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Phase locking of convectively coupled equatorial atmospheric Kelvin waves over Indian Ocean basin

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The properties of convectively coupled Kelvin waves in the Indian Ocean and their propagation over the Maritime Continent are studied. It is shown that Kelvin waves are longitude – diurnal cycle phase locked over the Maritime Continent, Africa and the Indian Ocean. Thus, it is shown that they tend to propagate over definite areas during specific times of the day. Over the Maritime Continent, longitude-diurnal cycle phase locking is such that it agrees with mean, local diurnal cycle of convection. The strength of the longitude-diurnal cycle phase locking differs between 'non-blocked' Kelvin waves, which make successful transition over the Maritime Continent, and 'blocked' waves that terminated within it. It is shown that a specific combination of Kelvin wave phase speed and time of the day at which a wave approaches the Maritime Continent influence the chance of successful transition into the Western Pacific. Kelvin waves that maintain phase speed of 10 to 11 degrees per day over the central-eastern Indian Ocean and arrive at 90E between 9UTC and 18UTC have the highest chance of being 'non-blocked' by the Maritime Continent. The distance between the islands of Sumatra and Borneo agrees with the distance travelled by an average convectively coupled Kelvin wave in one day. This suggests that the Maritime Continent may act as a 'filter' for Kelvin waves favoring successful propagation of those waves for which propagation is in phase with the local diurnal cycle of precipitation. The AmPm index, a simple measure of local diurnal cycle for propagating disturbances, is introduced and shown to be useful metric depicting key characteristics of the convection associated with propagating Kelvin waves.