

Illustrative slides from Andrew Winters of the UAlbany North Pacific Jet phase space metric. This research was motivated by the following earlier pioneering work:

- Athanasiadis, P. J., J. M. Wallace, and J. J. Wettstein, 2010:
Patterns of wintertime jet stream variability and their relation to the storm tracks. *J. Atmos. Sci.*, **67**, 1361–1381.
- Griffin, K. S., and J. E. Martin, 2016: Synoptic features associated with temporally coherent modes of variability of the North Pacific jet stream. *J. Climate*, **29**, in press.
- Jaffe, S. C., J. E. Martin, D. J. Vimont, and D. L. Lorenz, 2011: A synoptic climatology of episodic, subseasonal retractions of the Pacific jet. *J. Climate*, **24**, 2846–2860.

250-hPa North Pacific Zonal Wind Variability

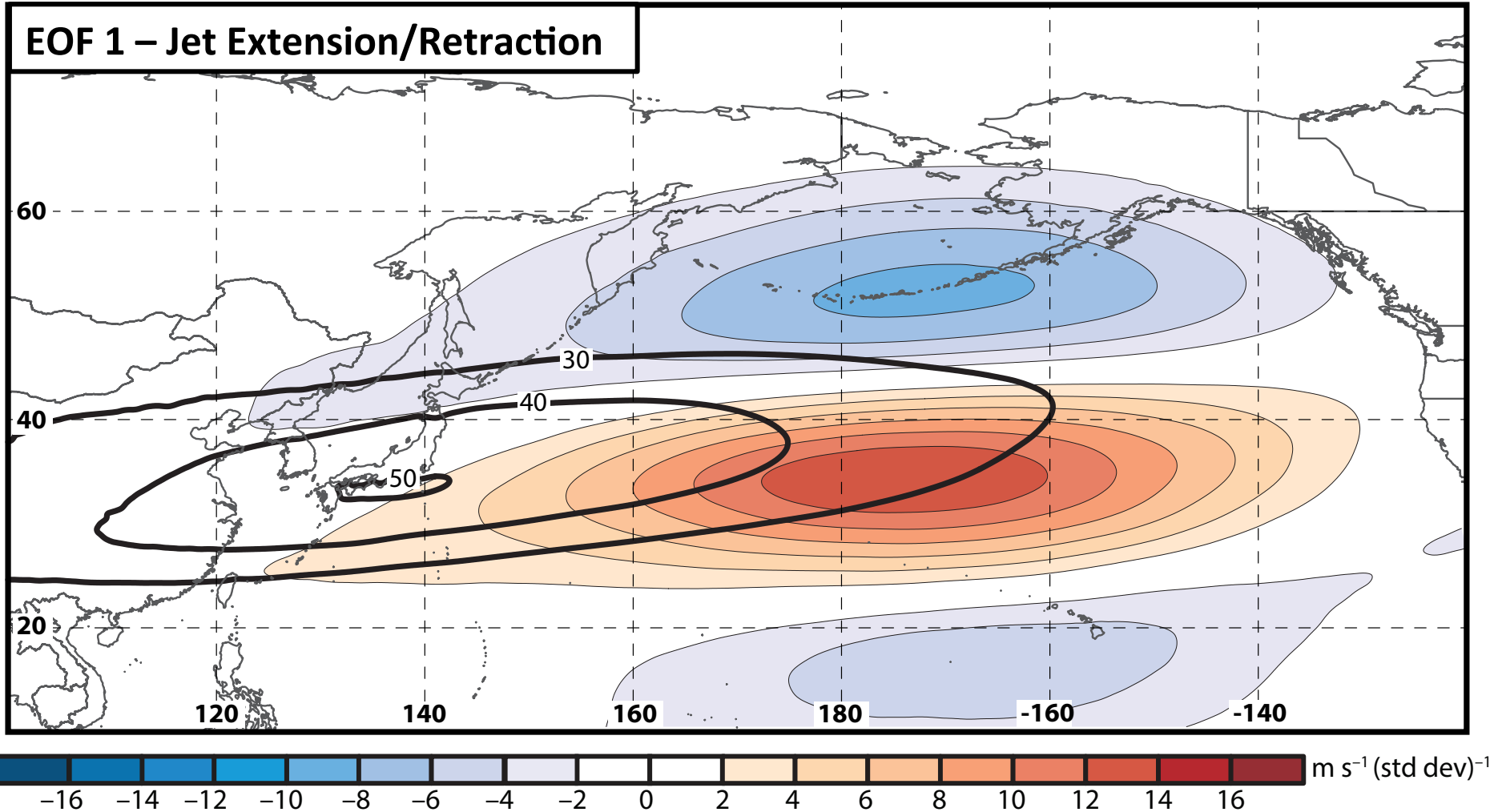
- Removed the mean and the annual and diurnal cycles from 6-hourly, 250-hPa zonal wind data from the CFSR (1979–2014)
- Restricted data to the cool season (Sept.–May)
- Performed an EOF analysis on the zonal wind anomalies within the domain: 10–80°N ; 100°E–120°W

Analysis techniques and resultant EOF patterns are consistent with related work on the North Pacific Jet:

- Athanasiadis et al. (2010)
- Jaffe et al. (2011)
- Griffin and Martin (2016)

250-hPa North Pacific Zonal Wind Variability

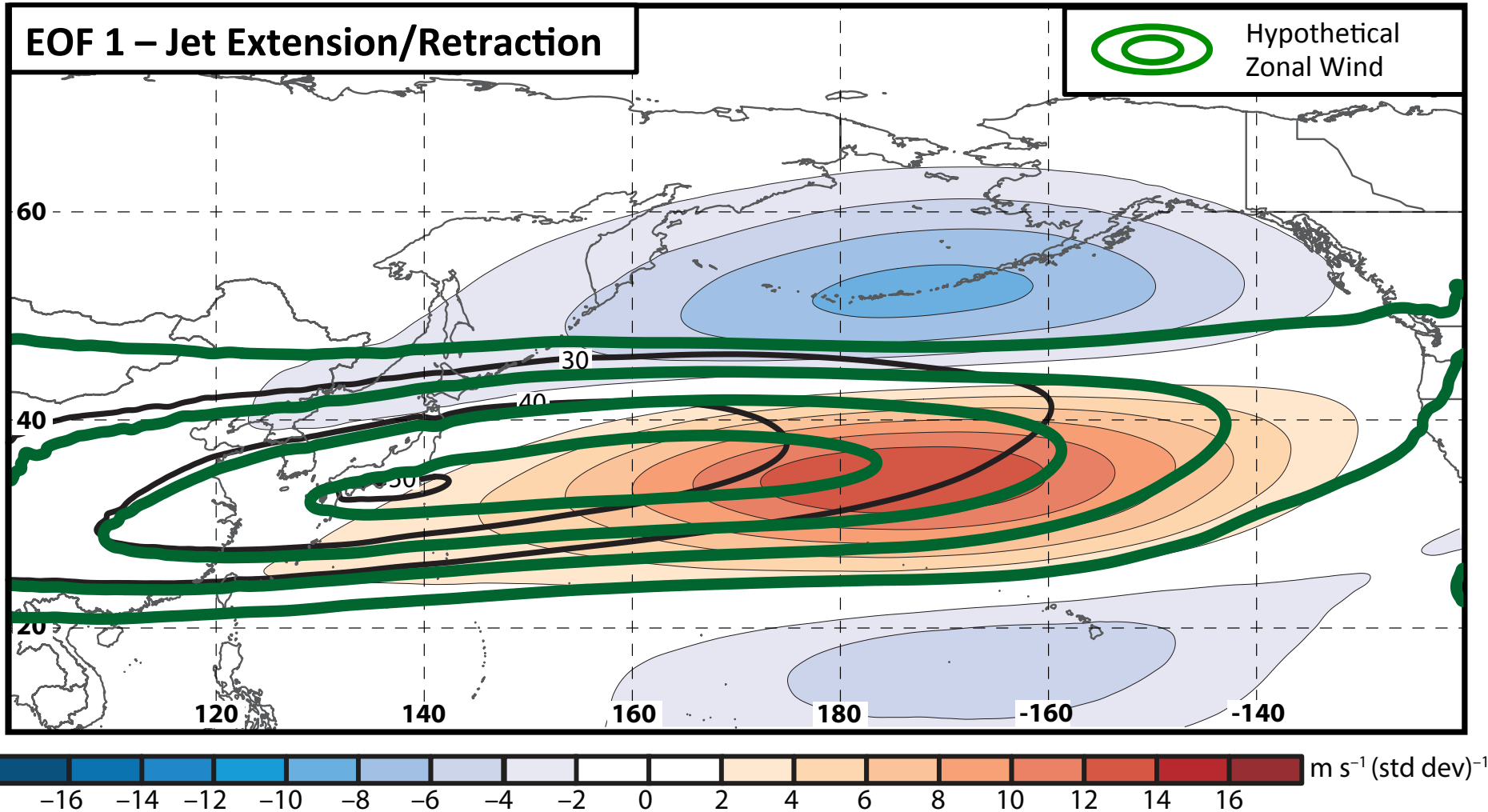
EOF 1 – Jet Extension/Retraction



Sept.–May mean 250-hPa zonal wind: black contours
Sept.–May 250-hPa zonal wind EOF 1 pattern: shading

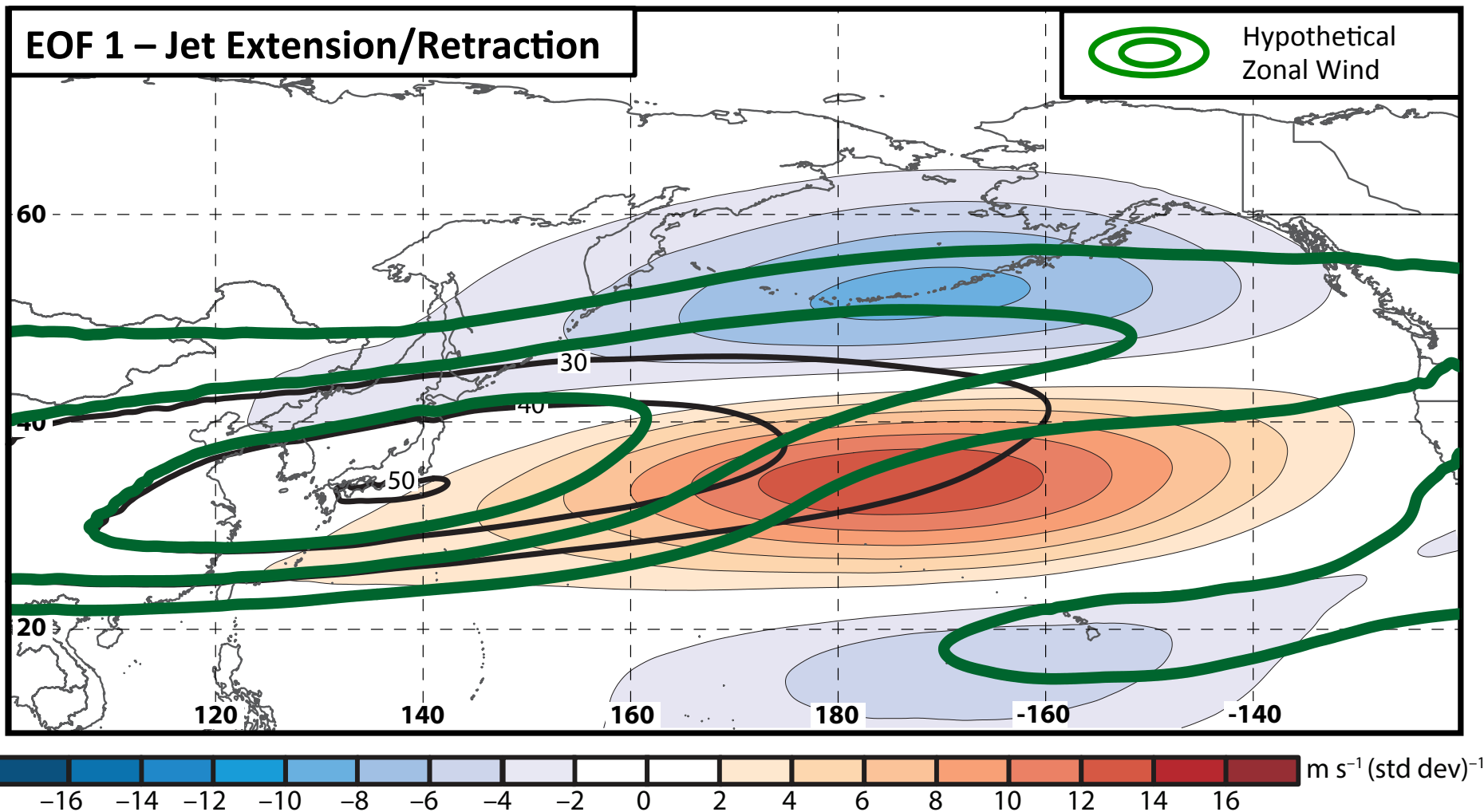
+ EOF 1: Jet Extension
– EOF 1: Jet Retraction

