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# A Comparison of tropical and mid-latitude Storm Evolution in Response to Wind Shear

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Darwin lies within the tropics of northern Australia and records an average of twelve severe storm events during the build-up and wet seasons (October to May) each year. Such events are generally very poorly forecast, with part of the reason being that thresholds of CAPE and vertical wind shear used to define severe storm conditions for mid-latitude environments are being implemented directly for tropical environments. This is done as conceptual models of severe storms for tropical environments, to our knowledge, do not exist.

This study investigates, with the aid of the Clark-Hall cloud resolving model, how vertical wind shear influences storm development within a tropical environment. It is found that the Richardson number, defined as the ratio of CAPE to half the square of the averaged wind shear, does not consistently distinguish between splitting and non-splitting storms in tropical environments. This study shows that larger wind shears are required in a tropical environment for a storm of given updraft velocity to split, compared with the same storm in a mid-latitude environment. This finding is supported by the notion held by forecasters at the Darwin Bureau of Meteorology that the storm forecasting tools, developed for mid-latitude storms but used there operationally, over-forecasts supercells within the tropics.

The reason that higher shears are required for tropical storms to split seems to be due to the larger water loading within the deeper tropical storms compared to those in mid-latitudes. The greater negative buoyancy that results, initiates a gust front relatively earlier in the storm lifetime than for the mid-latitude storms. This gust front then cuts off the warm inflow necessary for the storms flanks to intensify for splitting to occur. At higher shears in the tropics, entrainment reduces the storm depth and thus water loading, and delays the gust front initiation, thus allowing splitting to occur.