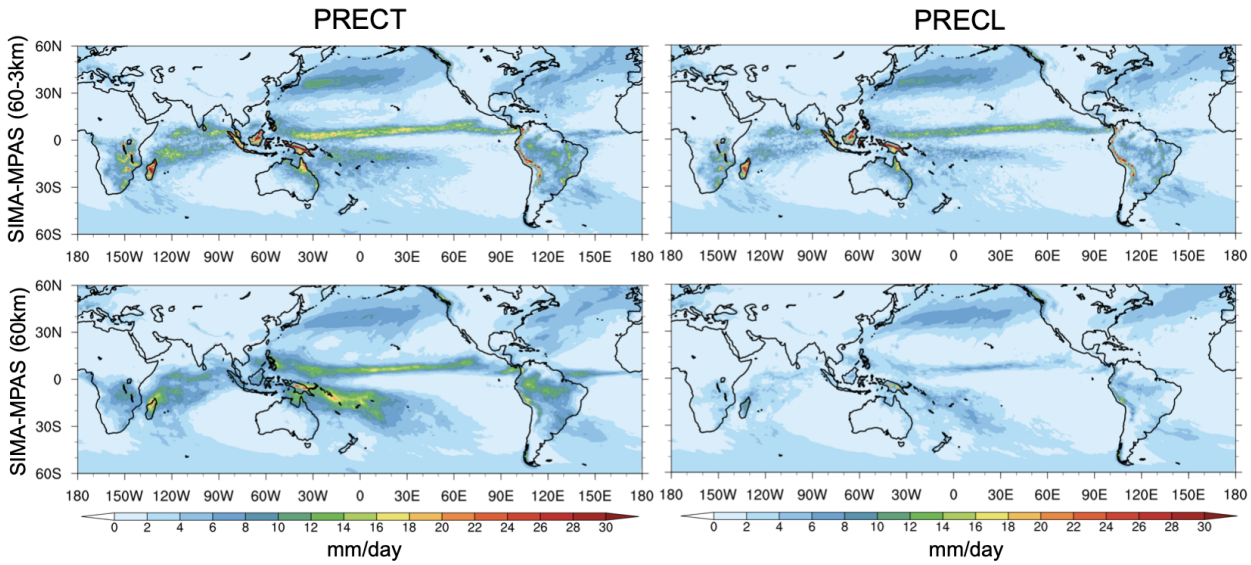

Figure S9: Mean daily total precipitation (PRECT) and the large-scale precipitation (PRECL) from the results of SIMA-MPAS 60-3km and SIMA-MPAS 60 km (averaged over 2000-2002, Nov-March).