250-hPa North Pacific Zonal Wind Variability



+ EOF 1: Jet Extension
- EOF 1: Jet Retraction

250-hPa North Pacific Zonal Wind Variability

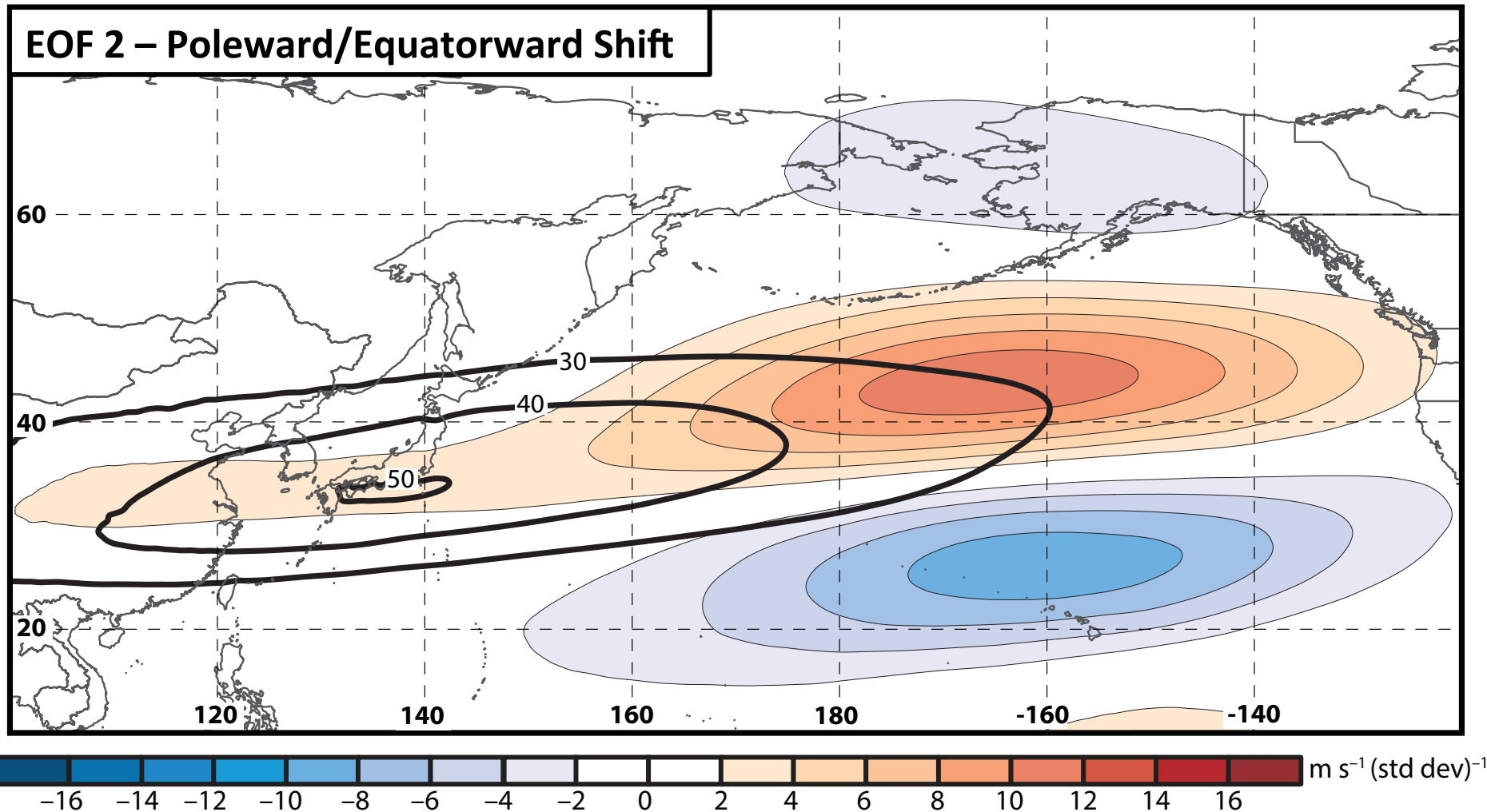


Sept.–May mean 250-hPa zonal wind: black contours
Sept.–May 250-hPa zonal wind EOF 1 pattern: shading

+ EOF 1: Jet Extension
– EOF 1: Jet Retraction

250-hPa North Pacific Zonal Wind Variability

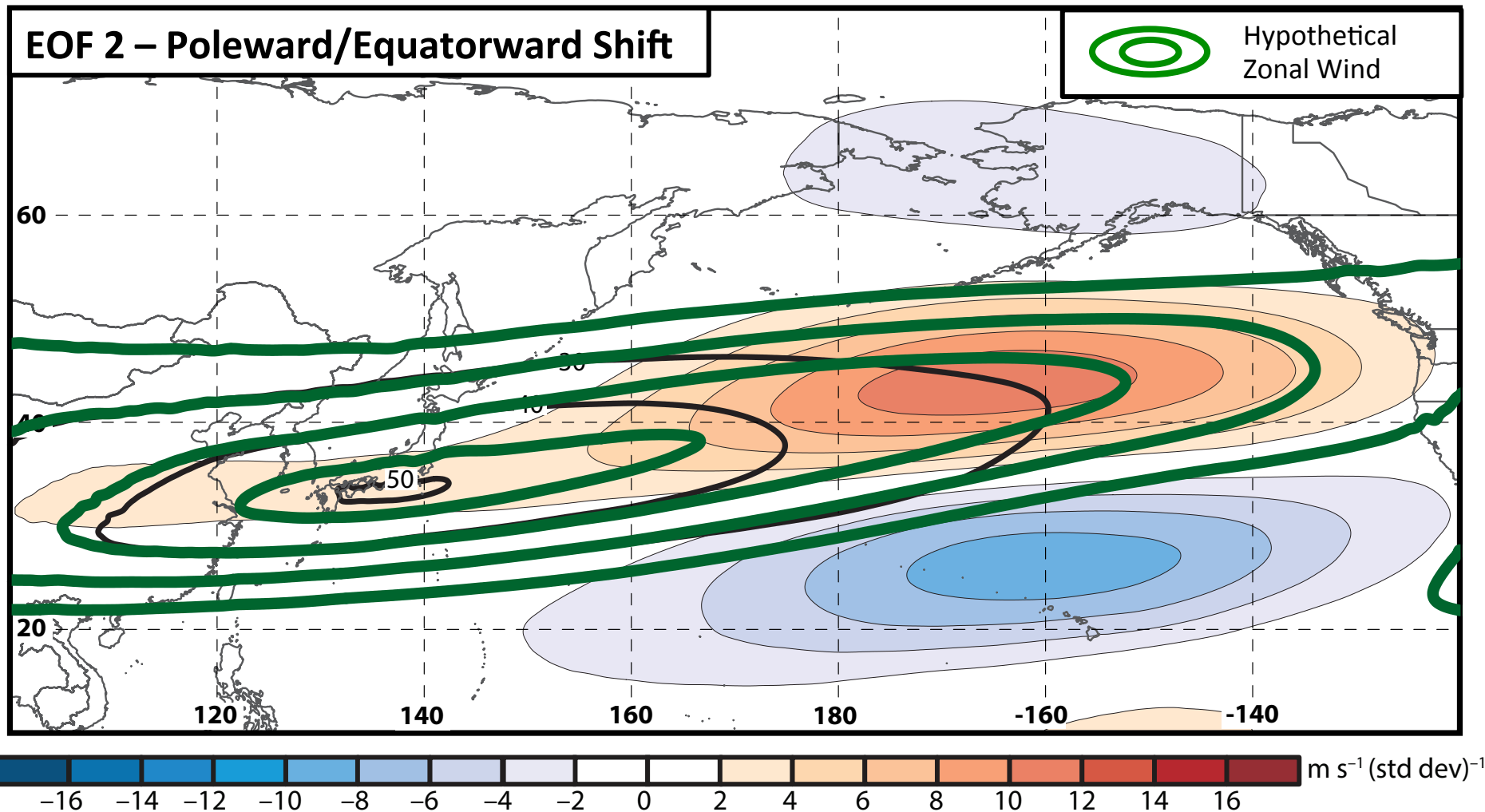
EOF 2 – Poleward/Equatorward Shift



Sept.–May mean 250-hPa zonal wind: black contours
Sept.–May 250-hPa zonal wind EOF 2 pattern: shading

+ EOF 2: Poleward Shift
– EOF 2: Equatorward Shift

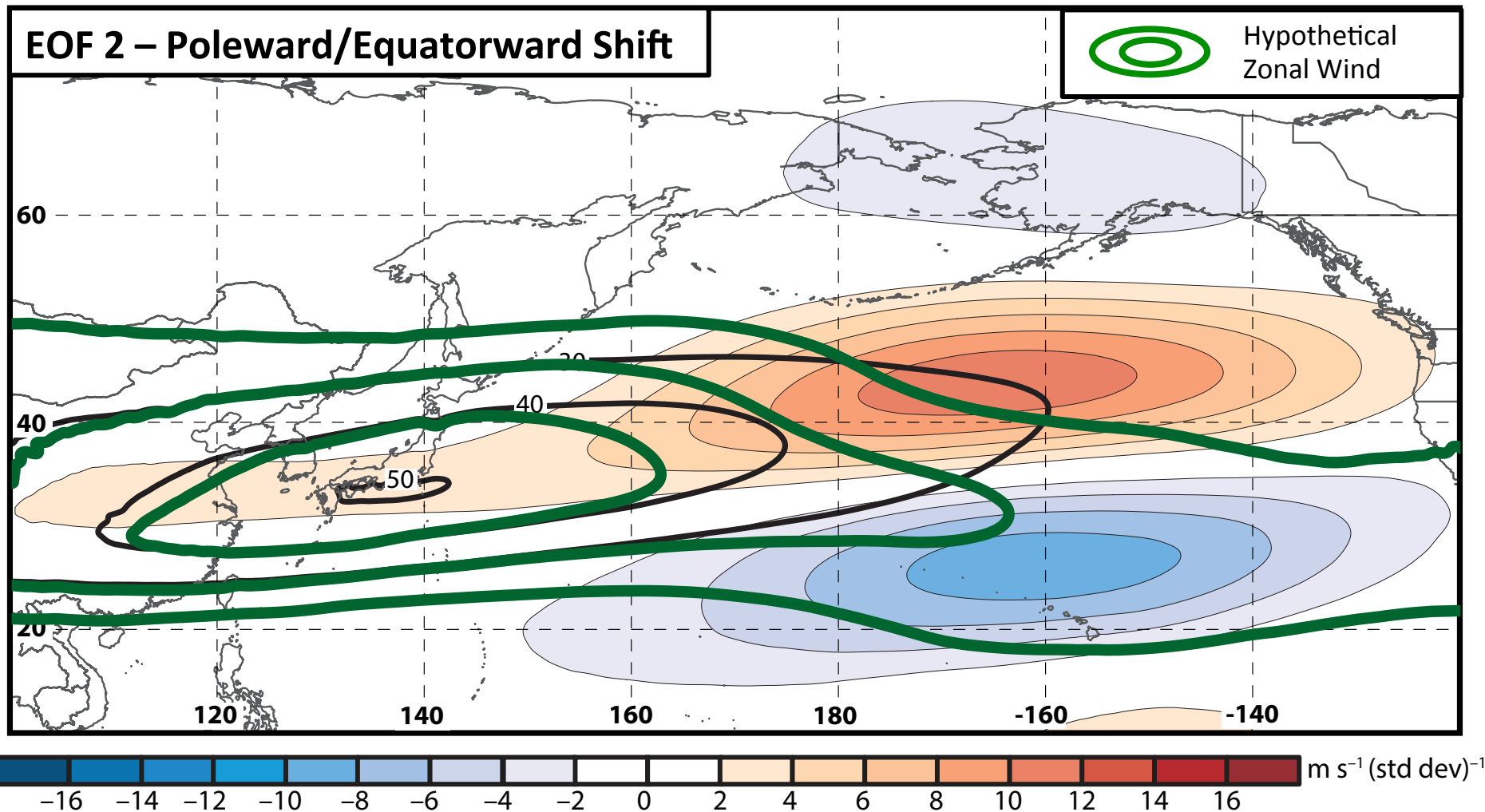
250-hPa North Pacific Zonal Wind Variability



