## MR3252: Tropical Meteorology

Paper Summary for Holloway and Neelin (2010): Please answer the following questions with as much detail as possible. Your answers may be in paragraph form or list form as appropriate.

1.	What were the authors' primary research questions and/or hypotheses?
2.	What motivated the authors to conduct this study?
3.	What is column water vapor?
4.	How did the authors execute this research? What data did they use? What models, if any, did that they run? How did they use these data and models? In other words, what was the experimental design?

5.	What are some potential key limitations in this study, including those that were explicitly mentioned in the article?
6.	What were the article's central conclusions? How did they relate to the primary research questions and/or hypotheses? (i.e., If possible, match a conclusions or set of conclusions to each research questions and/or hypothesis.) In your answer, include at a minimum details about the relationship between free tropospheric humidity and updraft mass flux. NOTE: Some of the answers might get repeated some in answers to the below questions, so read all the questions first then think about your answers. You don't need to repeat the same material across different answers. Combine questions if you feel it is appropriate.
7.	Why does the phase change to ice provide additional buoyancy to updrafts in the upper troposphere?
8.	In figures like Fig. 7 and Fig. 8, what does a positive virtual potential temperature difference mean?

9.	What cloud-scale process are the authors trying to parameterize by controlling mixing profiles?
10.	Attempt to describe the results of the paper in terms of a "tipping point" or "criticality" past which deep convection can occur, but below which deep convection is inhibited. What are three processes that the authors attribute to favoring convection passing this tipping point?