Supporting Information for

Assessing and enhancing Noah-MP land surface modeling over tropical environments

Yanyan Cheng[1*], Kalli Furtado[1], Cenlin He[2], Fei Chen[3], Alan Ziegler[4], Song Chen[1], Matteo Detto[5,6], Yuna Mao[7], Baoxiang Pan[8], Yoshiko Kosugi[9], Marryanna Lion[10], Shoji Noguchi[11], Satoru Takanashi[12] Lulie Melling[13], Baoqing Zhang[14]

1 Centre for Climate Research Singapore, Singapore, Singapore

2 NSF National Center for Atmospheric Research, Boulder, Colorado, USA

3 Division of Environment and Sustainability, The Hong Kong University of Science and Technology, Hong Kong, Hong Kong, China

4 Faculty of Fisheries Technology and Aquatic Resources, Maejo University, Chiang Mai, Thailand

5 Department of Ecology and Evolutionary Biology, Princeton University, Princeton, New Jersey, USA

6 Smithsonian Tropical Research Institute, Panama City, Panama

7 State Key Laboratory of Earth Surface Processes and Resource Ecology, Faculty of Geographical Science, Beijing Normal University, Beijing, China

8 Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing, China

9 Laboratory of Forest Hydrology, Division of Forest and Biomaterials Science, Graduate School of Agriculture, Kyoto University, Kyoto, Japan

10 Forest Research Institute Malaysia, Kepong, Selangor, Malaysia

11 Tohoku Research Center, Forestry and Forest Products Research Institute, Iwate, Japan

12 Kansai Research Center, Forestry and Forest Products Research Institute, Kyoto, Japan

13 UN Sustainable Development Solutions Network, Asia Headquarters, Sunway University, Bandar Sunway, Selangor, Malaysia

14 Key Laboratory of West China's Environmental Systems (Ministry of Education), College of Earth and Environmental Sciences, Lanzhou University, Lanzhou, Gansu, China

