

Running the Single Column Version of GFS with IOP Forcings

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Main Goals at this stage

- Write an interface to the GFS Single Column Model (SCM), designed by Riuyu Sun, to allow it to take initial conditions and forcings from various Intensive Observing Periods (IOPs) instead of from the 3D GFS model.
- IOPs I'll use in the future: BOMEX (shallow Cu) ASTEX (Lagrangian IOP in the Azores region), idealized Scu to shal Cu in NE Pacific.
- I start with a very simple IOP: a dry convective boundary layer (DCBL).
- First: some details on technical issues I've dealt with so far.

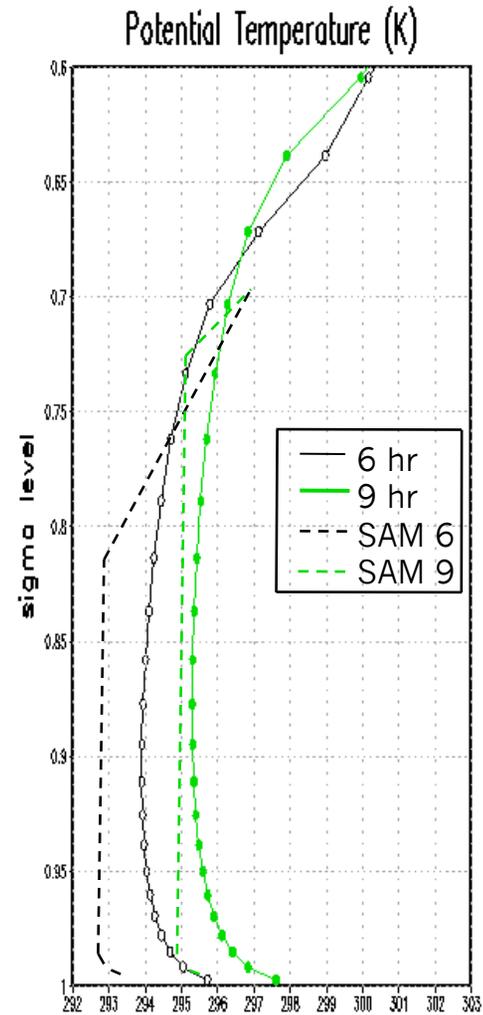
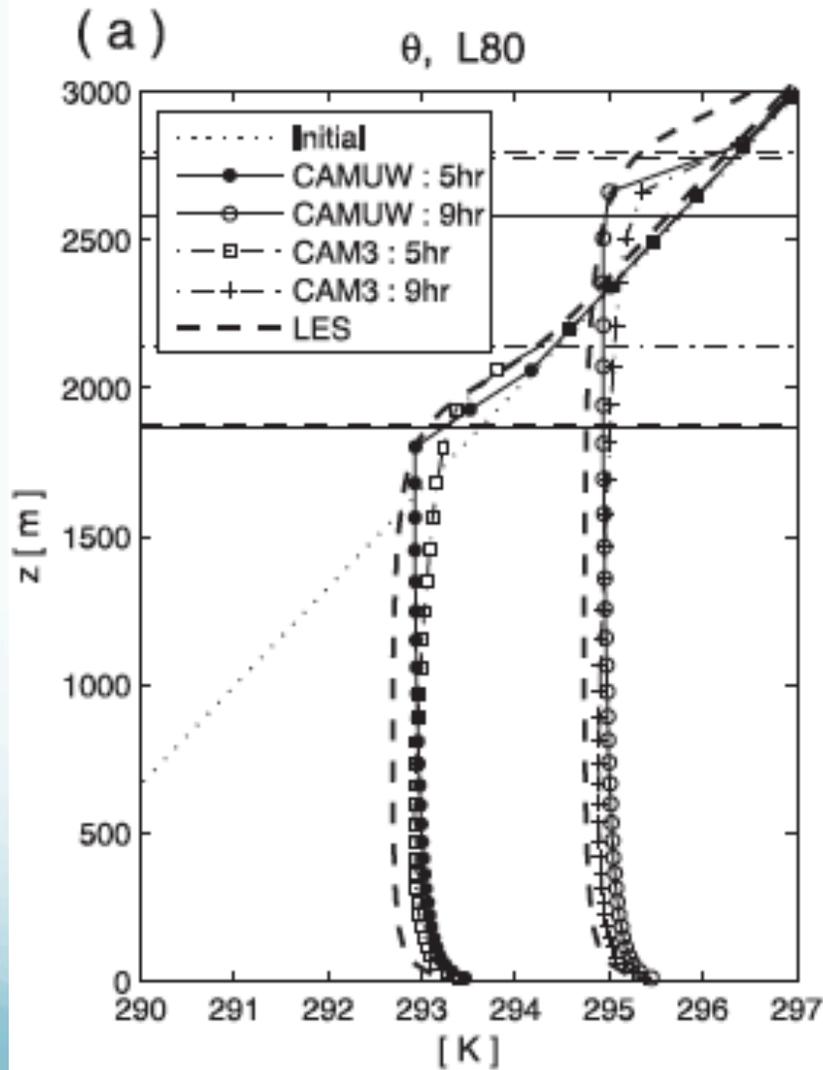
Technical Details

- What the interface needs to accomplish
 - A. Read in Netcdf forcings designed for SCAM or SAM (cloud-resolving model).
 - B. Interpolate the forcings to the GFS 64 level vertical grid.
- What have been my challenges
 - Getting familiar with the model! I plan to write up some documentation or flow chart to help future single column-modelers with this part.
 - Learning Fortran 77 and GrADS, the software used to look at model input and output.
 - An unknown: does the SCM interpolate time -varying forcings in time? Right now the setup is for constant forcings.

