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Origin of vortices initiated over West Africa and impact on cyclogenesis

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Previous studies showed that vortices related to African Easterly Waves over West Africa evolves following a north (∼20°N) low-level (850 hPa) dry path or a south (∼10°N) mid-level (600-700 hPa) moist path. The aim of this study is to better understand the origin of these two paths by applying an objective vortex detection approach for 38 years (1980 to 2017) of the interim ECMWF Re-Analyses dataset. Only vortices reaching and staying over the Atlantic Ocean for more than two days are considered. Vortices of the south path are moist and cold vortices initiated primarily in August and September between 20°E and the African coast, mostly near the coast. Vortices of the north path are dry and warm vortices initiated primarily in July and August with a large initiation density south of the Hoggar Mountain. Based on various diagnostics, it is hypothesized that most north vortices are orographic depression generated in the leeward side of the Hoggar (and Aïr) Mountains and advected to the east-southeast by a reinforced steering flow (reinforced Harmattan wind), possibly in relation with dry intrusions. Both north and south vortices that formed over West Africa, even east of the Greenwich meridian, are able to initiate tropical cyclones over the Atlantic. Due in part to their different seasonal distributions, a merge of these vortices near the coast is exceptional and has a poor impact on cyclogenesis.