



Beyond Geostrophic and Gradient Wind: Enhancing Radio Occultation Wind Field Estimation (Figures and Supplementary Material)

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EGU25, Wednesday 30th of April, 08:35

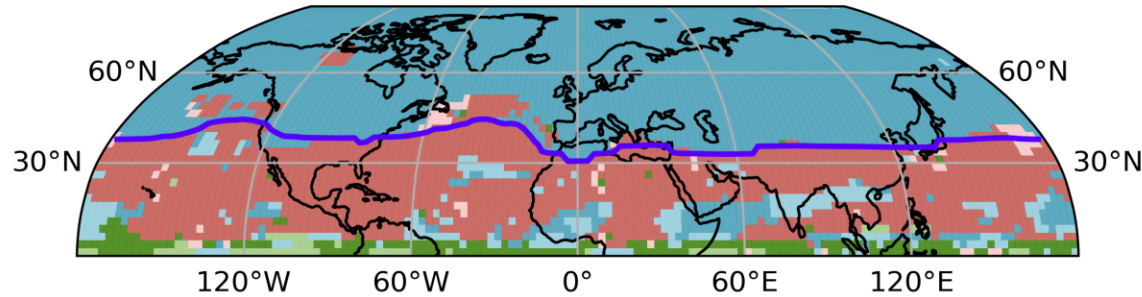
G5.1 – Atmospheric and Environmental Monitoring with Space-Geodetic Techniques

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Best Estimate

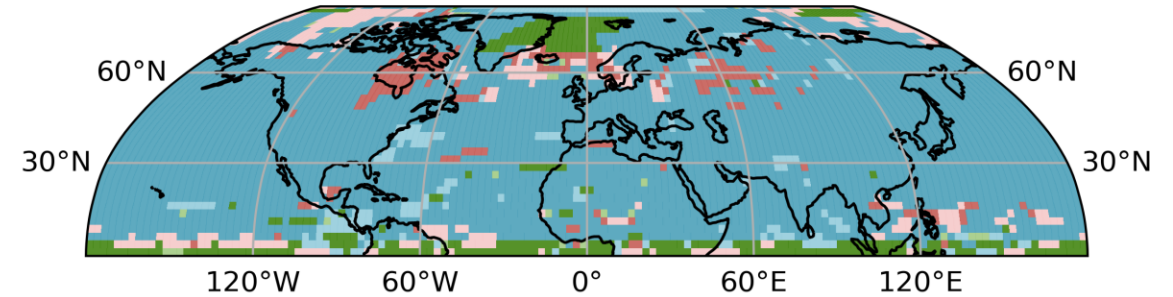
a)

2009-01, 200 hPa, best estimate, GNSS-RO to ERA5

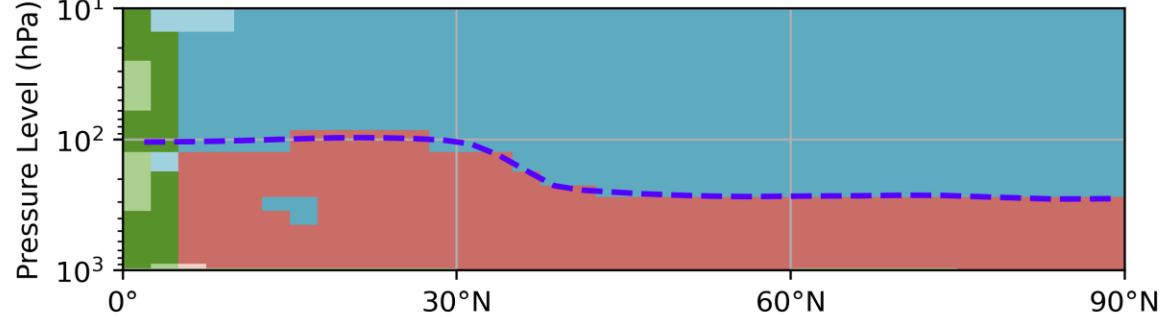


b)

