Enhancing Single-Precision with Quasi Double-Precision: Achieving Double-Precision Accuracy in the Model for Prediction Across Scales-Atmosphere (MPAS-A) version 8.2.1

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Supplementary Information

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model
├─── DBL   --benchmark using double precision
├─── SGL  --control test using single precision
└─── QDP  --control test using single precision and quasi double-precision algorithm

test
├─── c2_DBL--benchmark using double precision. (The Jablonowski and Williamson baroclinic wave test case)
        ├─── atmosphere_model        -- run the model
        ├─── bwave_surface_p.ncl      -- script to produce plots of surface pressure and kinetic energy
        ├─── init_atmosphere_model  --run to create initial conditions
        ├─── namelist.atmosphere      --namelist options available when running the MPAS
        ├─── namelist.init_atmosphere --namelist options available when running the MPAS initialization
        ├─── README
        ├─── stream_list.atmosphere.output –the output of MPAS
        ├─── streams.atmosphere --the XML stream configuration file for an MPAS
        ├─── streams.init_atmosphere --The XML stream configuration file for an MPAS initialization
├─── c2_SGL--benchmark using double precision.
├─── c2_QDP--benchmark using double precision.
├─── c5_DBL--benchmark using double precision. (The super cell)
├─── c5_SGL--benchmark using double precision.
├─── c5_QDP--benchmark using double precision.
├─── c7_240km_DBL--benchmark using double precision. (The real data)
├─── c7_240km_SGL--benchmark using double precision.
├─── c7_240km_QDP--benchmark using double precision.
├─── c7_120km_DBL--benchmark using double precision.
├─── c7_120km_SGL--benchmark using double precision.
├─── c7_120km_QDP--benchmark using double precision.
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Figure S1. The code layout of the research. The model part represent the model code including benchmark using double precision(DBL), control test using precision and control test using single precision(SGL) and quasi double-precision algorithm(QDP). The three models are run separately in 4 tests includes the Jablonowski and Williamson baroclinic wave test case, super cell, real data with 240km and real data with 120km. All configurations can be found in the test file. Only the case 7 use the GFS data, it can also be found under folder case7. Model code and plotting data related to this manuscript is available at: https://doi.org/10.5281/zenodo.13765421.