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Analysis of biases from parallel observations of co-located manual and automatic weather stations in Indonesia

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Inhomogeneities are often found in long records of climate data. These can occur because of various reasons, among others such as relocation of observation site, changes in observation method, and the transition to automated instruments. Changes to these automated systems are inevitable, and it is taking place worldwide in many of the National Meteorological Services. However this shift of observational practice must be done cautiously and a sufficient period of parallel observation of co-located manual and automated systems should take place as suggested by the World Meteorological Organization. With a sufficient parallel observation period, biases between the two systems can be analyzed.

In this study we analyze the biases of a yearlong parallel observation of manual and automatic weather stations in 30 locations in Indonesia. The location of the sites spans from east to west of approximately 45 longitudinal degrees covering different climate characteristics and geographical settings. We study measurements taken by both sensors for temperature and rainfall parameters. We found that the biases from both systems vary from place to place and are more dependent to the setting of the instrument rather than to the climatic and geographical factors. For instance, daytime observations of the automatic weather stations are found to be consistently higher than the manual observation, and vice versa night time observations of the automatic weather stations are lower than the manual observation.