Sectional Cloud Model for CESM2 (CESM2-CARMA Cloud)

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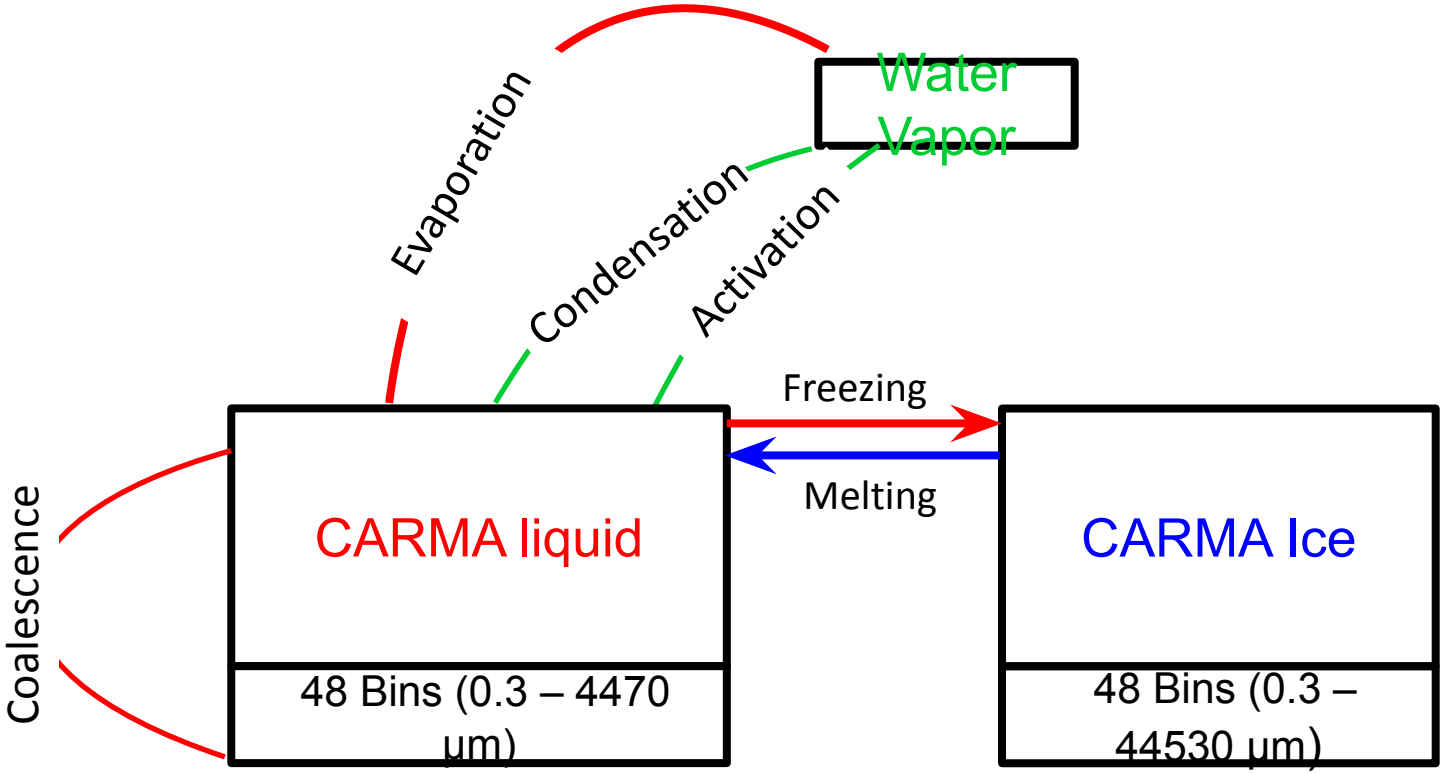
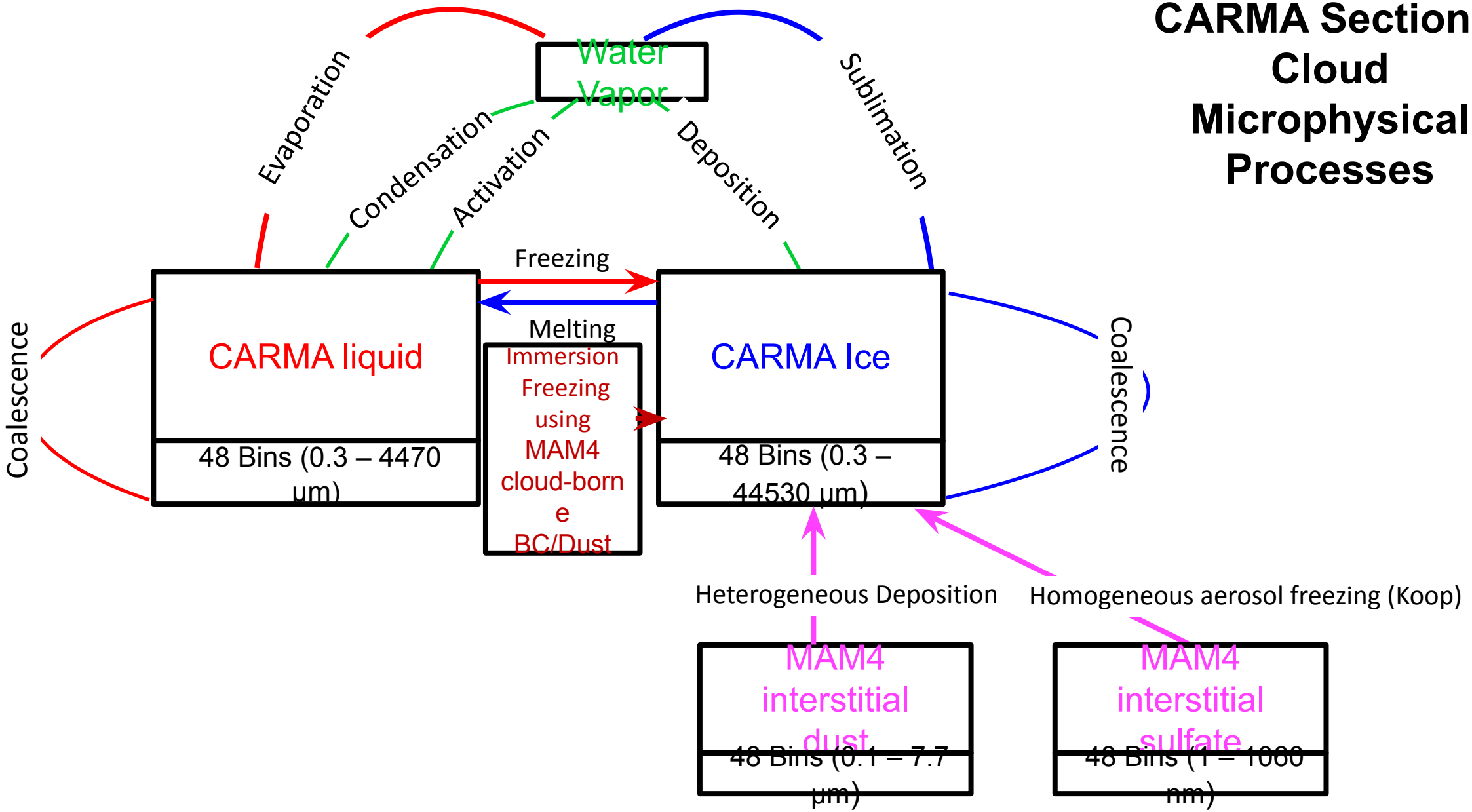
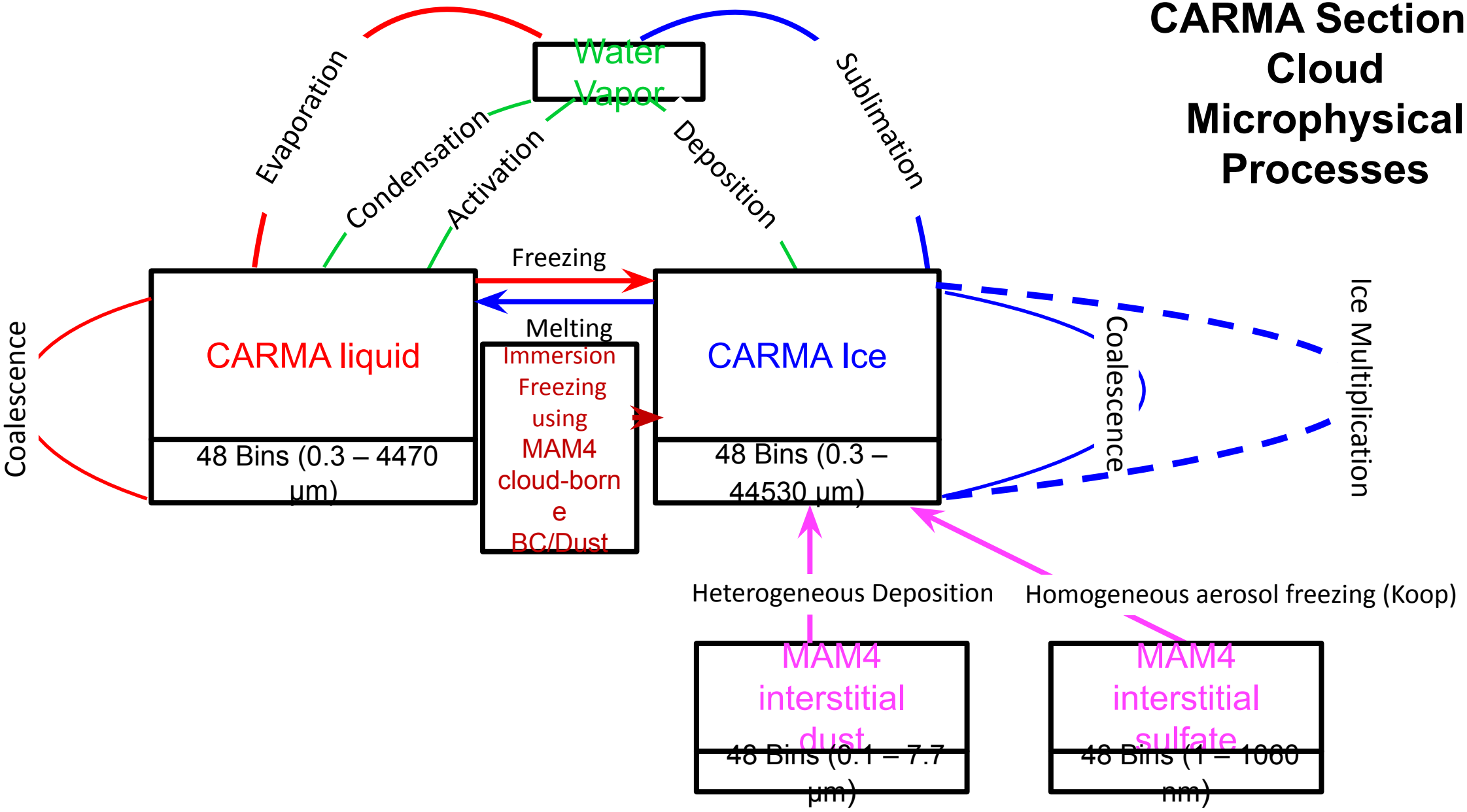
CARMA Sectional Cloud Microphysical Processes