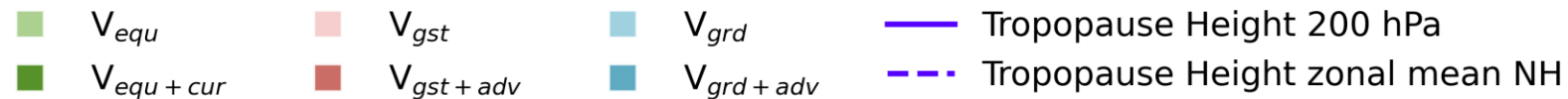
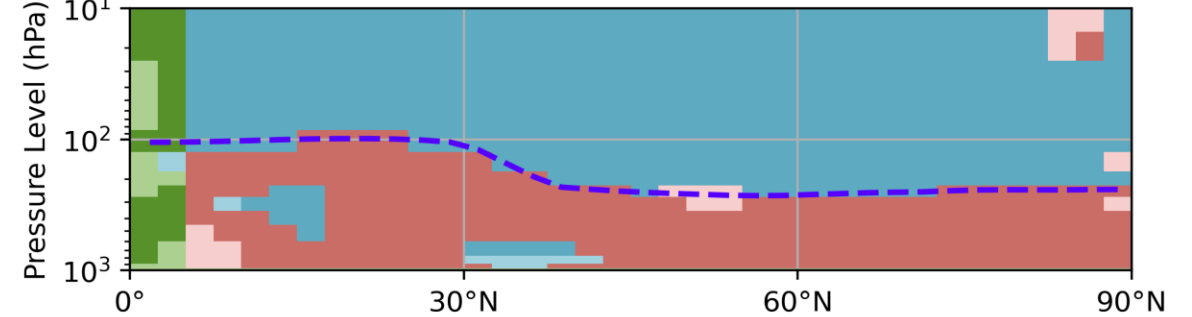
2014-01, 10 hPa, best estimate, GNSS-RO to ERA5



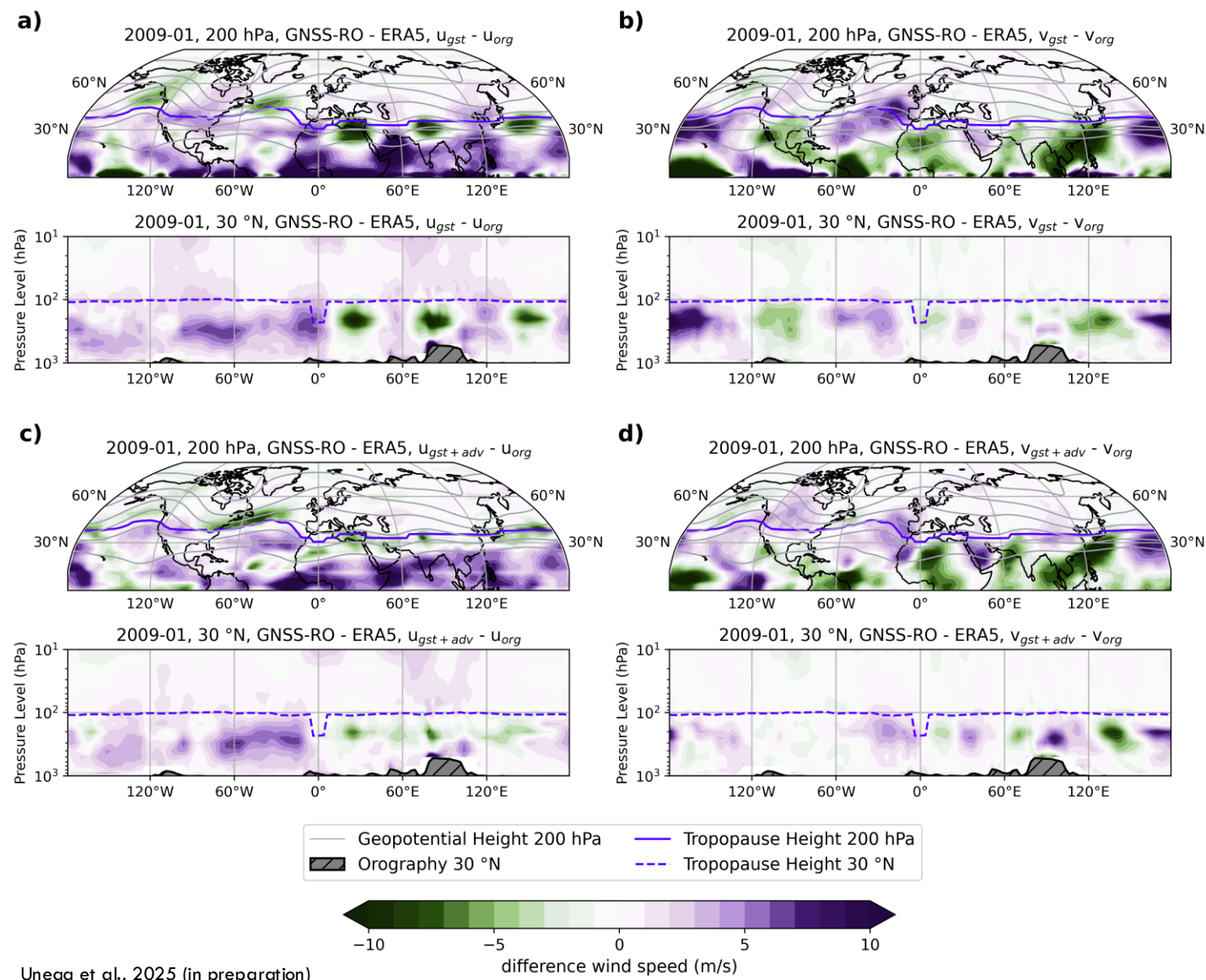
2009-01, best estimate, GNSS-RO to ERA5, zonal mean NH