Supplementary Figures

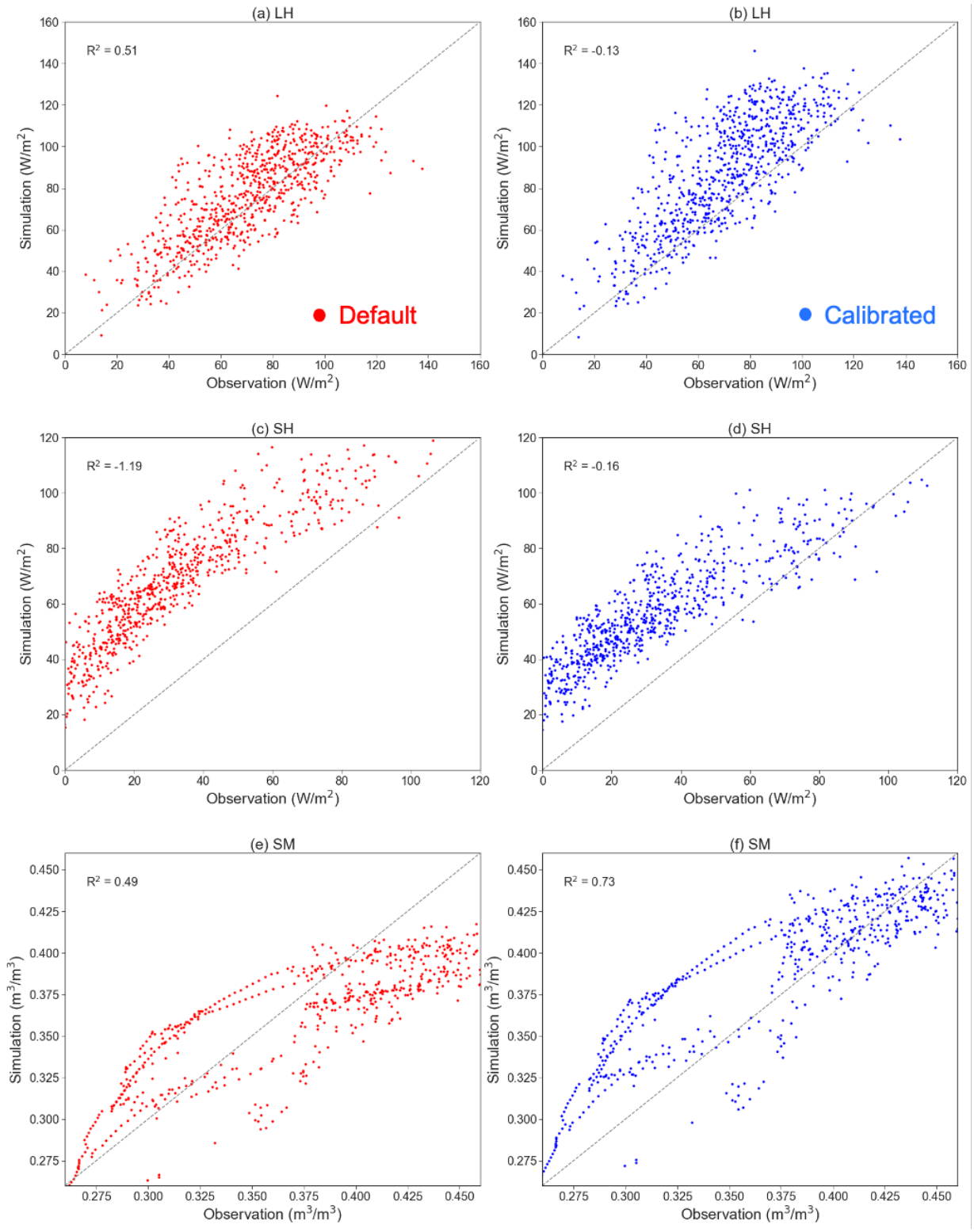

Figure S1: Scatterplot for observed and simulated for (a-b) latent heat, (c-d) sensible heat, and (e-f) soil moisture at the Panama BCI tropical forest site, using default parameters (left column, red dots) and calibrated parameters (right column, blue dots). The negative R^2 values indicate the model is arbitrarily poor.

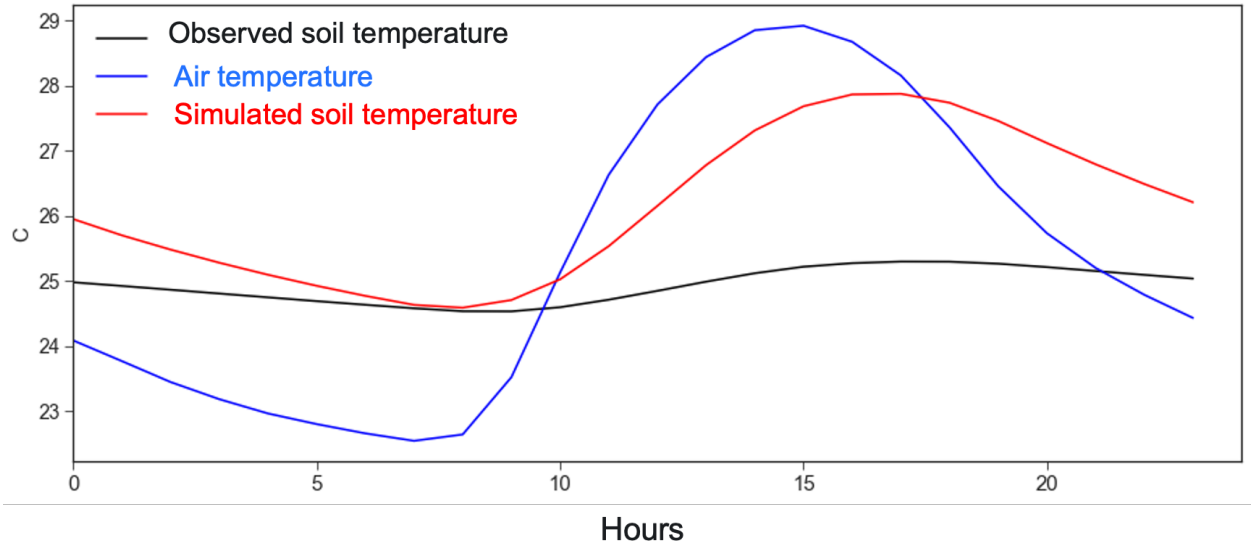

Figure S2: Observed and Noah-MP simulated soil temperature and air temperature at the Malaysia PSO site.