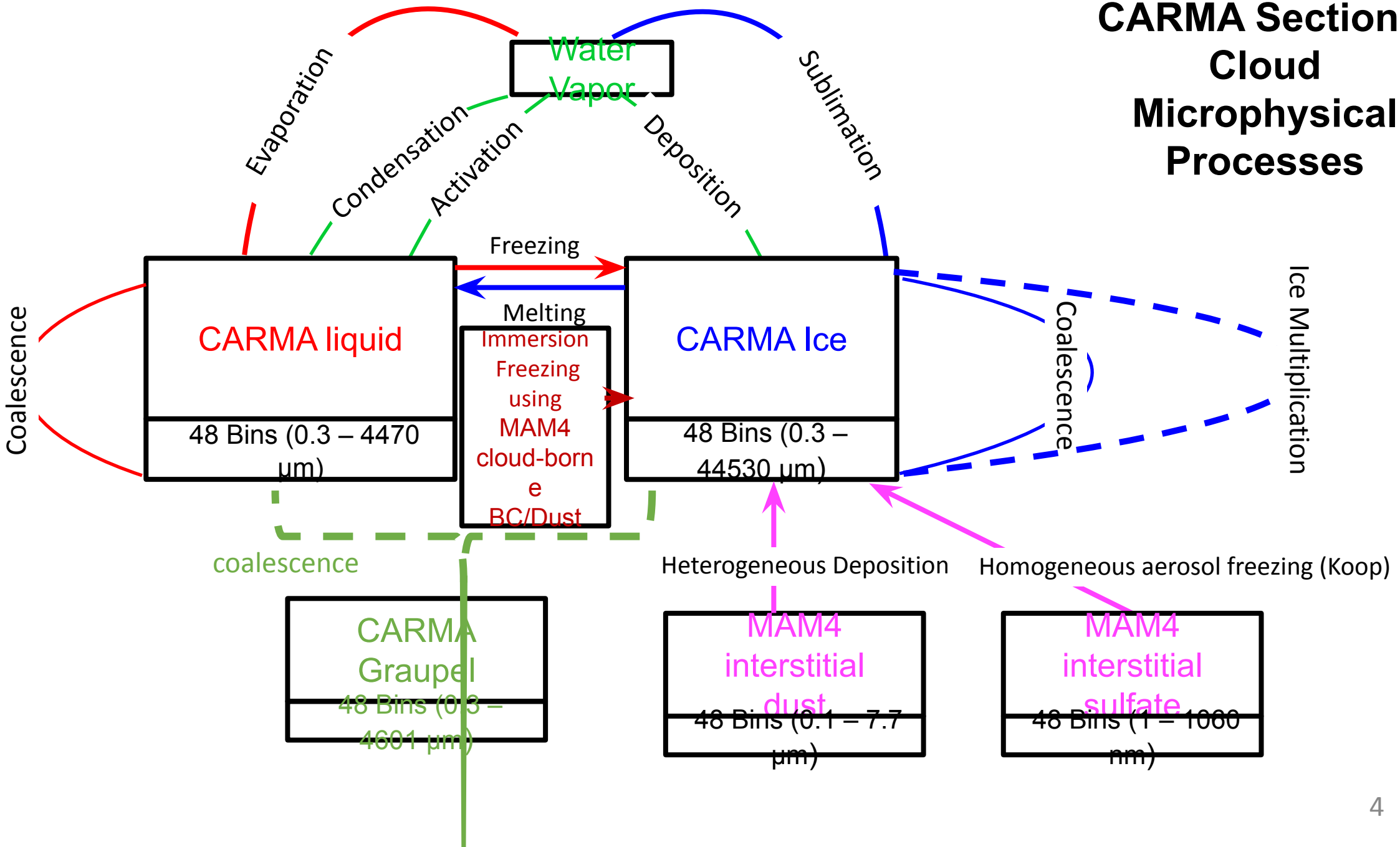
CARMA Sectional Cloud Microphysical Processes



