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A Wake due to the Maldives in the eastward Wyrtki jet

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A wake due to islands in background zonal flow has been observed in the equatorial Pacific Ocean. This study detects a wake due to the Maldives in the eastward Wyrtki jets in the Indian Ocean using in-situ observations and examines its dynamics with numerical models. Observations by acoustic Doppler current profilers deployed east of the Maldives show semiannual variability in cross equatorial velocity, which cannot be explained by prevailing annual wind forcing related to monsoons. Output from a high-resolution ocean general circulation model (OGCM), OFES, shows that the semiannual current variability is a part of a wavelike structure that appears east of the Maldives in concurrent with the eastward Wyrtki jets. Most of the Maldives are atolls. Their top heights are mostly lower than the sea surface, but higher than mean thermocline depth, and they can be a block against the Wyrtki jet. An experiment is conducted using a 1.5-layer model, in which islands that are similar to the Maldives in shape are imposed, and an equatorial eastward zonal jet is driven by idealized wind forcing. Results show that the 1.5-layer model is able to reproduce the wake with a similar spatial structure to the OGCM results. Temporal variability in the zonal jet is not essential in the dynamics of the wake, because an experiment in which a steady zonal flow is given at the eastern end of the model domain reproduces a similar wake. Experiments with the 1.5-layer model show that the zonal wavelength of the wake becomes larger as the speed of the eastward zonal jet increases.

Keywords: Equatorial Ocean, Indian Ocean, Maldives, Wake, Dynamics