A FEATURE-BASED PERSPECTIVE ON TC-MIDLATITUDE FLOW
INTERACTION: A CLIMATOLOGY OF ROSSBY WAVE
INITIATION AND PHASE-LOCKING

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A classical motivation for research on tropical cyclones (TCs) undergoing extratropical transition (ET) is their potential to develop Rossby wave packets, in a situation often associated with high impact weather and reduced predictability. Recent research suggests that most transitioning TCs rather interact with and modify a pre-existing Rossby wave pattern. It is therefore not trivial to disentangle the contribution of the TC to flow amplification from other processes not directly related to the presence of the storm. Here we revisit the problem of TC-midlatitude flow interaction in a feature-based climatology for western North Pacific ET in the period 1979-2013.

First, we clarify the climatological relevance of the interaction between a TC and a zonally-oriented or only weakly amplified waveguide. We show that 23% of all recurving TCs in the Western North Pacific basin interact with a straight jet and among them, 1 out of 3 is able to initiate a Rossby wave. This frequency is 3 times larger than the climatological frequency of Rossby wave initiation (RWI) in that region. A comparison of ET events leading or not leading to RWI during straight jet situations shows that strong jet streams rather resist flow amplification, whereas strong meridional moisture transport and associated diabatic outflow favour RWI.

Second, a climatological investigation of ET during pre-amplified midlatitude flow situations sheds light on the important deceleration of the upstream trough during ET and the relevance of “phase-locking” for very strong Rossby wave amplification.