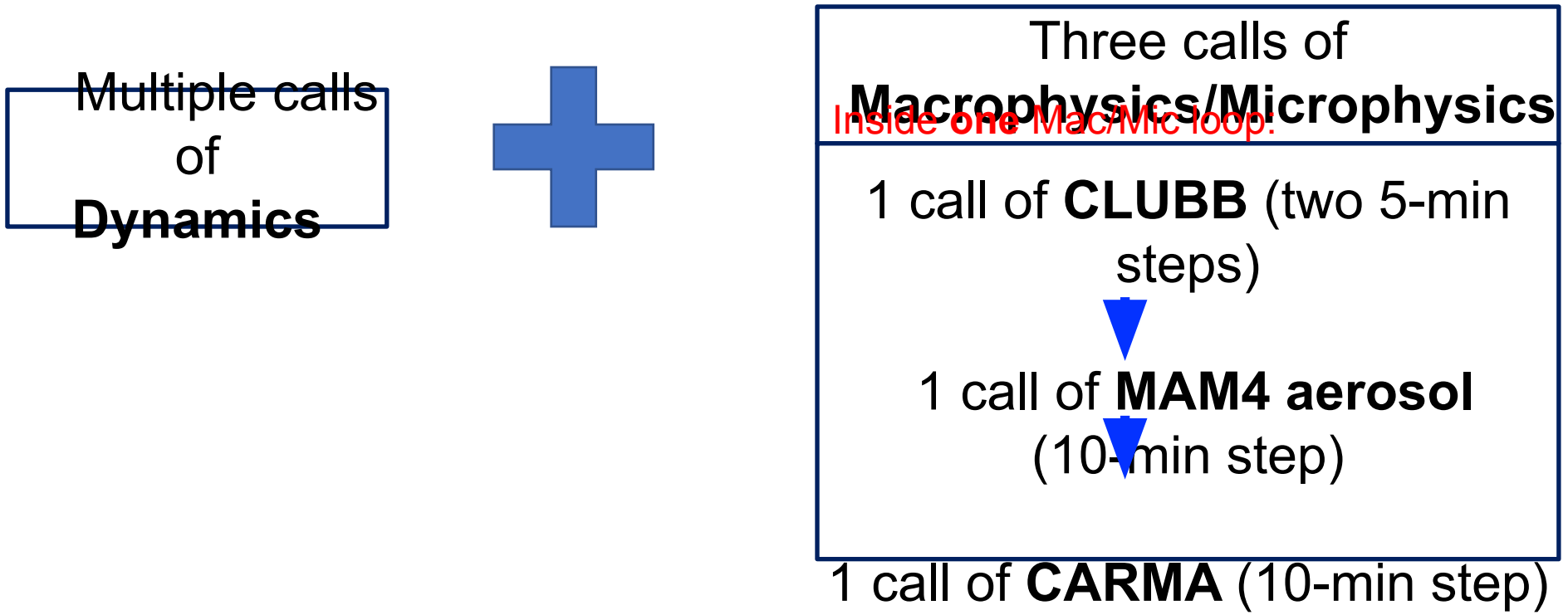
CARMA Sectional Cloud Microphysical Processes



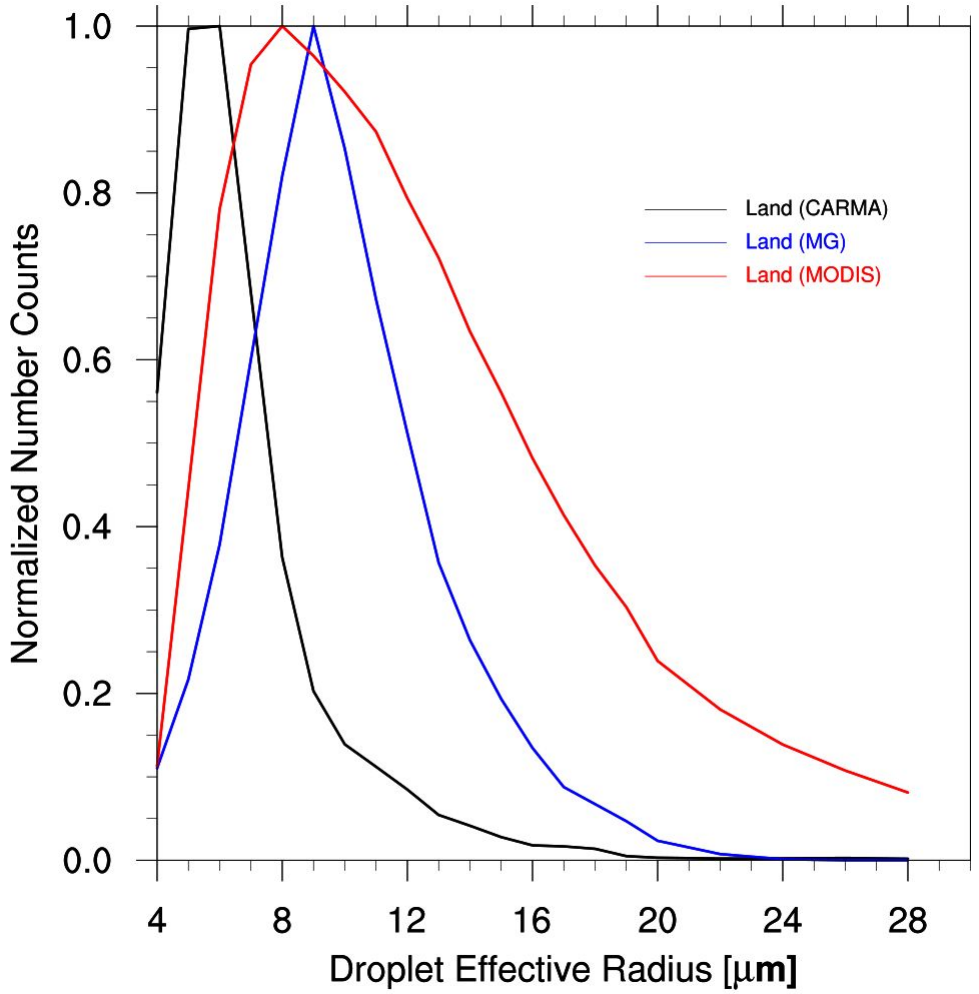
CARMA Sectional Cloud Microphysical Processes

