Use DTDM to plan and conduct an experiment concerning the sea-breeze circulation (SBC). You may do one of the following examples, or design your own experiment. As before, you should start with a prediction/hypothesis, plan a set of simulations to test the hypothesis, and conclude with an evaluation of the hypothesis. As before, you can work in teams of two if you wish, and deliver the report to me in PowerPoint or Keynote format. **Don’t be afraid to be quantitative!**

Some possible experiments using `surface_flux`, as in `input_sbf_no_rolls.txt`. You may want to make the domain deeper (increase `nz`) and/or run the model longer (`timend`).

- Vary the stability of the environment (in `environ`), the land-air surface temperature difference `tdelt` and/or the heat exchange coefficient `cdh` and assess influence on sea-breeze circulation strength, timing, inland penetration or lifting at the sea-breeze front (SBF).

- Impose a mean onshore or offshore wind (by making `usurf` nonzero) and assess influence on sea-breeze circulation strength, timing, inland penetration or lifting at the SBF. You can add shear by manipulating `shear1`, `shear2`, `shear3`, `sdepth1`, `sdepth2` with or without a nonzero `usurf`.

- Characterize the development of the SBC with respect to accelerations and dynamic and buoyancy pressure gradients. If you’re comfortable with manipulating the code, try adding surface friction to see if that helps. (I can assist with this; if you’re using Windows, you need to install g95 to remake the executable.)

- Is there any difference between anelastic and compressible SBC simulations? I wouldn’t expect the differences to be significant.

Some ideas for extending the Rotunno experiment (in `rotunno_seabreeze`), starting with `input_seabreeze.txt`:

- Run the model out longer (for several days) for a variety of experiments. How much of what we were seeing in class is contaminated by “spin-up” issues? Does the model reach a statistically steady state? If so, does it depend on the heat source magnitude or the latitude?

- Use DTDM’s tools and your physical intuition to explain why the timing of the maximum onshore flow varies with latitude, or why there is no offshore flow in the linear model at the equator, or why the intensity of the circulation decreases poleward.

- Assess the effect of linearity on the results by running nonlinear versions of the experiments.
• Compare to data, collected from observations or taken from a more dynamically sophisticated model. Is there a tendency for the summer sea-breeze onshore flow maximum to vary with latitude?