Sept.–May mean 250-hPa zonal wind: black contours
Sept.–May 250-hPa zonal wind EOF 2 pattern: shading

+ EOF 2: Poleward Shift
– EOF 2: Equatorward Shift

250-hPa North Pacific Zonal Wind Variability



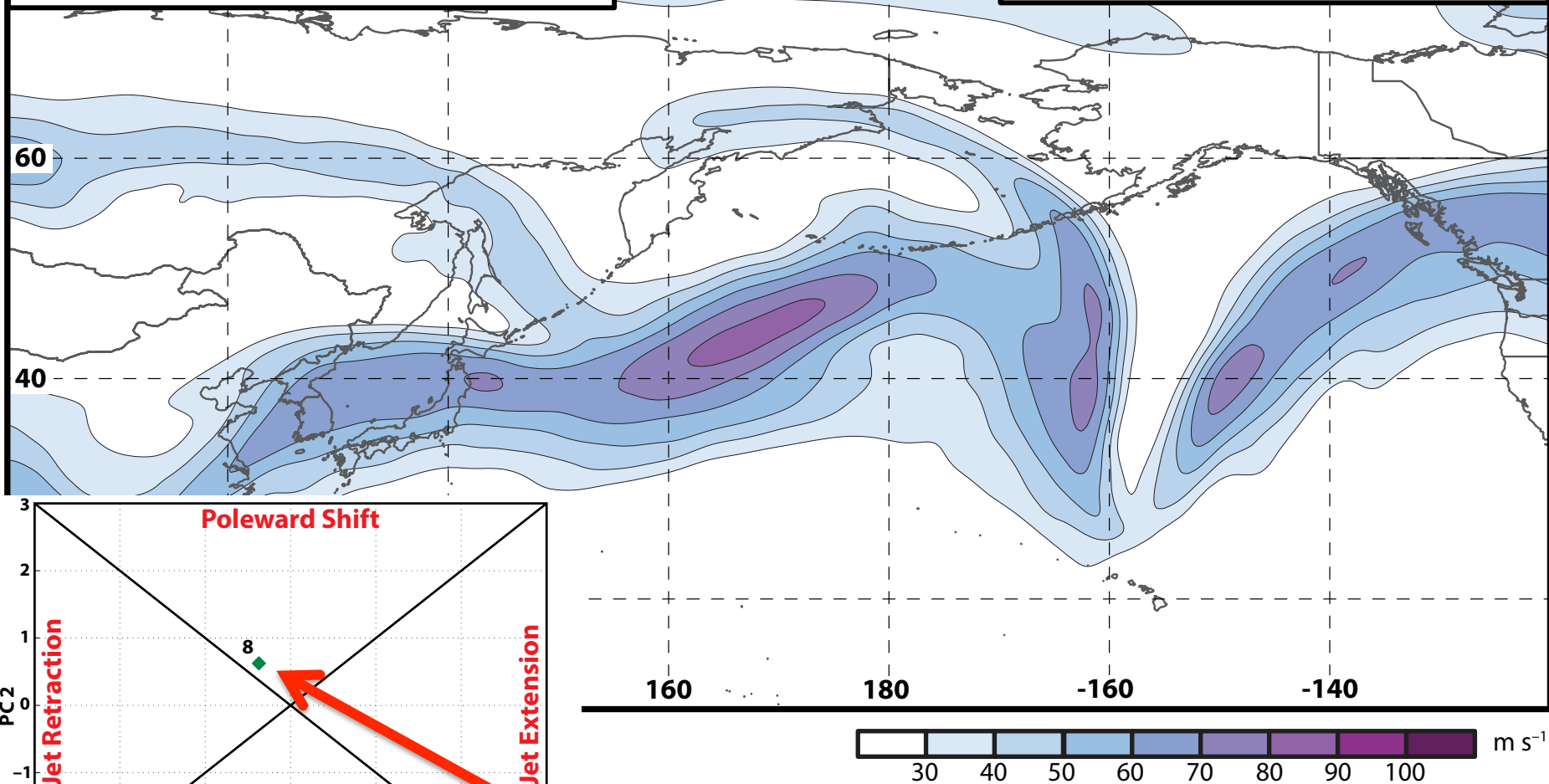
Sept.–May mean 250-hPa zonal wind: black contours
Sept.–May 250-hPa zonal wind EOF 2 pattern: shading

+ EOF 2: Poleward Shift
– EOF 2: Equatorward Shift

250-hPa North Pacific Zonal Wind Variability

0000 UTC 8 November 2014

250-hPa wind speed: shaded



Instantaneous 250-hPa zonal wind anomalies can be projected onto EOF 1 and EOF 2, resulting in a point on a North Pacific Jet phase diagram

NPJ-based Composites

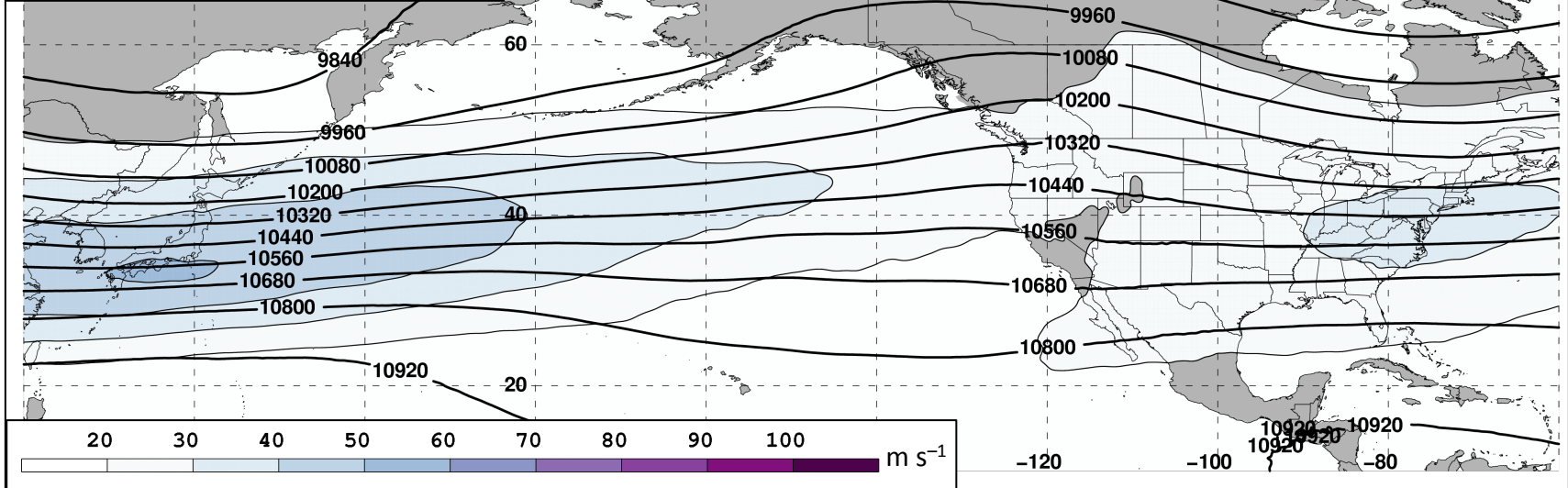
- Projected 250-hPa zonal wind anomalies at 6-h intervals during Sept–May from 1979–2014 onto the NPJ phase diagram
- Cataloged all times during which the position within the phase diagram was a distance > 1 PC-unit from the origin for at least 3 days
- Classified the identified times by the quadrant of the phase diagram they reside in

	Jet Extension	Jet Retraction	Poleward Shift	Equatorward Shift
# Events	159	162	189	149

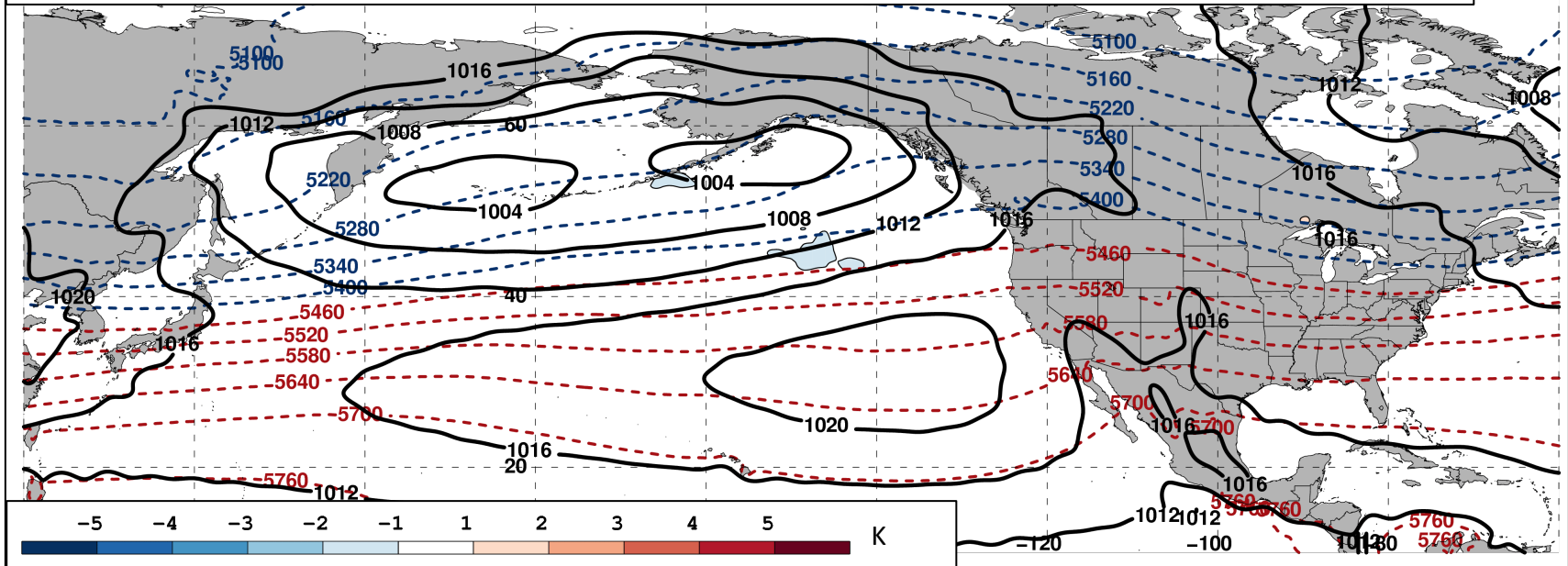
Poleward Shift

250-hPa Wind Speed, Geo. Heights, Geo. Height Anomalies: Day -10

Poleward Shift (n = 189)

