

Extreme midlatitude jets in a warming climate — a PV gradient perspective

Supervision:

Sebastian Schemm, Mona Bukenberger, Nora Zilibotti
mona.bukenberger@env.ethz.ch

Motivation: The jet stream is a crucial component of midlatitude atmospheric dynamics. It can act as a Rossby waveguide and is crucial to maintain blockings. This project will investigate changes between extreme jets in a present and future climate, and in particular study the role of diabatic processes in those changes. The project will combine PV thinking and Lagrangian perspectives to tackle the research objective.

Data: CESM2 and idealised ICON aquaplanet data for present and future climates.

Methods: Identify Extreme jet events and use the Lagrangian PV gradient framework to compare present-day and future extreme events. The PV gradient acts as a proxy for the jet intensity and location.

Hypothesis: Extreme jet events occurring in a warming climate might experience stronger diabatic influence and the most extreme jets might grow more extreme due to this effect and eventually live longer.

Additional requirement: An interest in large-scale dynamics will be useful. The project can be tailored to your interests - curiosity to develop your project along the way is very much appreciated by the team.

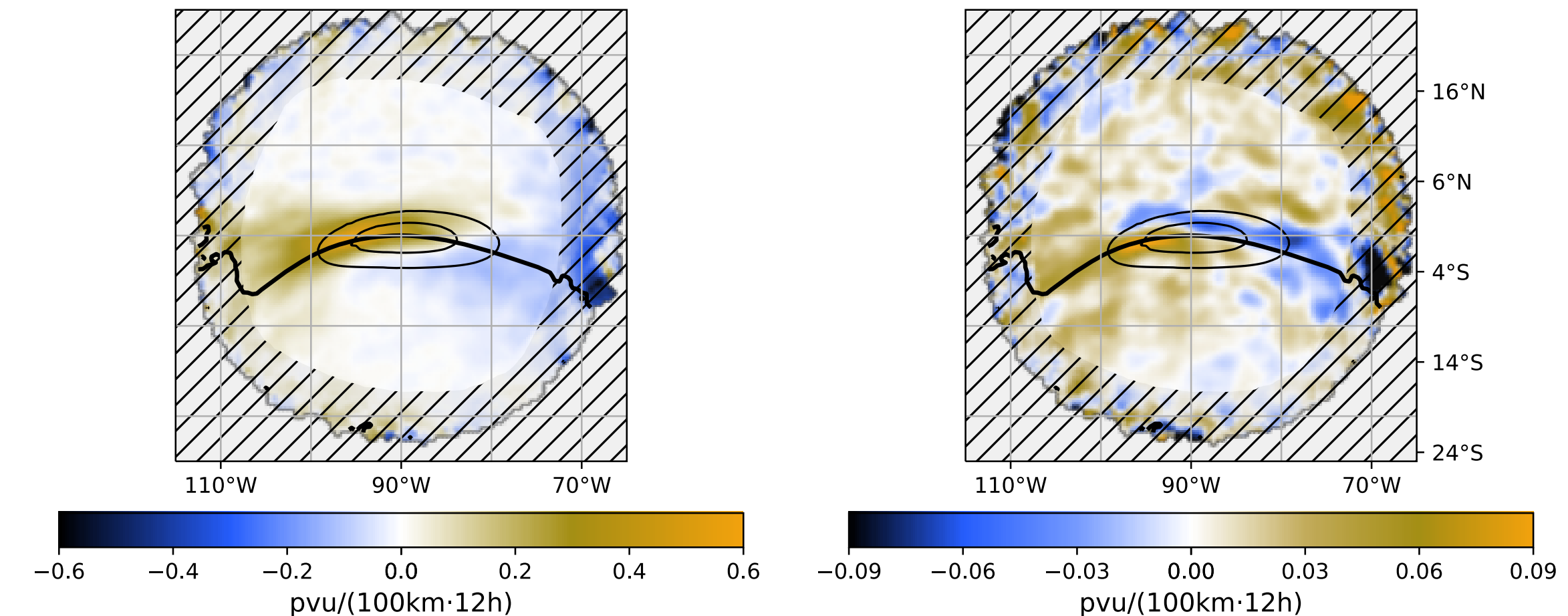


Figure 1: Composite of Lagrangian PV gradient tendencies

Shown are Lagrangian PV gradient tendencies for air parcels ending in a jet streak (think black contour) or in its environment

Left: Net PV gradient changes along 12-hour backward trajectories (shading). Right: Corresponding diabatic PV gradient tendency (shading). Additionally contours shown the 2 PVU isoline (thick black), horizontal wind speed (thin and black; 70 and 80 m/s).