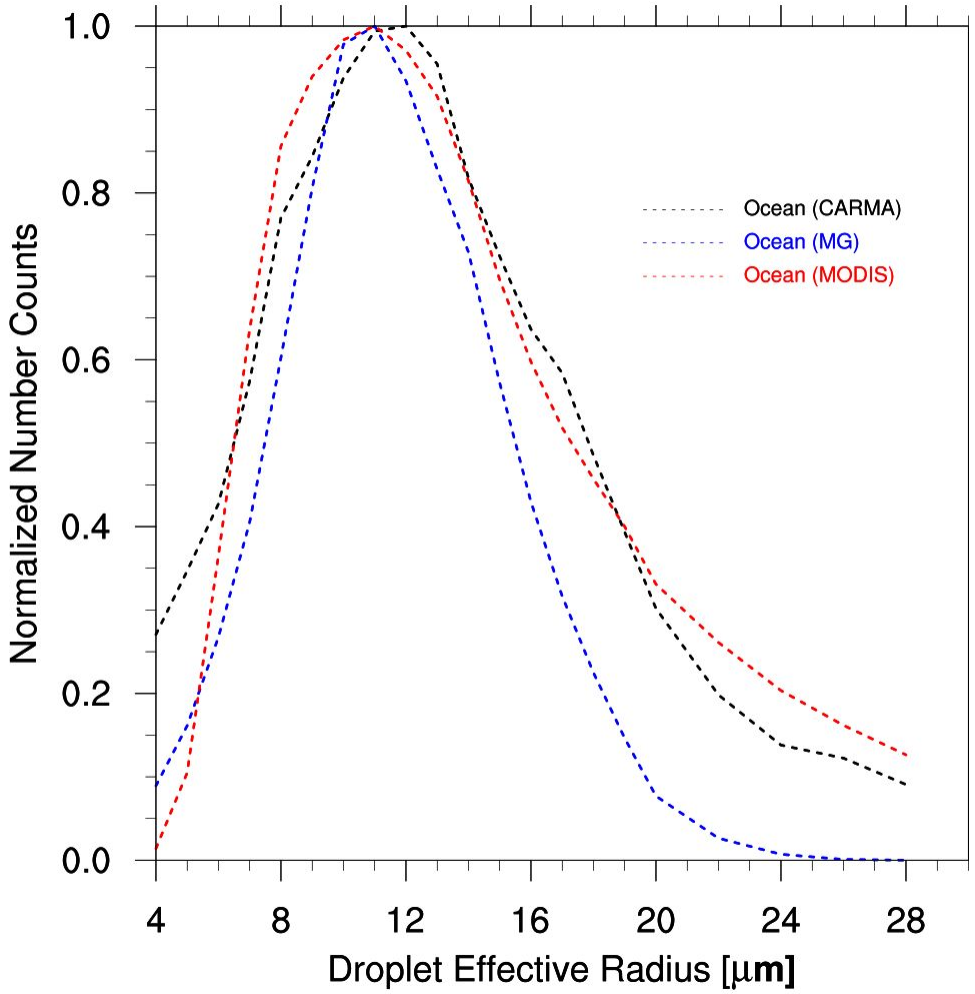


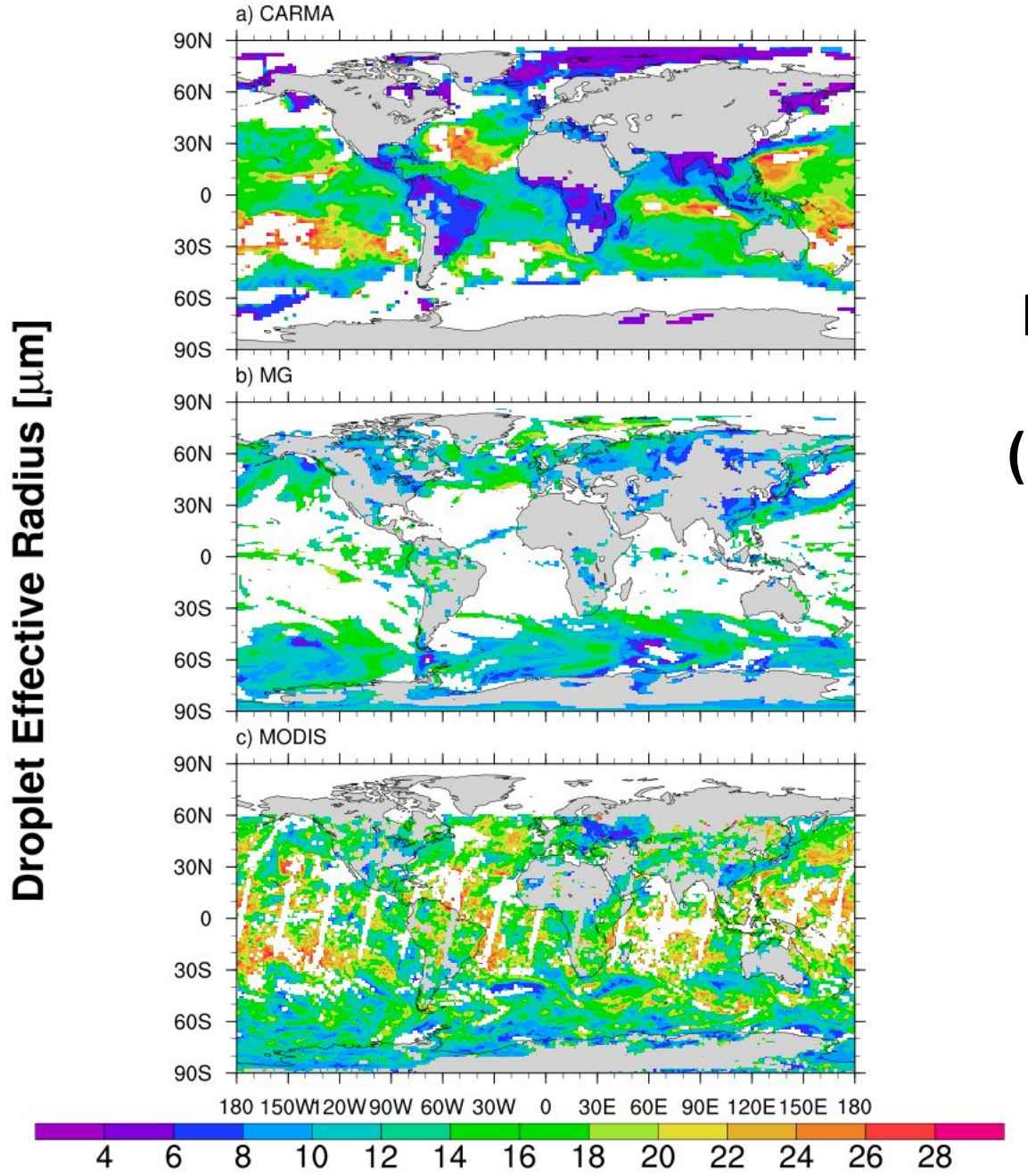
Sequence of Calling over 30 min



Droplet Effective Radius PDF [≤ 30 μm] (CARMA-MG-MODIS, 01/15/2008)

