History and Main Use of GFDL-SCM

- Development started more than a decade ago.
  - Originally following AM2 (GFDL-GAMDT 2004).
  - Currently following AM4 (Zhao et al. 2018a, 2018b).
- ~10 people have been involved with the SCM at some point.
  - Based on research need, not as main duty.
- Mainly used during the initial stage of new physical scheme implementation.
  - Small computational cost, well-controlled large-scale and forcing conditions => Easier to identify bugs and problems.
  - Currently used for testing the turbulence and convection schemes (e.g., EDMF, CLUBB)

Around 10 available cases in GFDL-SCM

- Simpler cases: the forcing is hard coded and case-specific.
  - Dry convective boundary layer: DCBL (Siebesma et al. 2007);
  - Continental shallow cumulus: ARM (Brown et al. 2002);
  - Marine stratocumulus: DYCOMS-II (Stevens et al. 2005, Ackerman et al. 2009);
  - Trade shallow cumulus: BOMEX (Siebesma et al. 2003); ATEX (Stevens et al. 2001); RICO (vanZanten et al. 2011).
- More complicated cases: the forcing is read in from the variational analysis (VARANAL) datasets in ASCII or NetCDF.
  - VARANAL format: Zhang and Lin 1997, Zhang et al. 2001.
  - Tropical warm pool deep convection: TWP-ICE (Davies et al. 2013).
  - Midlatitude continental convection: MC3E (Jensen et al. 2016).
  - Arctic clouds: MPACE (Klein et al. 2009).

General Thoughts about SCM

- It is somewhat challenging to connect good SCM results with good GCM performance.
  - It may be helpful to have more available SCM cases to cover a larger range of atmospheric conditions.
  - It may also be helpful to allow for some interactive coupling to the large-scale forcing, so that SCM does not fall into an unphysical or multiple equilibrium.
- A unified format for SCM case configuration would be useful.
  - This would facilitate running SCM across different conditions and comparing with other SCMs, LES, and observation.

Thank You!