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The Role of North American Convective Storms on Jet Stream Dynamics: **A Negative Potential Vorticity Perspective** A. Lojko¹, A. Winters², A.E. Payne³ & C. Jablonowski¹

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Motivation: Recent cases show convective clouds tops produce vorticity dipoles which intensify jet. We assess regions of Negative Potential Vorticity (PV) [1,2], a tracer for convectively generated vorticity. PV Dipole Order ~ Order ~ (Blue is 10 km 100-1000 negativ km Thunderstorm 55 N From Tiny to Huge let streak -PV 45 N 100 W Question: What are the Composite Characteristics of Negative PV interactions with the Jet Stream? **Data & Method:** Data: ERA5. 250 hPa (PV, Z, U, V, q). 21 years (2000 – 2021) 0.5 degree resolution, 6 hourly. **Domain:** [65 – 25 N, 100 - 50 W] **Method:** Find all -PV interactions within 100 km of jet. Create interaction centered composites based on mean location of interaction coordinate. . Negative PV – Jet Interaction Tracker: > 98th Percentile Area (Length > Find Minimum Distance I.D Synoptic-scale Negative PV. I.D Continious 2 PVU contours Get contour coordinates. Get Contour Coordinates and 2 PVU contours. 2. K-Means Clustering: same place, but ridge phase/amplitude varies in clusters. Squirrel

(Mean composite \neq amplified, EOF analysis shows ridge is dominant pattern). Solution: I.D 3 clusters (trained on centered PV field) using K-means to reveal ridges.

Highlights:

Synoptic-scale bands of negative Potential Vorticity (PV) often interact with the jet. Interactions are most common during cold seasons along the Eastern USA coast. Presence of negative PV next to jet is often co-located with jet streak, amplified ridge and enhancement of wave activity downstream. Negative PV intensifies wave activity along the jet via the shear generated by strong anti-cyclonic circulation and coincident sharpening of mid-latitude PV gradient.



Centered composites separated into **3 clusters show ridging environments**. Key Clustering Results:

- The interaction point is straddled by two PV dipole anomalies.
- +PV gradient (> .01 PVU km⁻¹), wind speed (>25 m s⁻¹) & ageostrophic wind speed (>15 m s⁻¹) anoms.
- Circulation/Dynamics patterns usual of convective storm / warm conveyor belts environments Cluster 1 Cluster 2























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