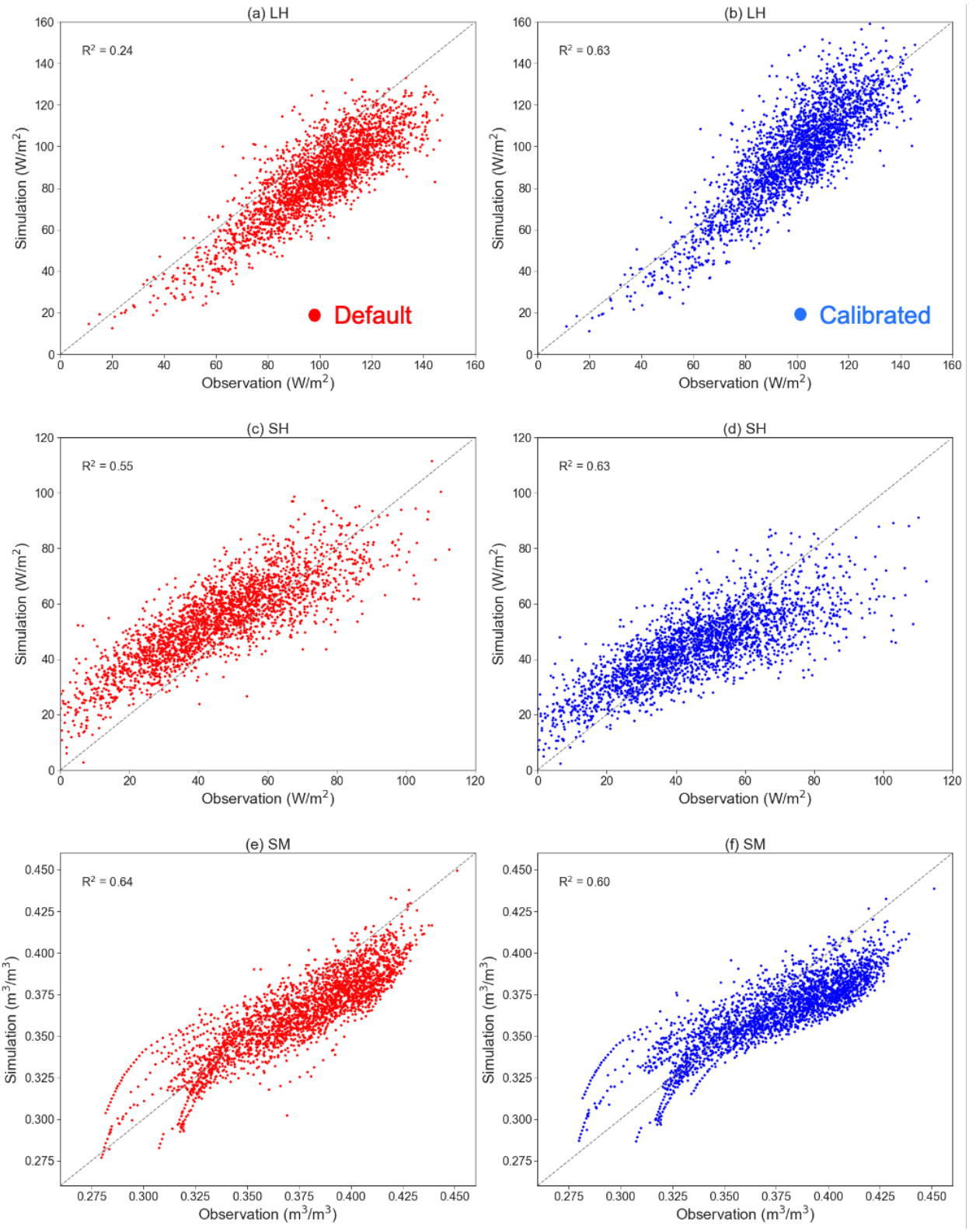

Figure S3: Scatterplot for observed and simulated for (a-b) latent heat, (c-d) sensible heat, and (e-f) soil moisture at the Malaysia PSO tropical forest site, using default parameters (left column, red dots) and calibrated parameters (right column, blue dots).