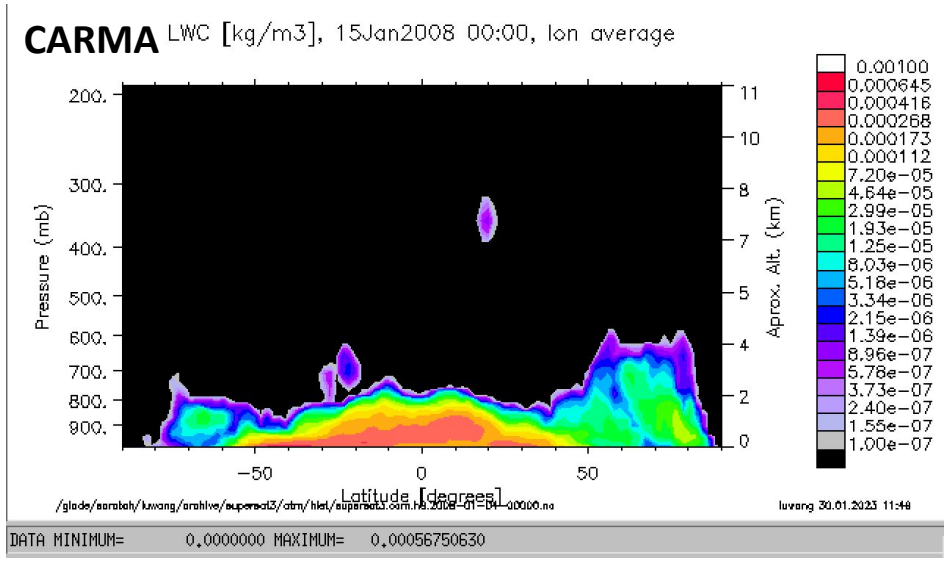


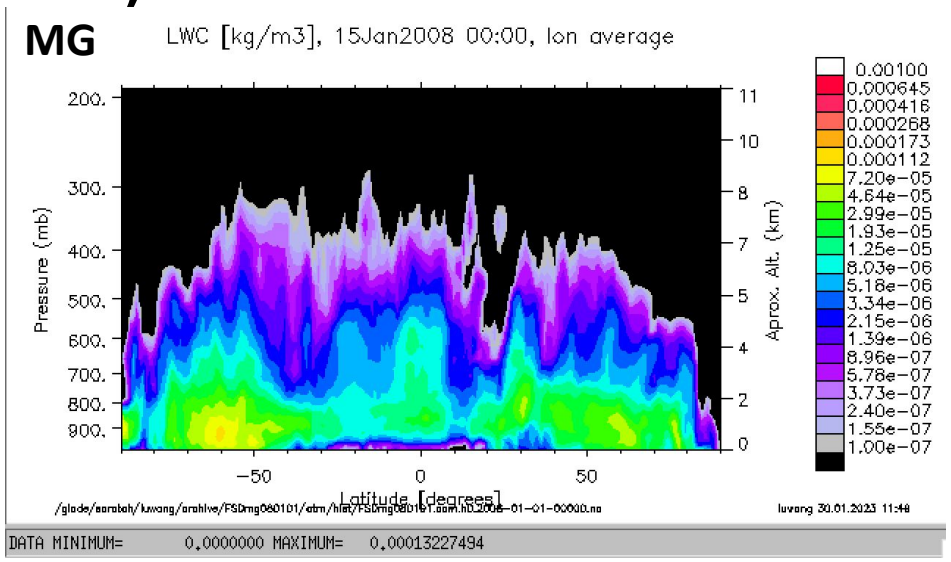


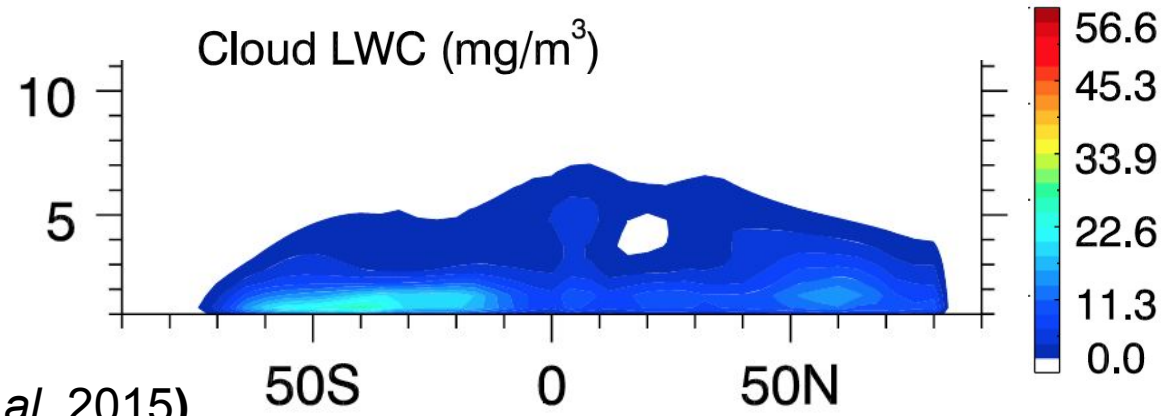


Droplet Effective Radius Map [≤ 30 μm]
(CARMA-MG-MODIS, 01/15/2008)