Dry Convective Boundary Layer Case

- I haven't yet written the new interface, so for the DCBL case I simply hard-coded the initialization and forcings into the file that would normally open the data files and send them to the SCM.
- This is easy for DCBL because almost everything is zero!
 - No winds, no tendencies, no moisture, no radiation.
 - Just an initial temperature profile and constant surface sensible heat flux of 300 W m^{-2} . (The same as in Bretherton and Park, 2009.)

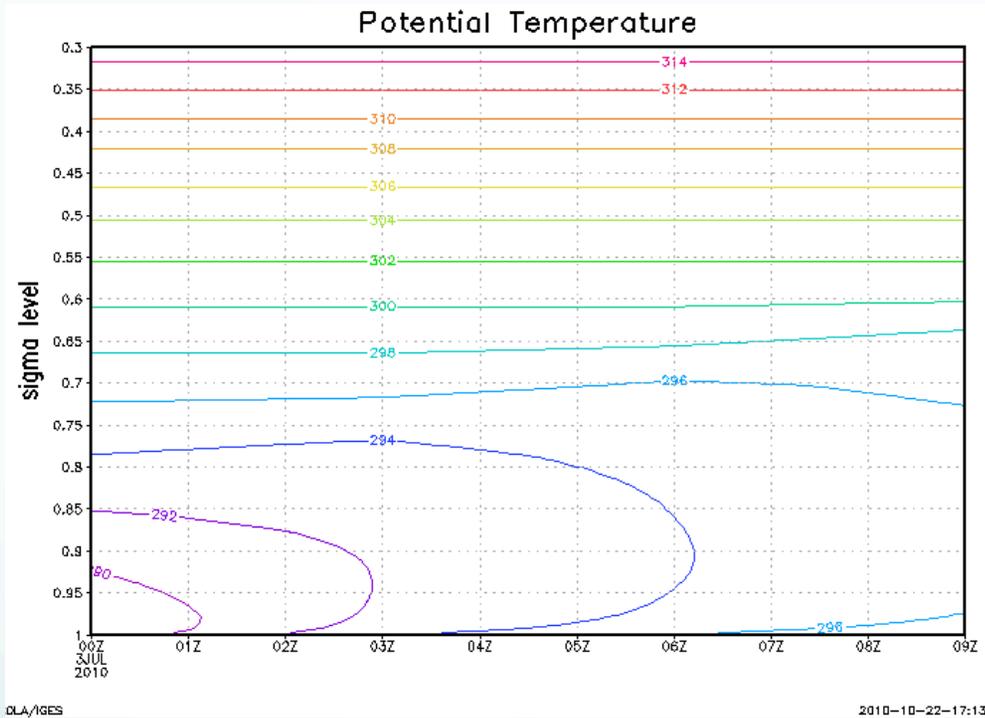
First 9 hours of DCBL case



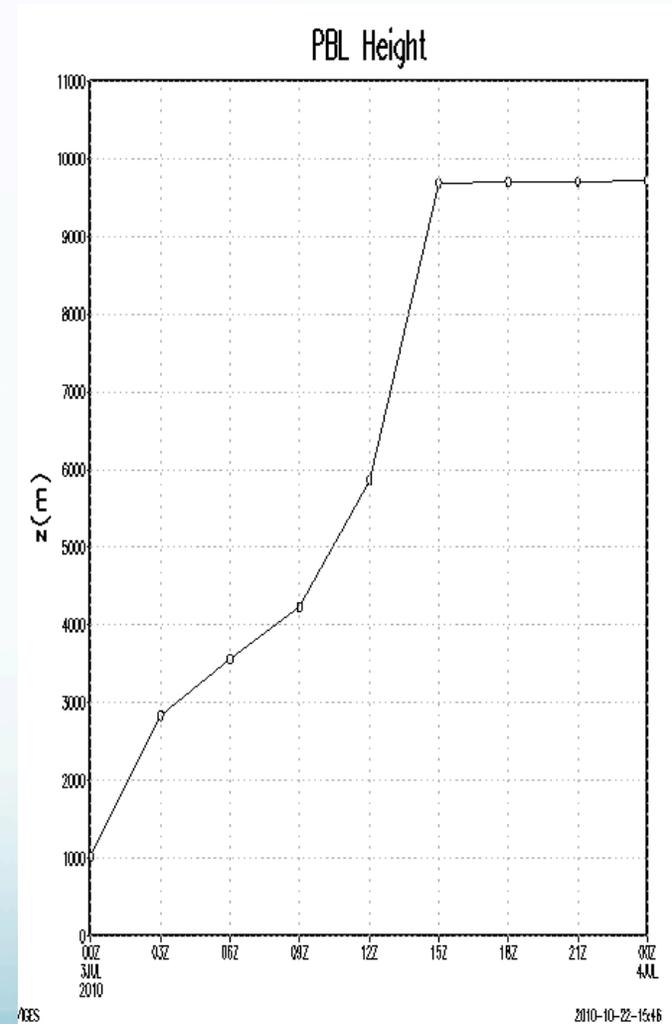
From Bretherton and Park, 2009

GFS SCM simulation

First 9 hours of DCBL case



After about 9 hours the PBL height shoots way up!
At this point other things start going wonky too...



Conclusions

- Setting up the kludgy DCBL case has given me a better sense of how I will write the interface for general IOP forcings.
- The model's strange behavior after 9 hours of simulation is probably due to an error in how I wrote in the forcings, though I am interested to know if something in the PBL scheme could be contributing.