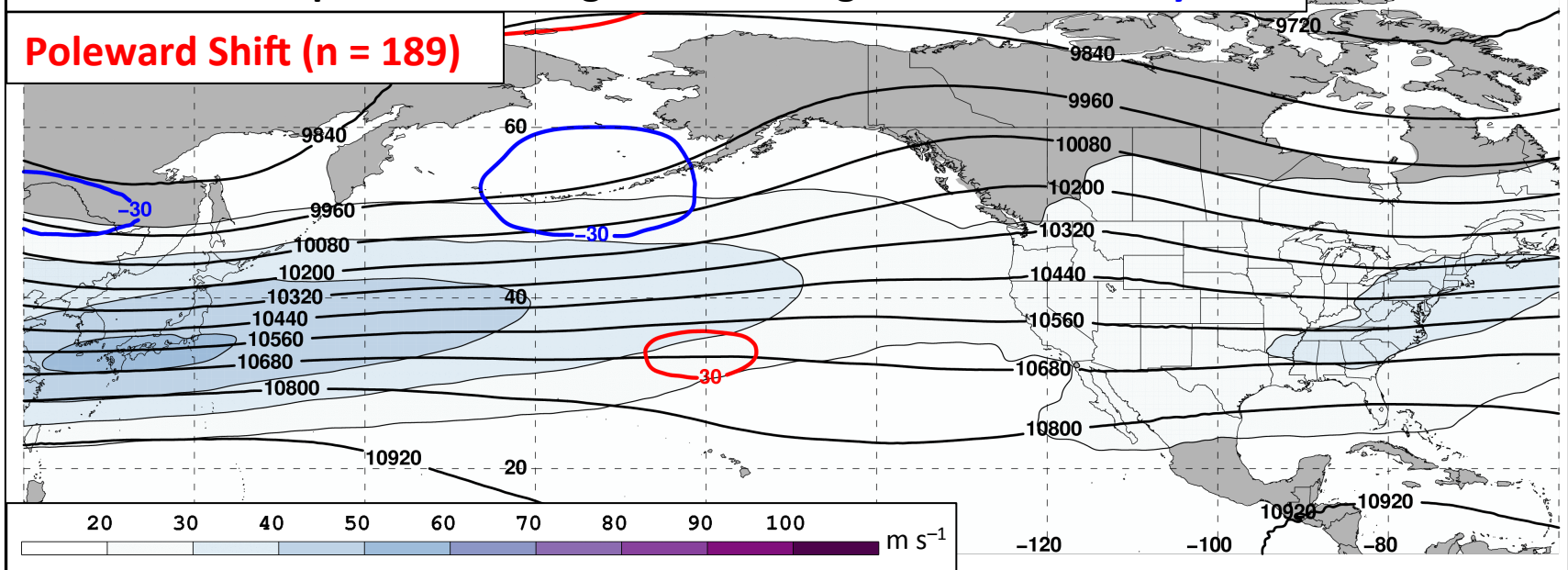


Mean Sea-Level Pressure, 1000–500-hPa Thickness, 850-hPa Temp. Anomalies: Day -10

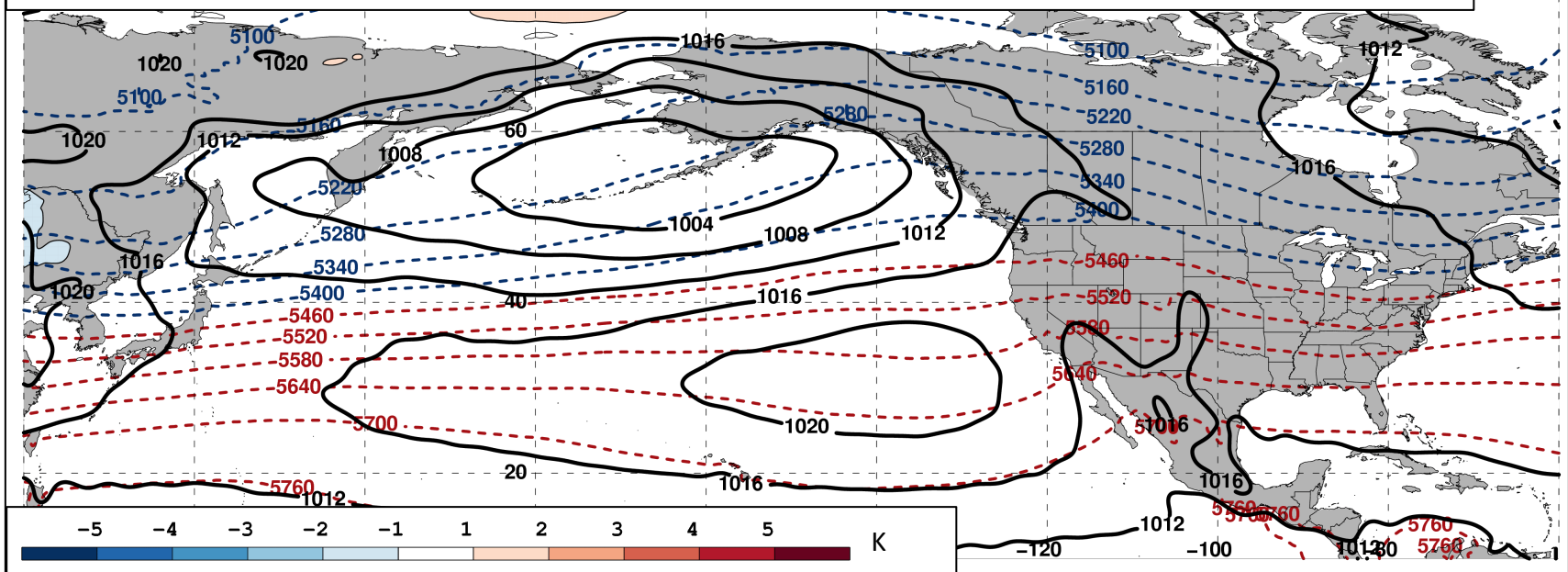


250-hPa Wind Speed, Geo. Heights, Geo. Height Anomalies: Day -8

Poleward Shift (n = 189)