LWC [kg/m^3](CARMA vs. MG, 01/15/2008)

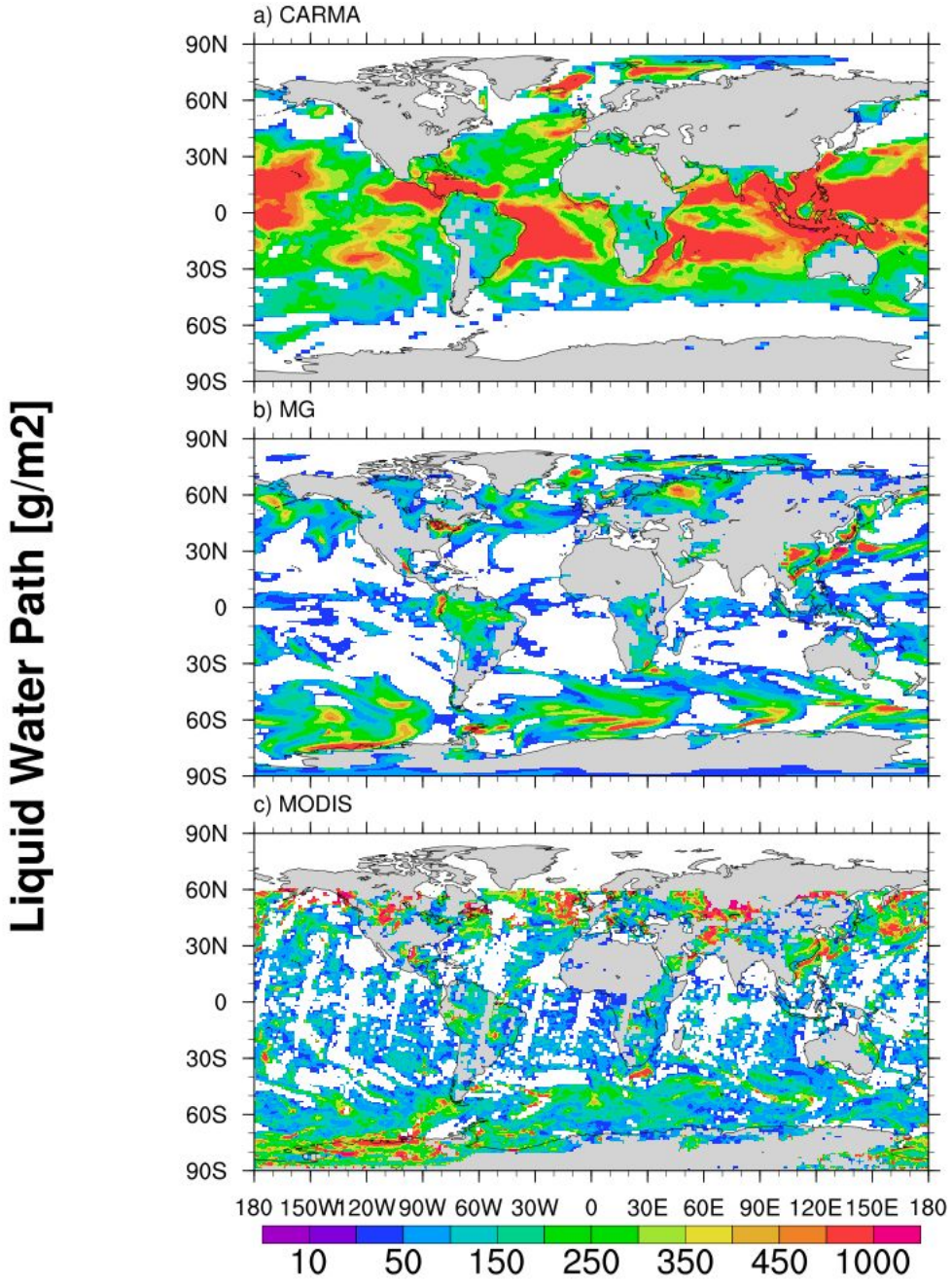


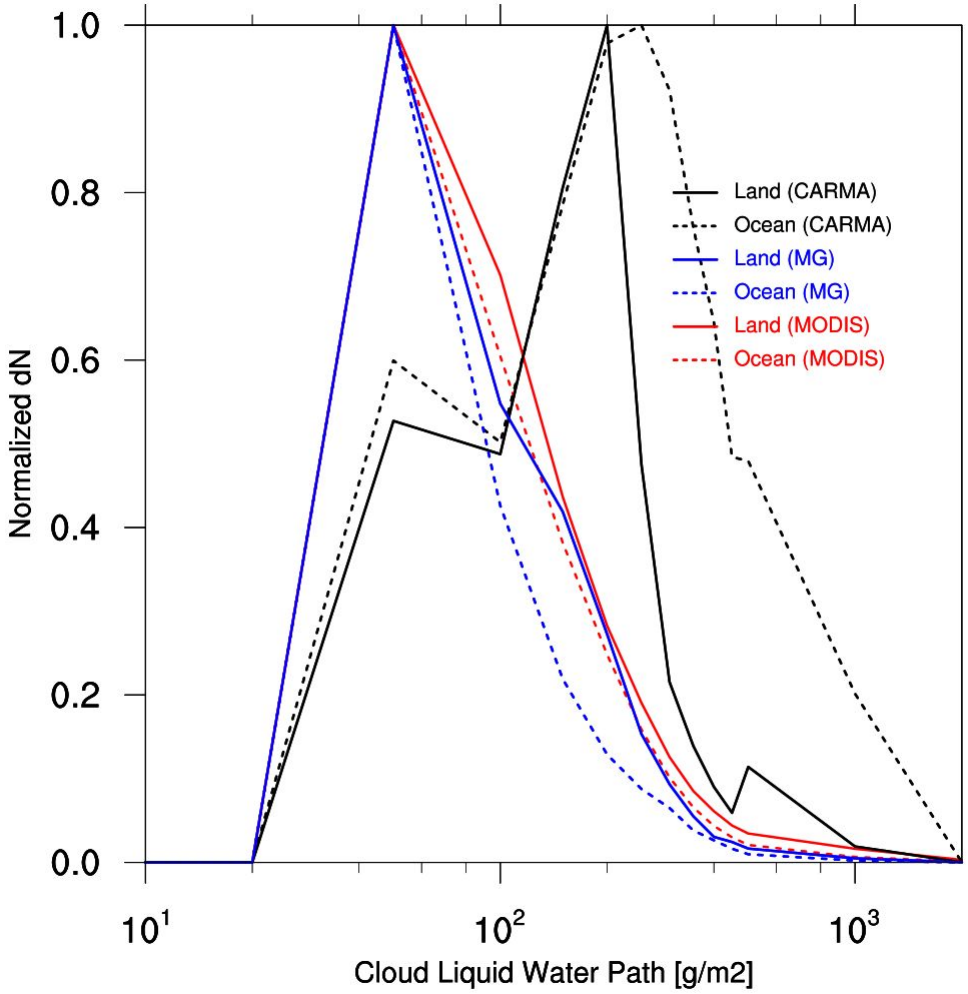




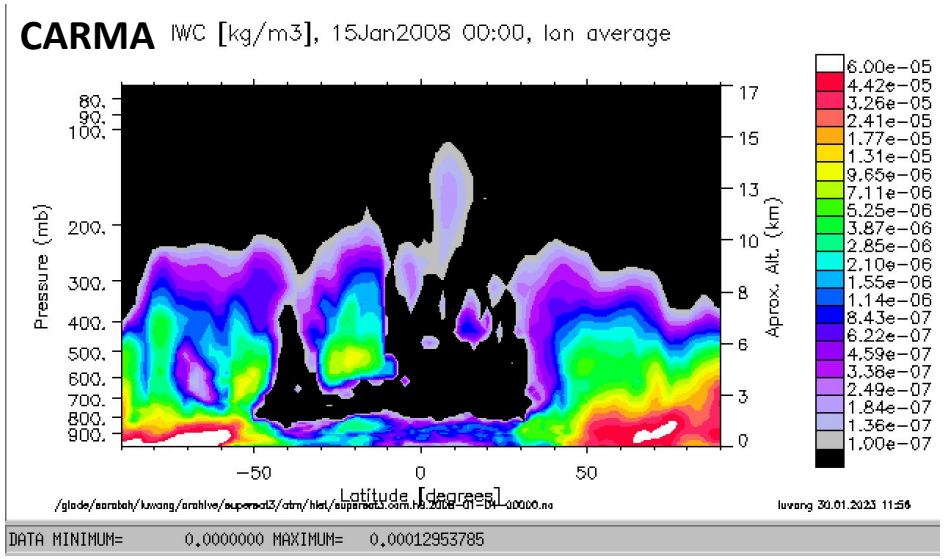
(Huang *et al*. 2015)