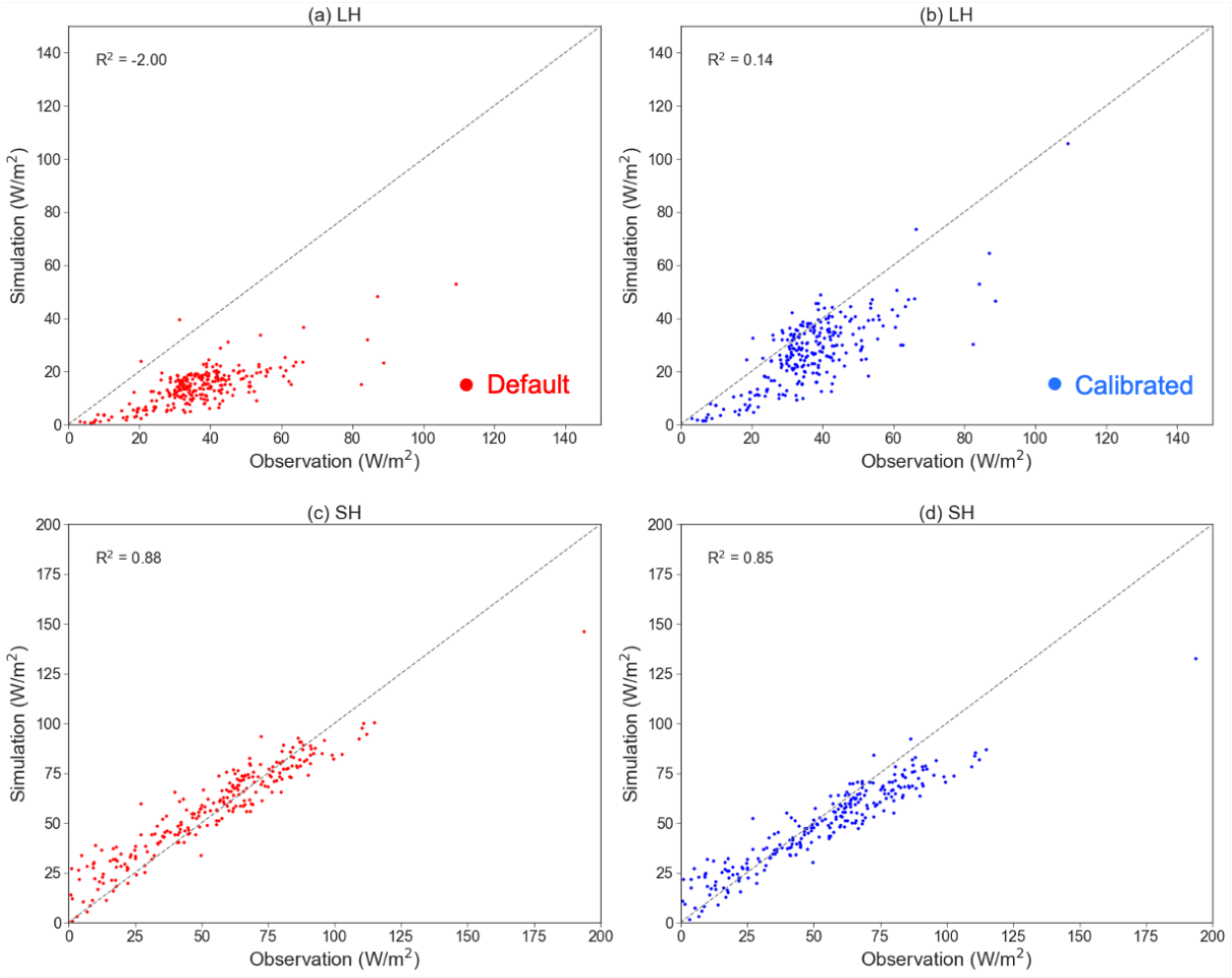

Figure S4: Scatterplot for observed and simulated for (a-b) latent heat and (c-d) sensible heat at the Singapore tropical urban site, using default parameters (left column, red dots) and calibrated parameters (right column, blue dots). The negative R^2 values indicate the model is arbitrarily poor.