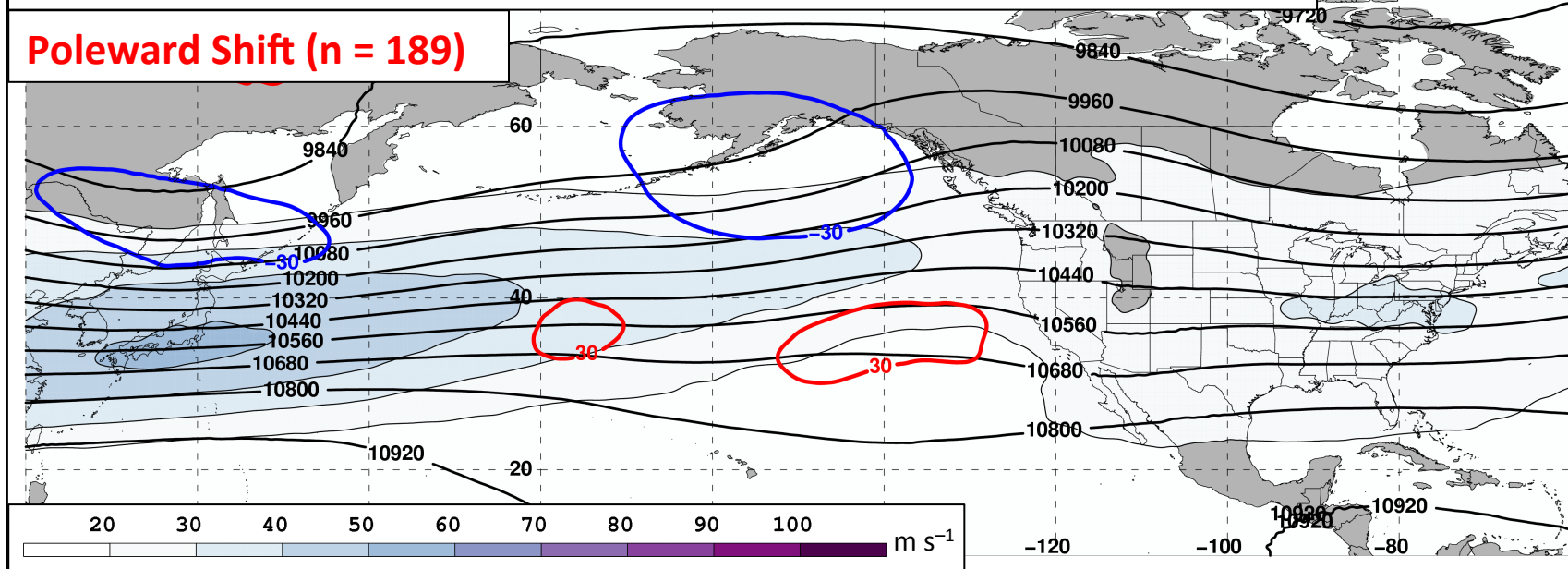


Mean Sea-Level Pressure, 1000–500-hPa Thickness, 850-hPa Temp. Anomalies: Day -8

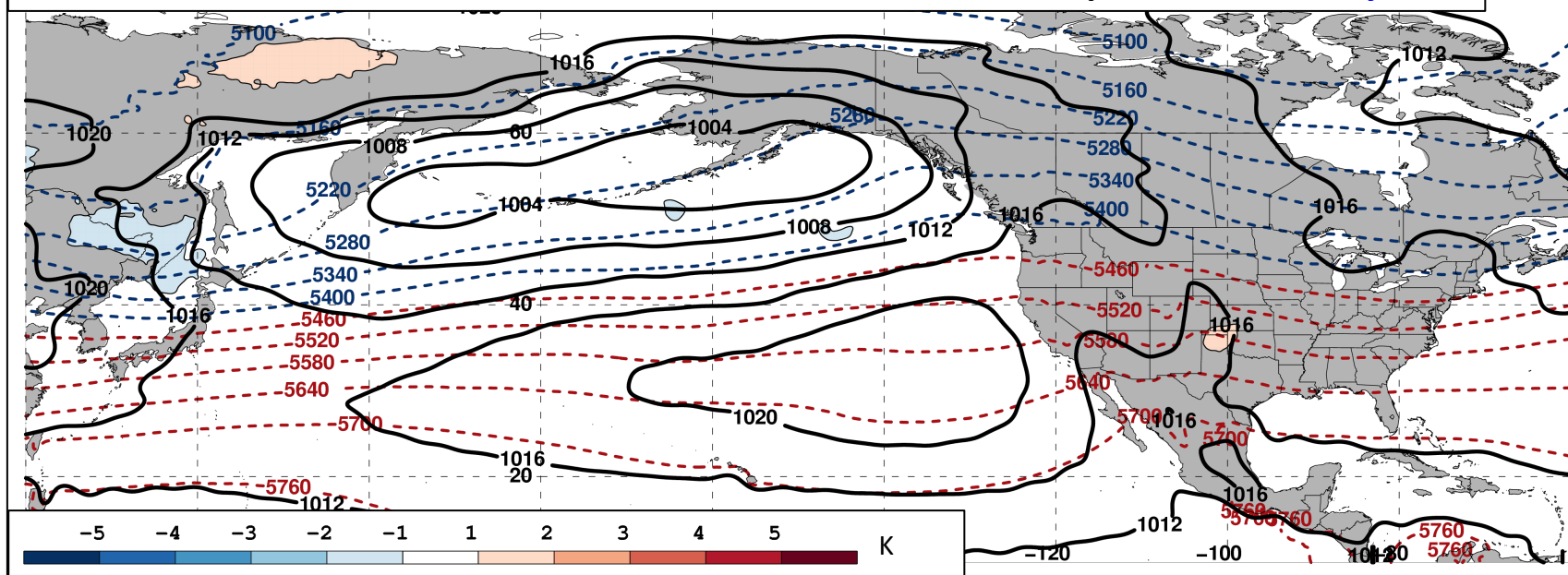


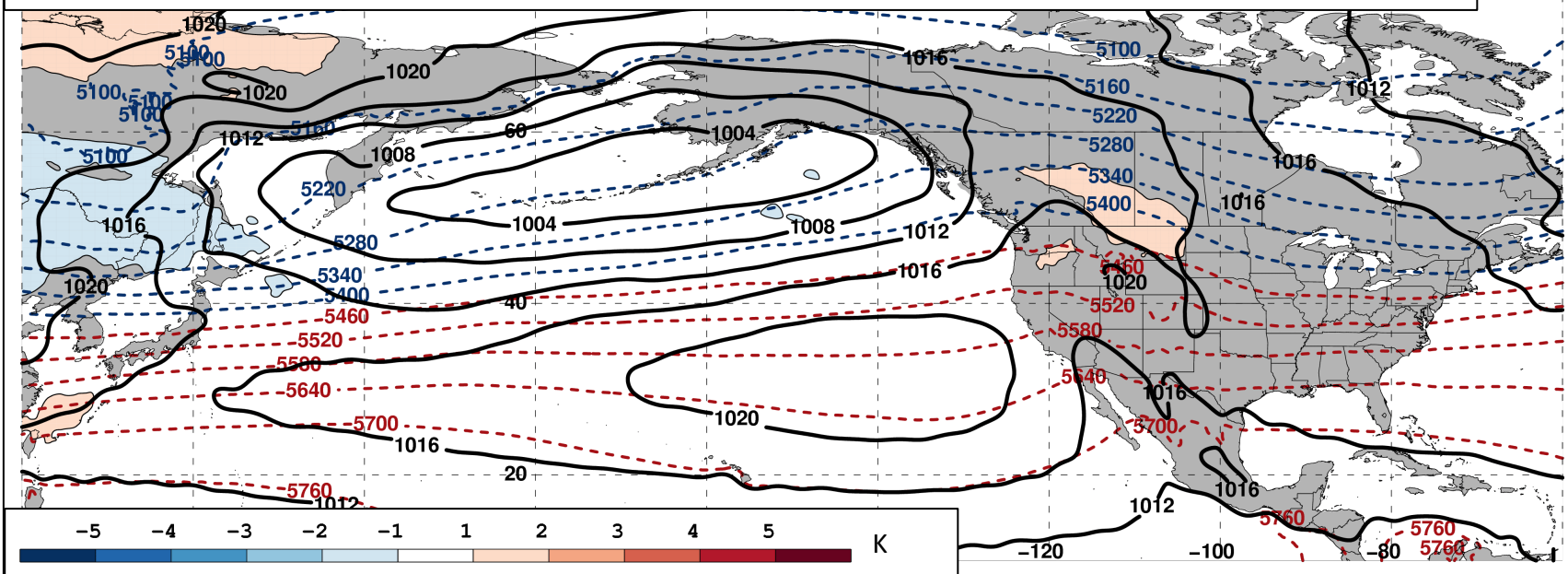
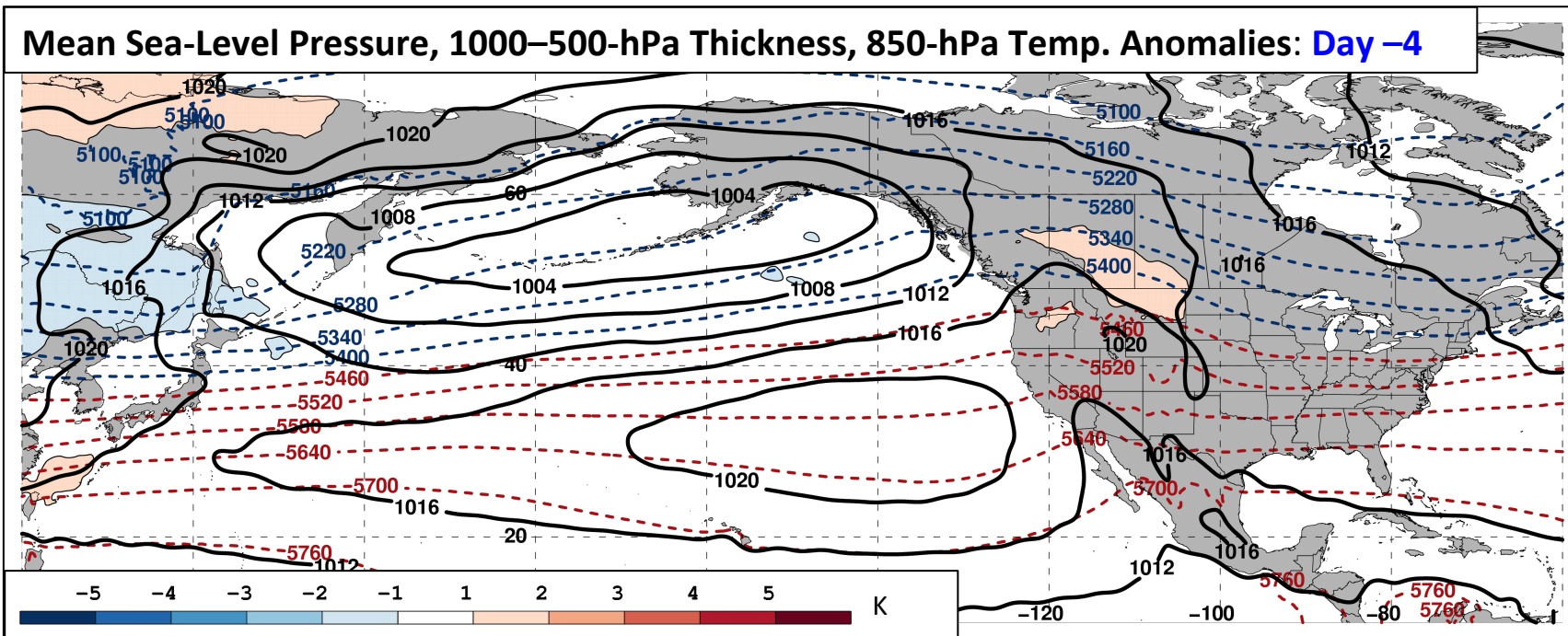
250-hPa Wind Speed, Geo. Heights, Geo. Height Anomalies: Day -6

Poleward Shift (n = 189)



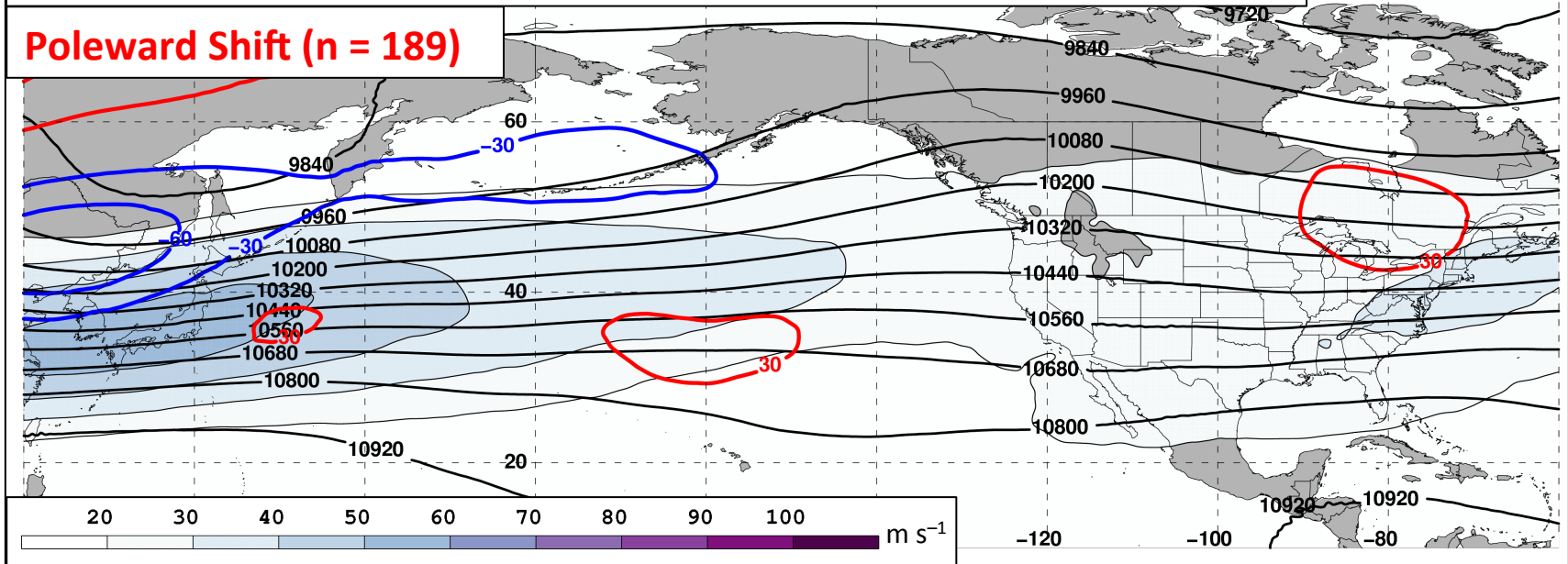
Mean Sea-Level Pressure, 1000–500-hPa Thickness, 850-hPa Temp. Anomalies: Day -6



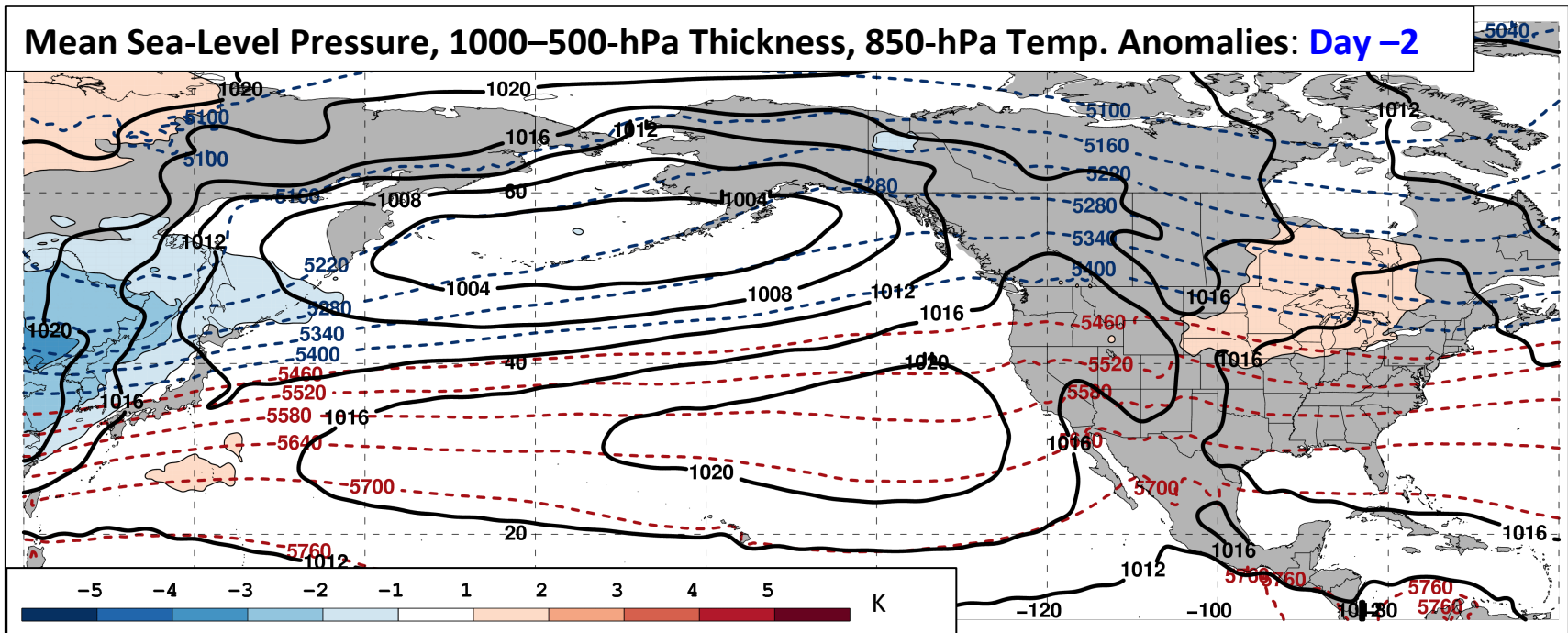


250-hPa Wind Speed, Geo. Heights, Geo. Height Anomalies: Day -2

Poleward Shift (n = 189)