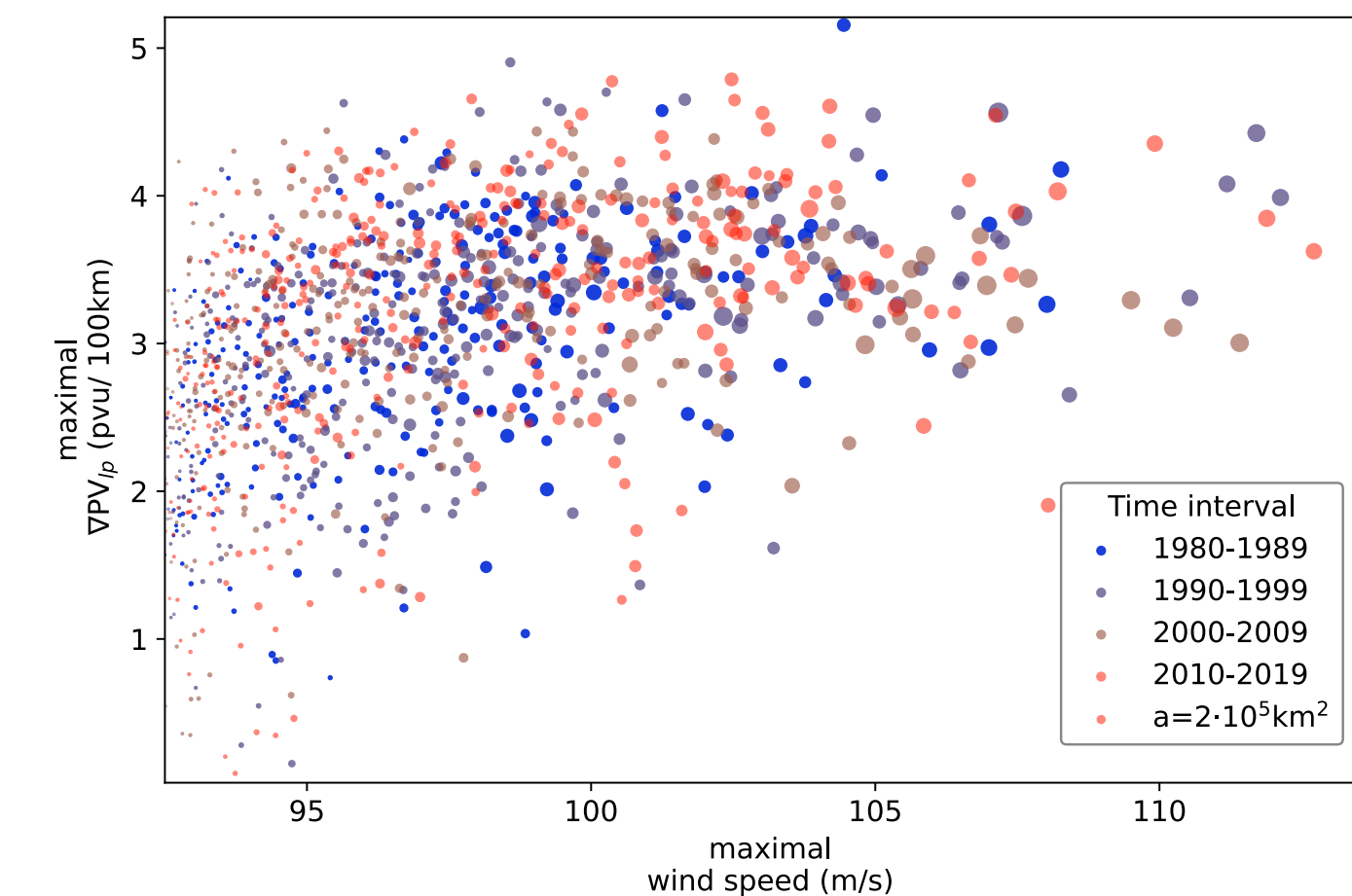


Figure 2: Relationship between PV gradient and wind speed

Shown are maximal wind(bottom axis), and maximal PV gradient (vertical axis) of extreme jet streaks. The size of the dots is proportional to the area of the extreme event and the color indicates the century.