

Write up for Gill, 1980

Due: Tuesday, 20 February, 2007

Read the following paper, and summarize its major results:

Gill, A. E., 1980: Some simple solutions for heat-induced tropical circulation. *Q. J. R. M. S.*, **106** 447-462.

As you are reading, consider the following questions:

1. What is the physical situation (in the vertical and horizontal) that Gill has in mind when calculating steady solutions to constant forcing? In what other physical situations (e.g. in the ocean as well as the atmosphere) might this model be valid?
2. What might be some limitations to Gill's interpretation? Why might the model be deficient?
3. What is the advantage to using the variables q and r in Eqns. 3.1 and 3.2? How do these variables simplify the interpretation of the forced response (e.g. Eqns. 4.6 and 4.5)?
4. Why is the response to symmetric heating elongated to the east (compared to the west) of the forcing region? What sets the horizontal extent of this response to the east and to the west? On a related note, why is there no response to the east of the forcing region for asymmetric forcing?
5. For the asymmetric solution, how are the surface winds collocated with the heating region? We will see that heating is often parameterized as $Q = K_q T$ where T is the sea surface temperature. Given a mean easterly flow, and the bulk formula for evaporation, what does this collocation imply about how the surface winds might feed back onto the SST?