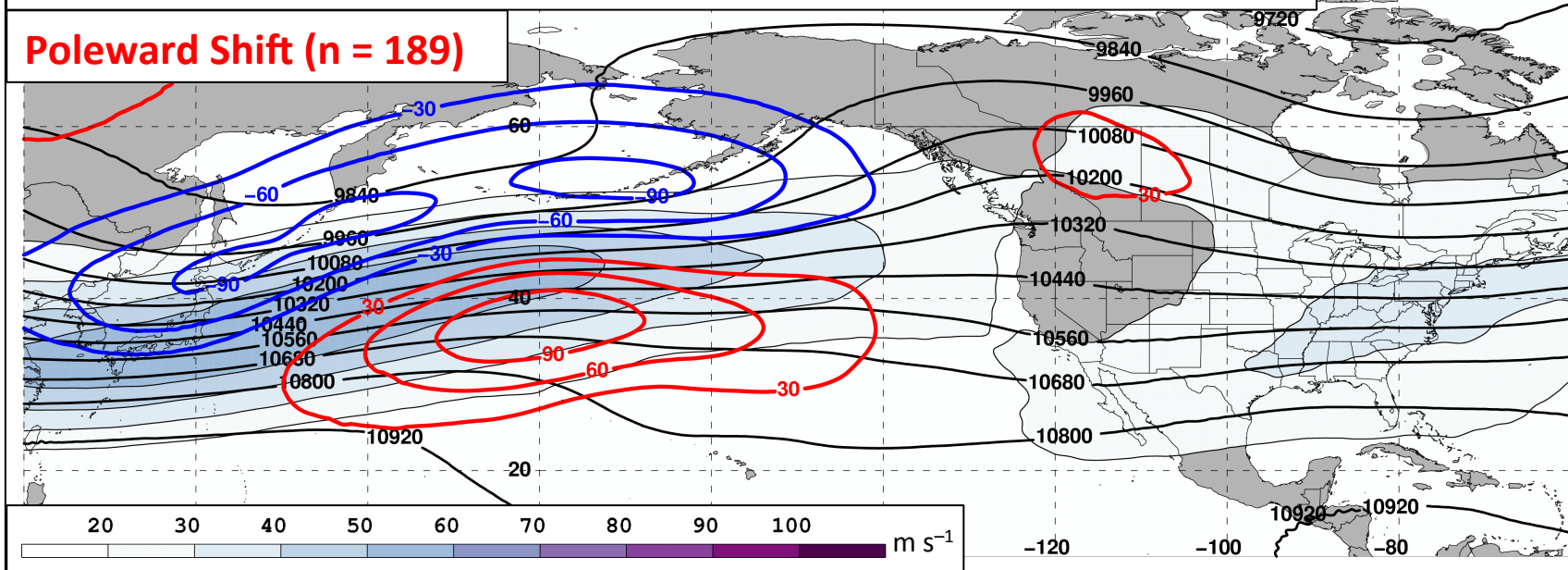


Mean Sea-Level Pressure, 1000–500-hPa Thickness, 850-hPa Temp. Anomalies: Day -2

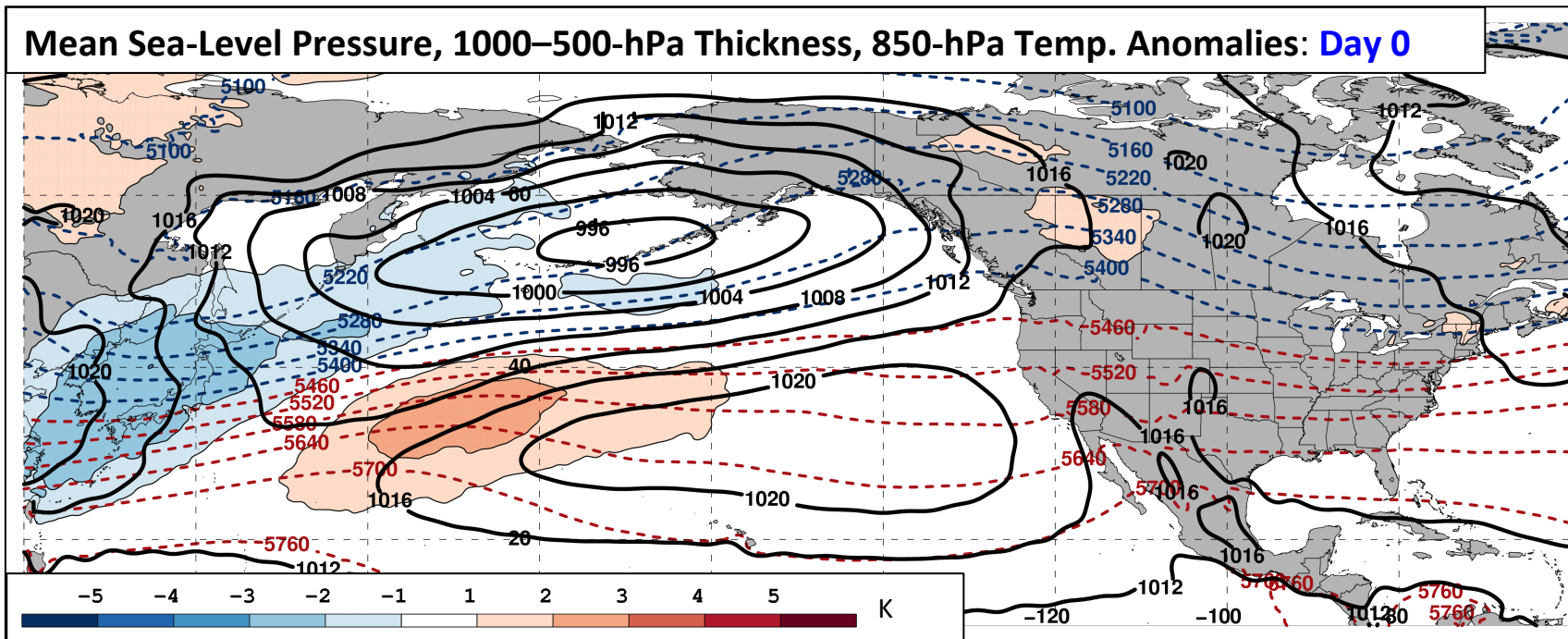


250-hPa Wind Speed, Geo. Heights, Geo. Height Anomalies: Day 0

Poleward Shift (n = 189)

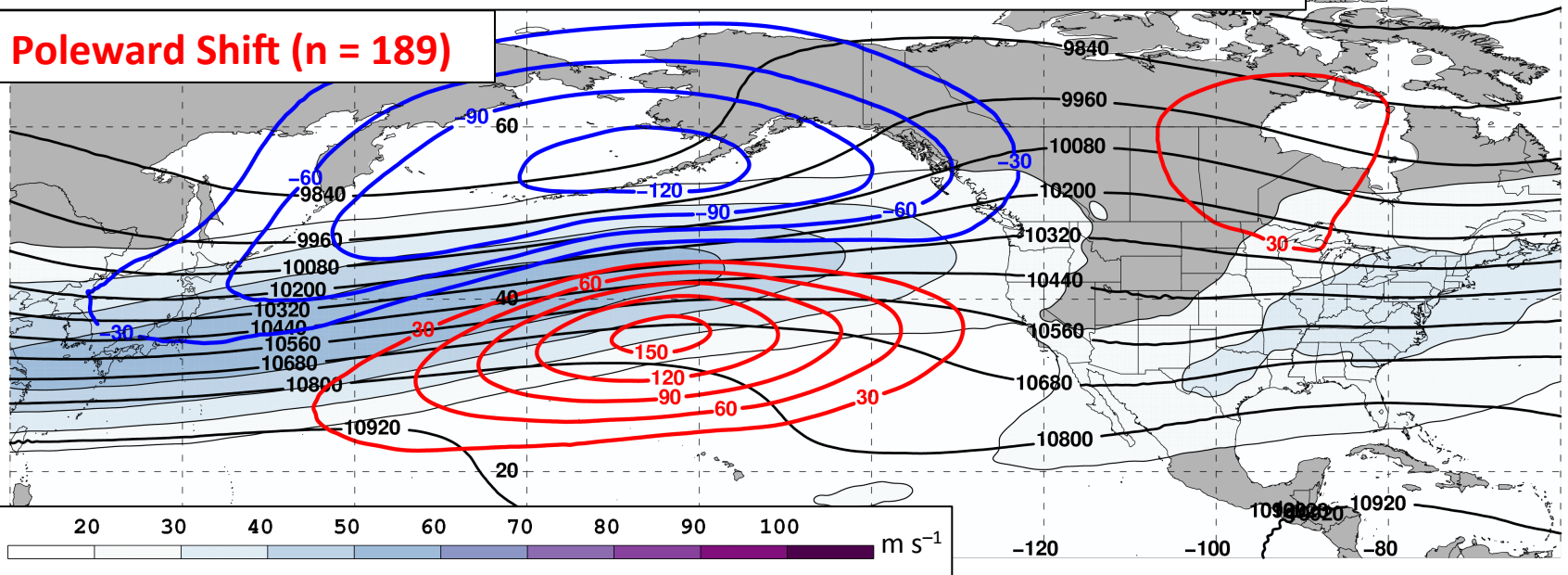


Mean Sea-Level Pressure, 1000–500-hPa Thickness, 850-hPa Temp. Anomalies: Day 0

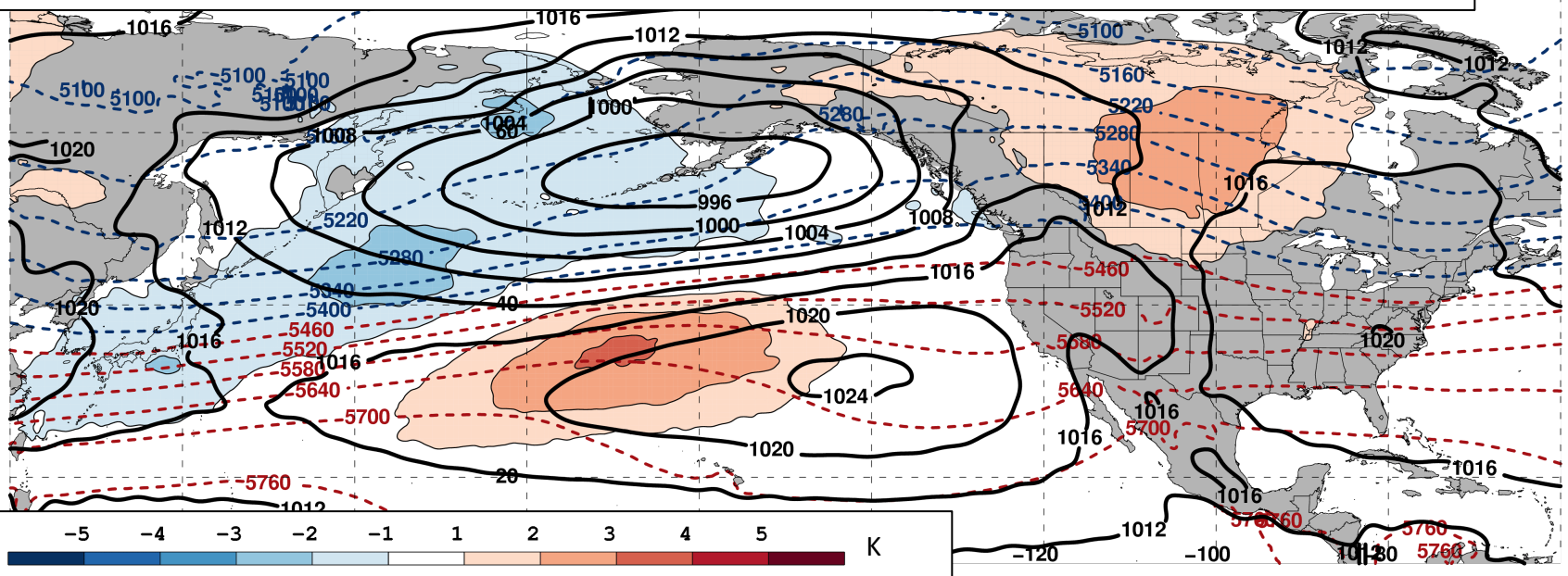


250-hPa Wind Speed, Geo. Heights, Geo. Height Anomalies: Day 2

Poleward Shift (n = 189)