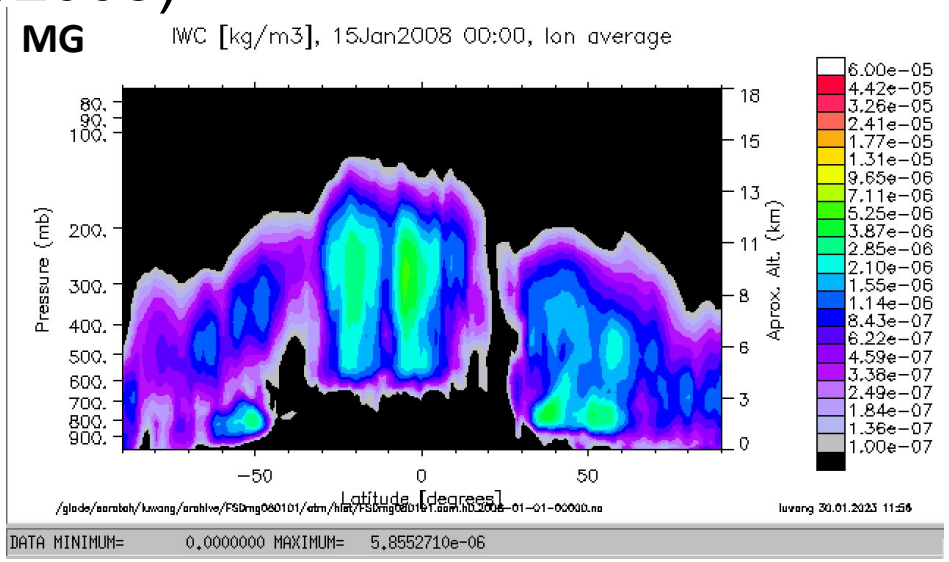
Liquid Water Path [g/m^2] (CARMA-MG-MODIS, 01/15/2008)



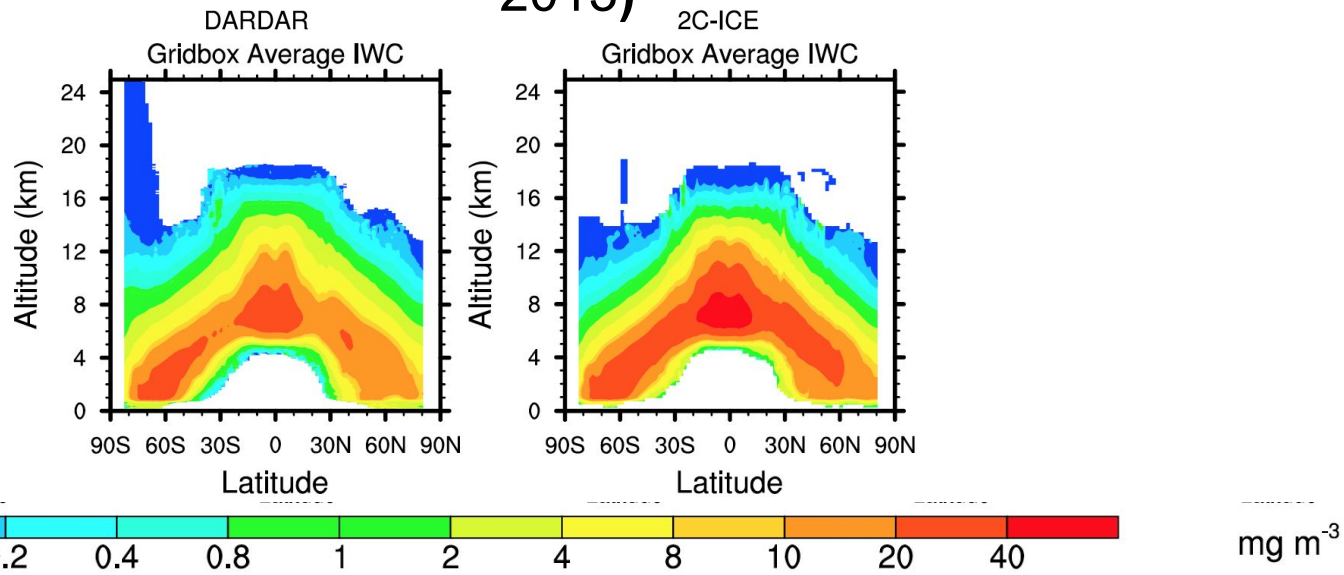


IWC [kg/m^3](CARMA vs. MG, 01/15/2008)

