This study documents BNU-ESM's setups and performance. As the authors mentioned, BNU-ESM has participated in CMIP5 and its results have been analyzed in many studies. A thorough documentation like this study would be beneficial and relevant to the climate science community and GMD's readers. I recommend its publication after some revisions.
Along the line of publishing a through documentation for the scientists that analyze CMIP5 data and the model developers in other centers, I have a few suggestions that hopefully would further improve the manuscripts:

1. Before evaluating BNU-ESM's internal variability, a systematic analysis of mean state would be helpful. In the current manuscript, only surface temperature and precipitation over the ocean are shown. In order for the readers to compare BNU-ESM's performance with those in other models, more fields are required. A good reference for thorough evaluation would be Chapter 9 in the IPCC report (Flato et al. 2013), which includes annual mean surface air temperature, precipitation (over land and ocean), shortwave and longwave cloud radiative forcing, and the seasonality of surface air temperature. Trenberth and Fasullo (2010) also show some great figures that demonstrate models biases in terms of annual mean and seasonality.

2. Following the previous comment, comparing with figures in Flato et al. 2013, there are some biases in BNU-ESM that are commonly shared in many other CMIP5 models, whereas some biases seems to be unique in BNU-ESM. The authors have identified some of these in the text; however, it would be worth elaborating more. A few features that catch my eyes:
(1) Most models have SST over Southern Ocean being higher than those in observations. However, BNU-ESM has cold biases in the region. The authors have mentioned two possible reasons: ACC strength and clouds. It would be helpful to show shortwave cloud radiative forcing biases. A band of excessive precipitation over Southern Ocean (and east of South America) seems to be related with this cold bias, whereas other models have deficient precipitation in the region.
(2) There are a few different aspects of the double ITCZ problem, and the current manuscript doesn't articulate this clearly. Some models simulate too much precipitation off equator (in both NH and SH) and too little precipitation at the EQ, but BNU-ESM only shows significant excessive precipitation at around 5N. The SPCZ being to equaterward and too horizontal is another aspect of the double ITCZ problem, which appears in BNU-ESM and many other models. It would be helpful to articulate these similarities and differences comparing with other models, as the descriptions for AMOC in line 1~5 on page 1616. (A few references for the double ITCZ problem: Li and Xie 2014, Hwang and Frierson 2013, Lin 2007)

3. If the authors see fit, some comparisons (in terms of mean state) with CAM that have similar schemes as in BNU-ESM would be interesting for readers, as those in line 25 p. 1617. For example, how do changes in convection schemes affect clouds, precipitation, or SST?

4. Again, if the authors see fit, an analysis of monsoon would be very relevant. Base on Figure 1 & 2, the model seems to simulate monsoon pretty well. A monsoon index diagnostic (as in Flato et al. 2013, which follows kim et al. 2011) together with a 2-D map of temperature seasonality might be relevant to the paper, but this is a whole new set of analysis and I leave decision of including it or not to the authors.

5. p.1611, line 13, There "is" no land cover change ….

6. Figure 3 & 4, it might be worth showing values over land for readers that are interested.

7. In the sea ice section, similar to the major suggestion 2.2 above, it would be worth comparing Figure 6 with Figure 9.22 and 9.23 in Flato et al. 2013, especially that BNU-ESM has an ice scheme that's slightly different from CAM4.

Reference:

Flato, G., J. Marotzke, B. Abiodun, P. Braconnot, S.C. Chou, W. Collins, P. Cox, F. Driouech, S. Emori, V. Eyring, C. Forest, P. Gleckler, E. Guilyardi, C. Jakob, V. Kattsov, C. Reason and M. Rummukainen, 2013: Evaluation of Climate Models. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assess- ment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Trenberth, K. E., and John T. Fasullo. Simulation of Present-Day and Twenty-First-Century Energy Budgets of the Southern Ocean, Journal of Climate, 2010.

Li, G., and S.-P. Xie, 2014: Tropical biases in CMIP5 multi-model ensemble: The excessive equatorial Pacific cold tongue and double ITCZ problems. *J. Climate*, 27, 1765-1780.

Hwang, Y.-T. and D. M. W. Frierson. Link between the double intertropical convergence zone problem and cloud biases over the Southern Ocean. *PNAS*, 110. 4935-4940. 2013

Lin, Jia-Lin. The Double-ITCZ Problem in IPCC AR4 Coupled GCMs: Ocean–Atmosphere Feedback Analysis. *J. Climate*, **20**, 4497–4525. 2007

Kim, Hyung-Jin, Kumiko Takata, Bin Wang, Masahiro Watanabe, Masahide Kimoto, Tokuta Yokohata, Tetsuzo Yasunari, 2011: Global Monsoon, El Niño, and Their Interannual Linkage Simulated by MIROC5 and the CMIP3 CGCMs. *J. Climate*, **24**, 5604–5618.