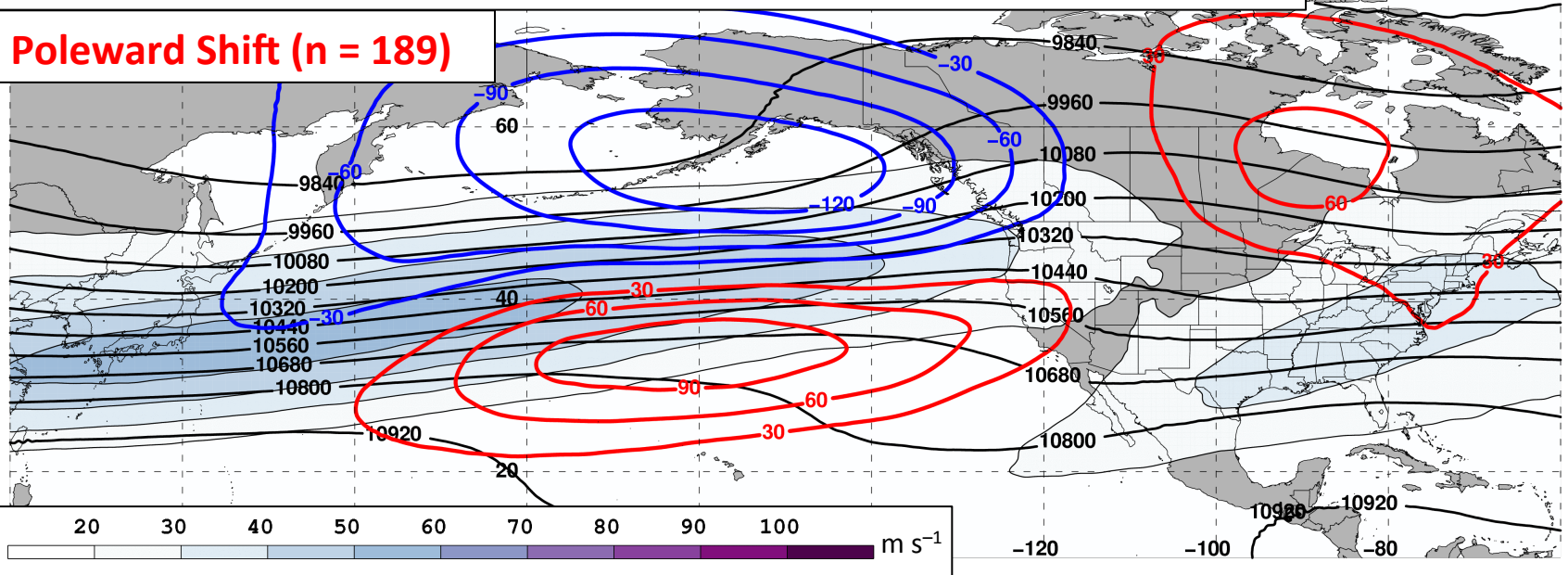


Mean Sea-Level Pressure, 1000–500-hPa Thickness, 850-hPa Temp. Anomalies: Day 2

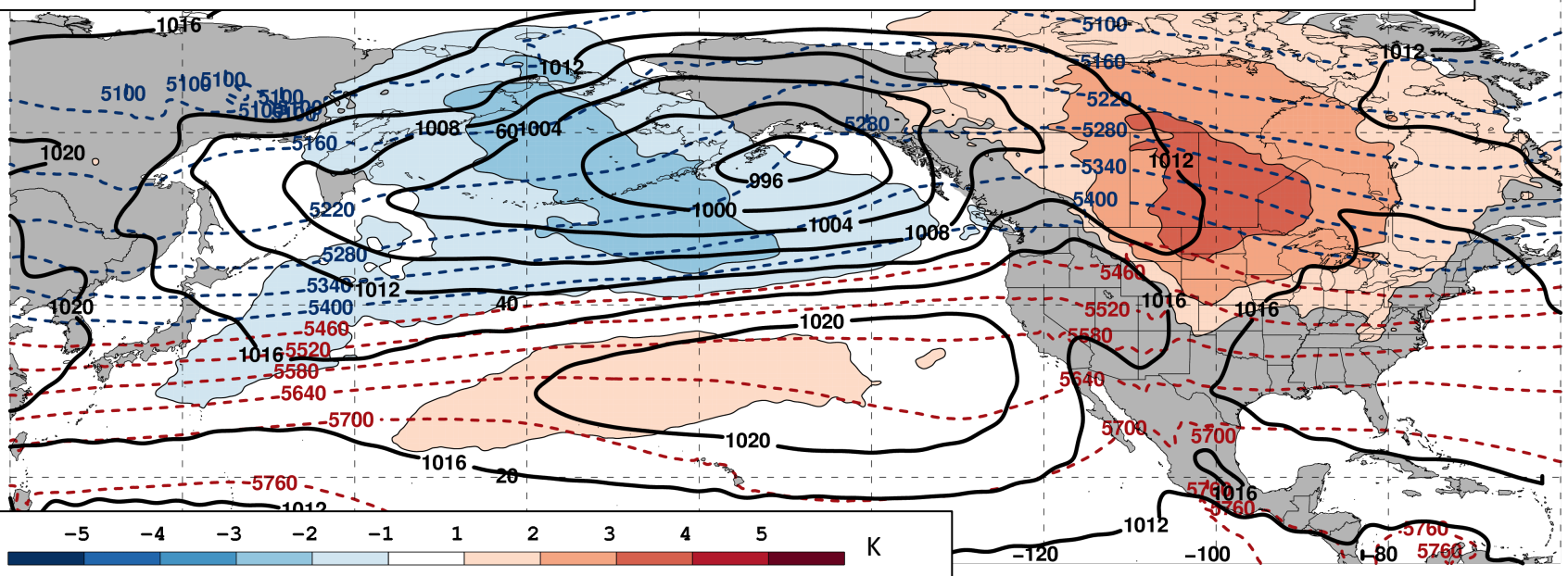


250-hPa Wind Speed, Geo. Heights, Geo. Height Anomalies: Day 4

Poleward Shift (n = 189)

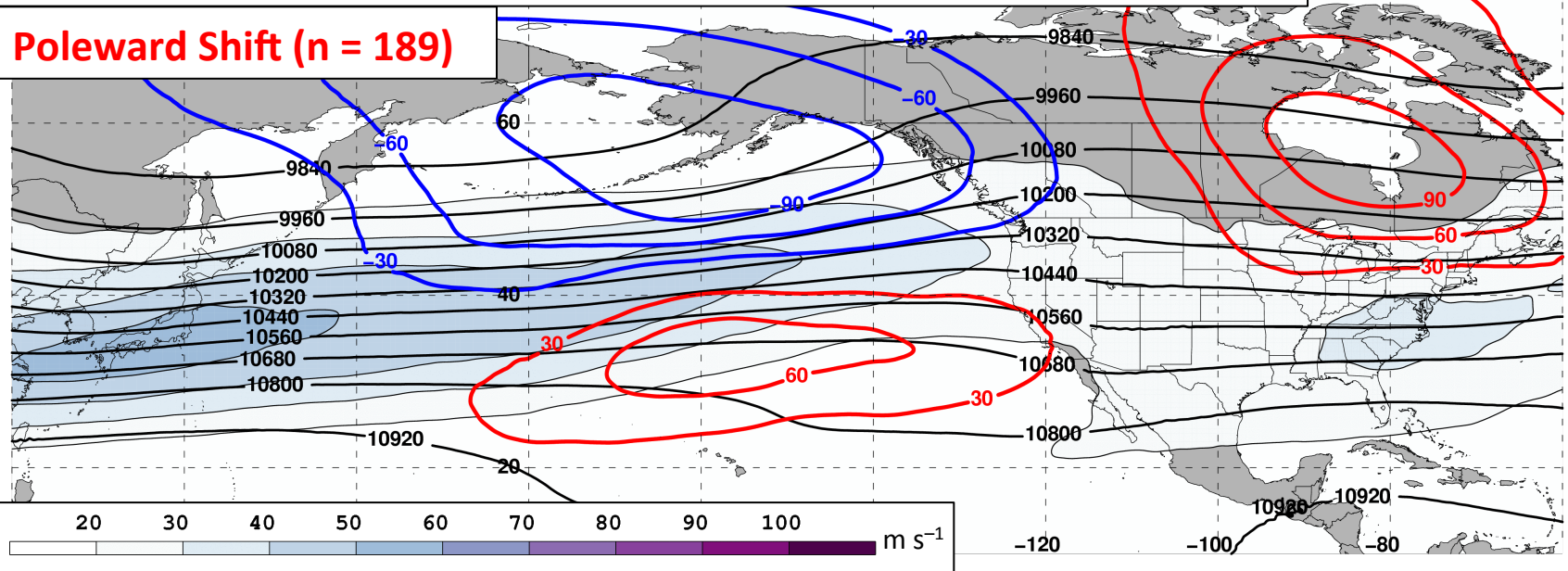


Mean Sea-Level Pressure, 1000–500-hPa Thickness, 850-hPa Temp. Anomalies: Day 4

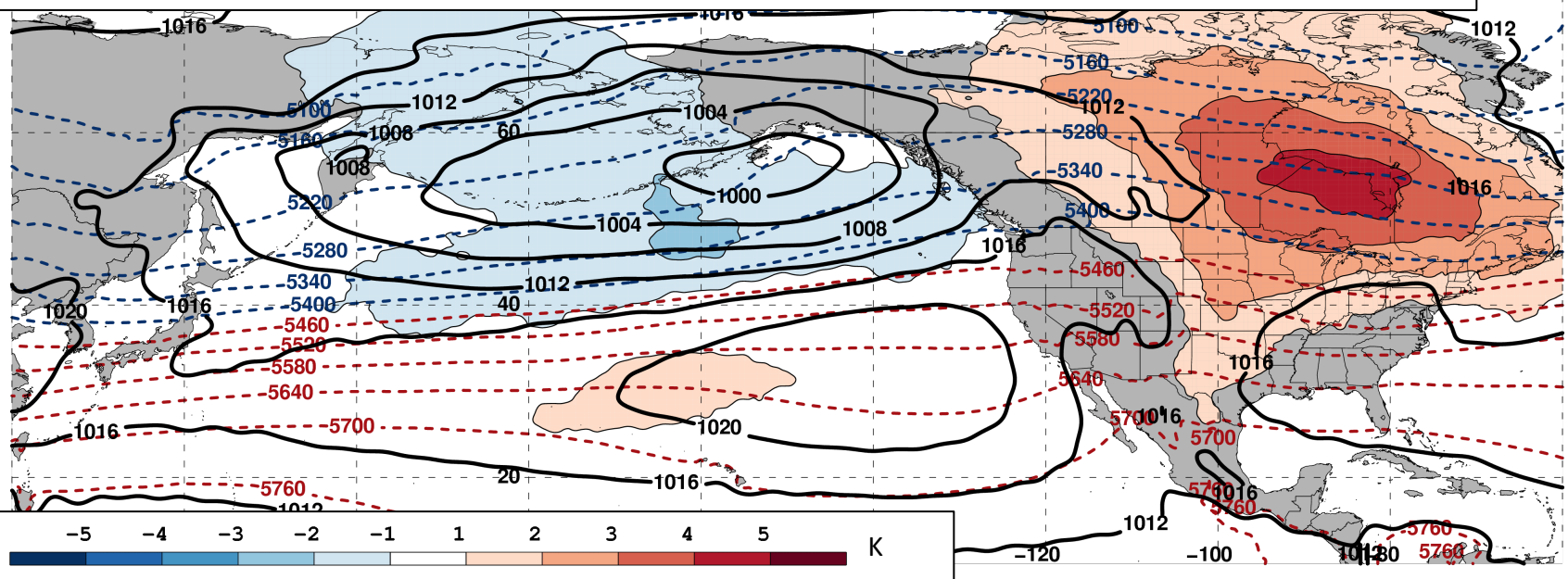


250-hPa Wind Speed, Geo. Heights, Geo. Height Anomalies: Day 6

Poleward Shift (n = 189)