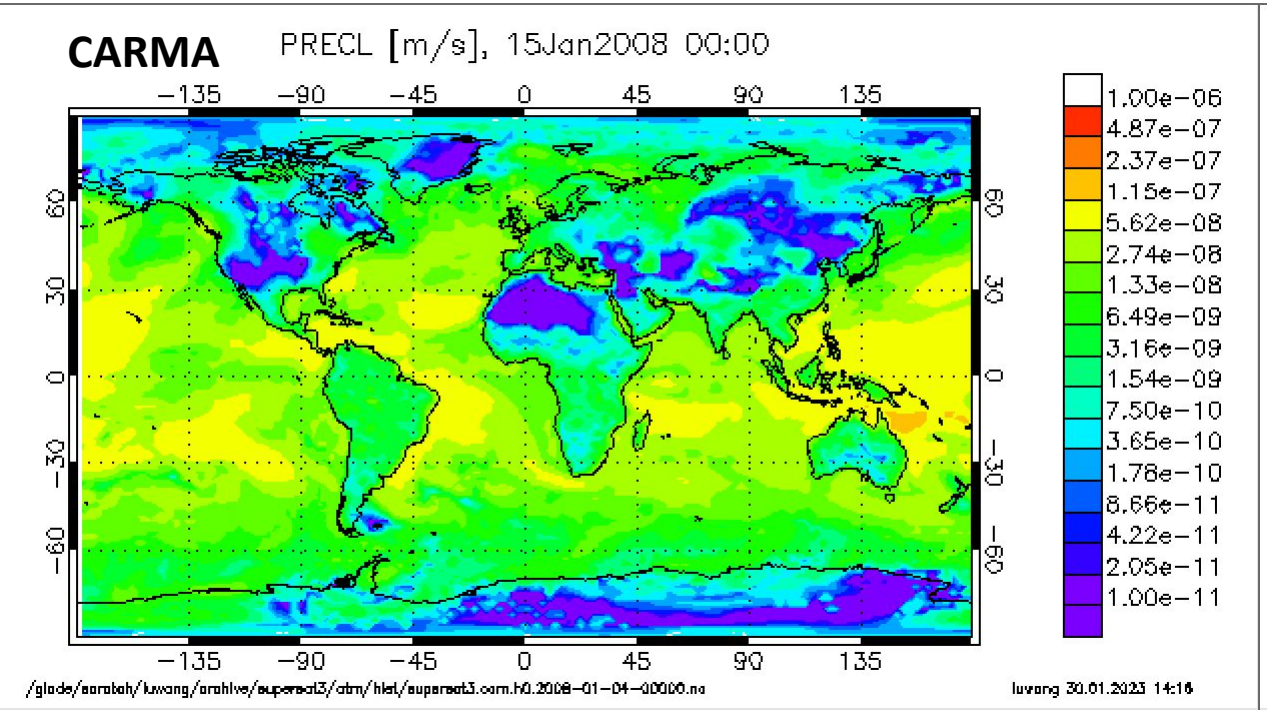


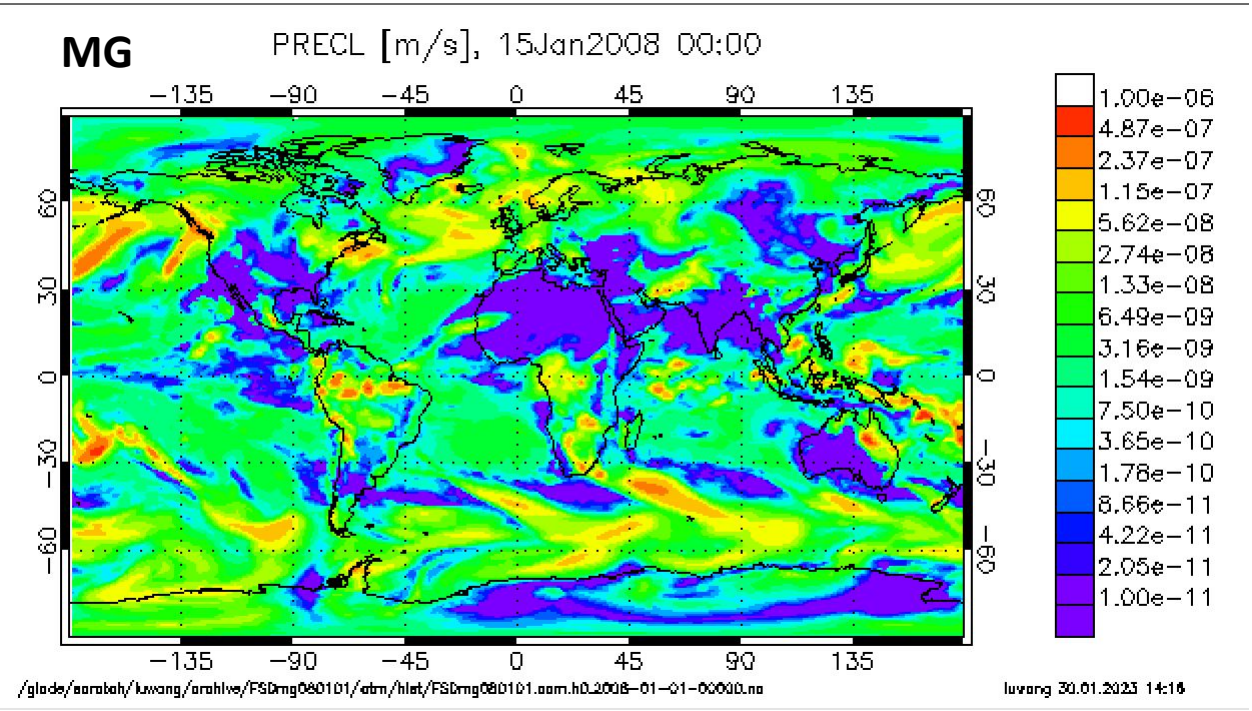


IWC [mg/m^3] (Bardeen *et al*. 2013)



PRECL (large-scale, from the microphysics) **(CARMA vs. MG, 01/15/2008)**





Conclusions & Ideas of Improvement

1. For liquid droplets, we have expanded the size range to drizzle and rain drop sizes. We solve the coagulation equation directly instead of using autoconversion. The water droplet simulation looks better over ocean than over land.

2. The modal aerosol/CARMA activation process produces too many droplets.

3. Tropical deep convection appears to collapse over time.

4. Planning to add ice multiplication for CARMA ice in the near future.

5. CESM2/CARMA is several times slower than CESM2/MG, but it is designed for better microphysics.