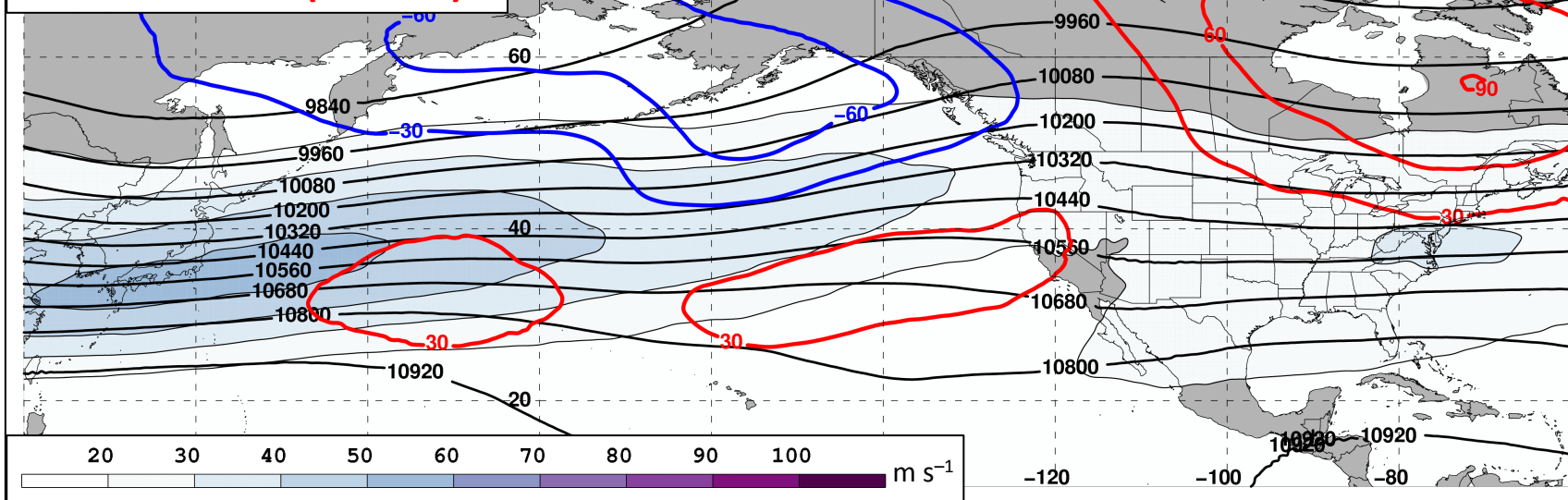


Mean Sea-Level Pressure, 1000–500-hPa Thickness, 850-hPa Temp. Anomalies: Day 6

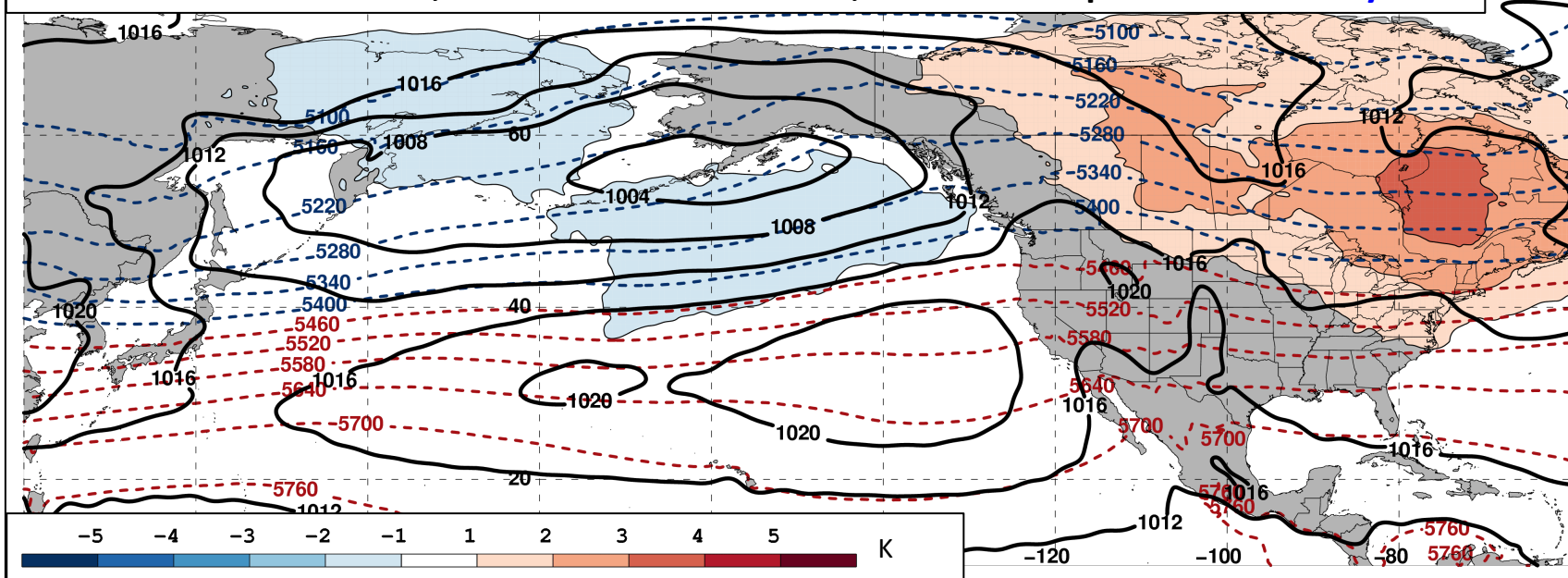


250-hPa Wind Speed, Geo. Heights, Geo. Height Anomalies: Day 8

Poleward Shift (n = 189)

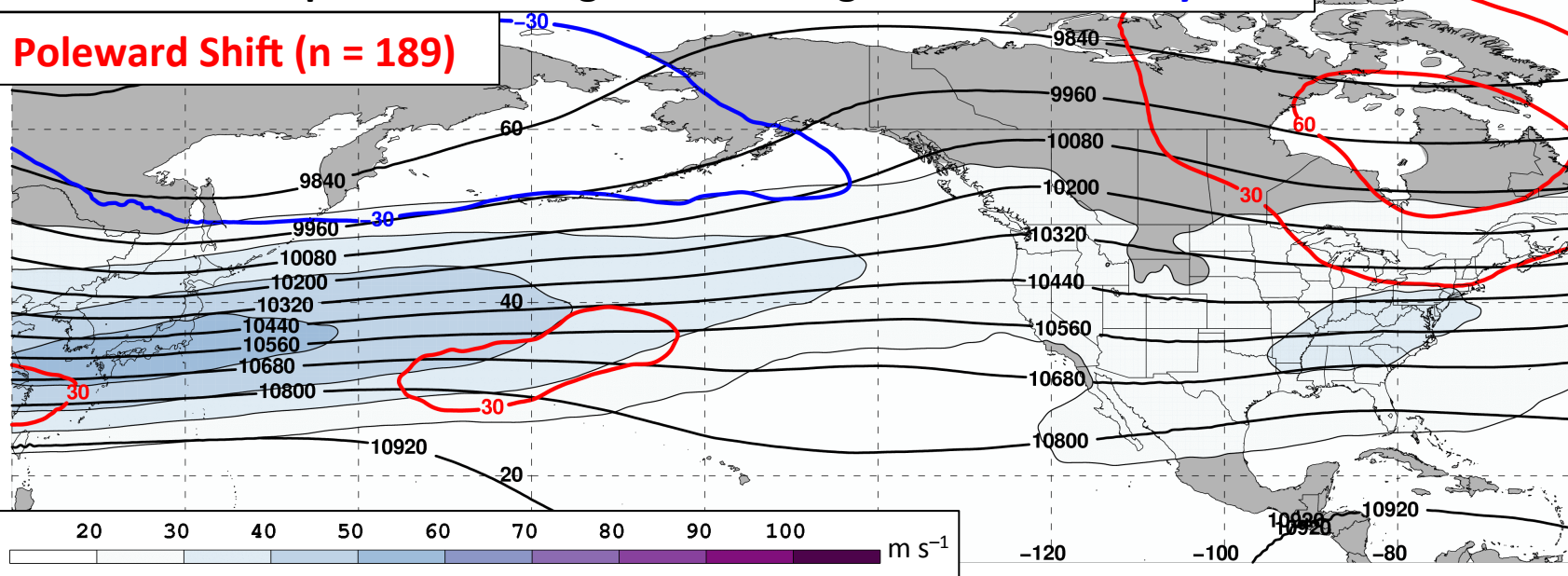


Mean Sea-Level Pressure, 1000–500-hPa Thickness, 850-hPa Temp. Anomalies: Day 8

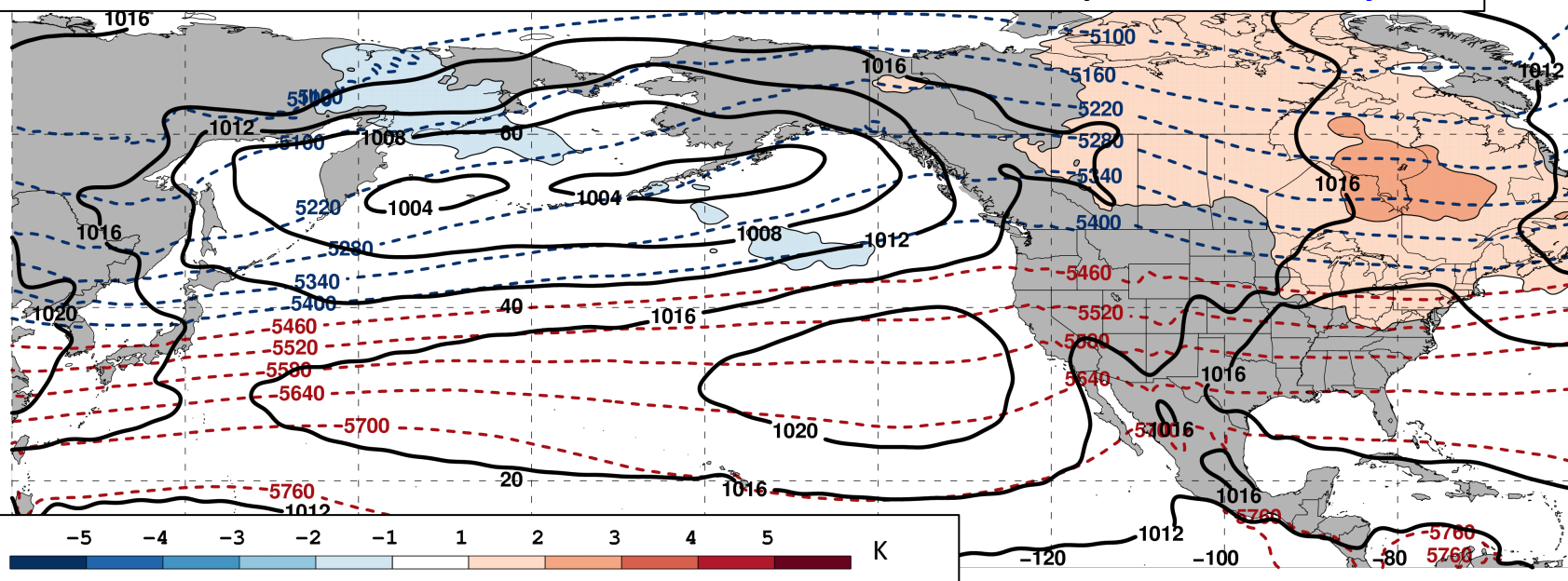


250-hPa Wind Speed, Geo. Heights, Geo. Height Anomalies: Day 10

Poleward Shift (n = 189)



Mean Sea-Level Pressure, 1000–500-hPa Thickness, 850-hPa Temp. Anomalies: Day 10



References

- Athanasiadis, P. J., J. M. Wallace, and J. J. Wettstein, 2010: Patterns of wintertime jet stream variability and their relation to the storm tracks. *J. Atmos. Sci.*, **67**, 1361–1381.
- Griffin, K. S., and J. E. Martin, 2016: Synoptic features associated with temporally coherent modes of variability of the North Pacific jet stream. *J. Climate*, **29**, in press.
- Jaffe, S. C., J. E. Martin, D. J. Vimont, and D. L. Lorenz, 2011: A synoptic climatology of episodic, subseasonal retractions of the Pacific jet. *J. Climate*, **24**, 2846–2860.