2014-01, best estimate, GNSS-RO to ERA5, zonal mean NH

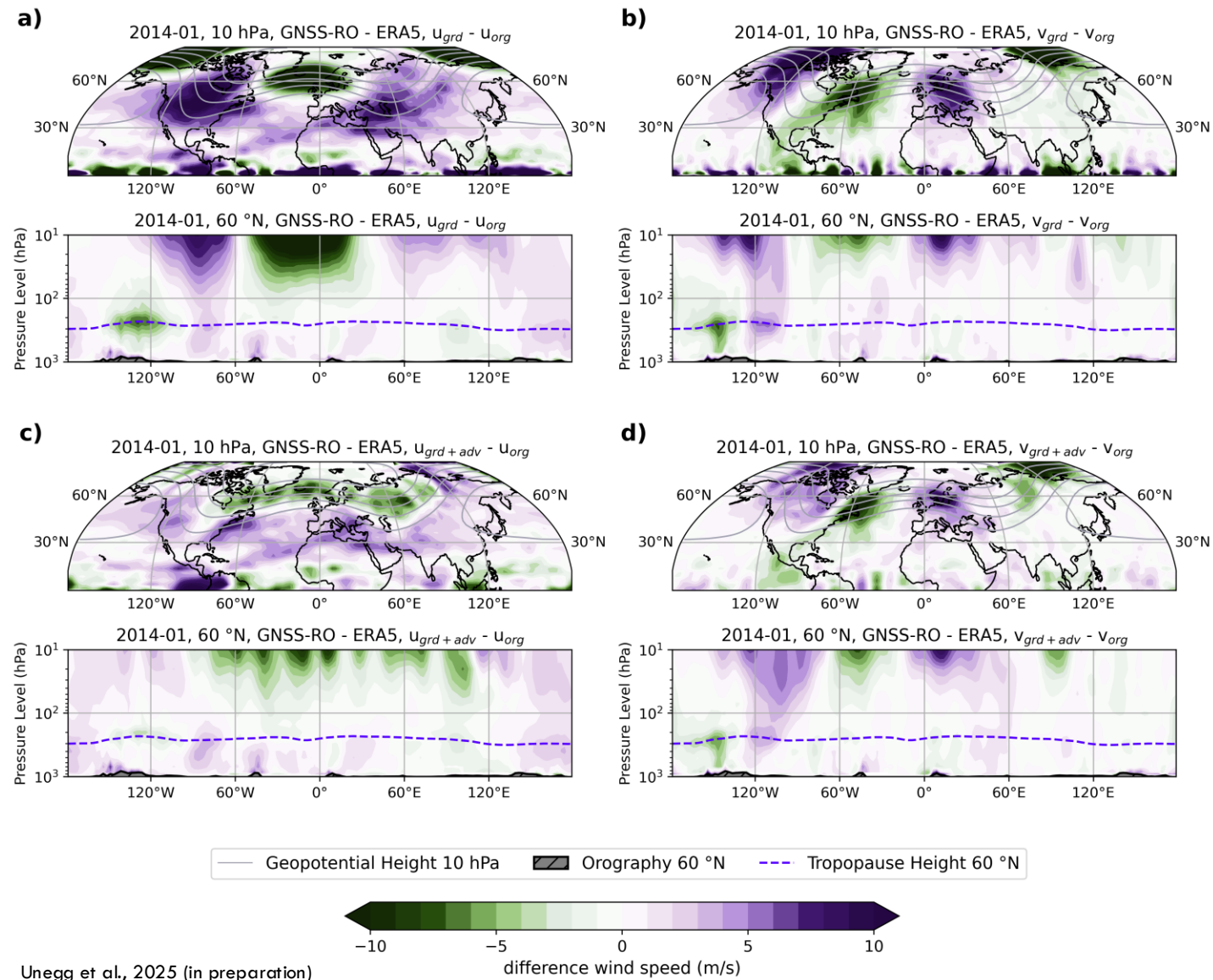


Approximation Bias (2009-01, 200 hPa, 30°N)



Unegg et al., 2025 (in preparation)

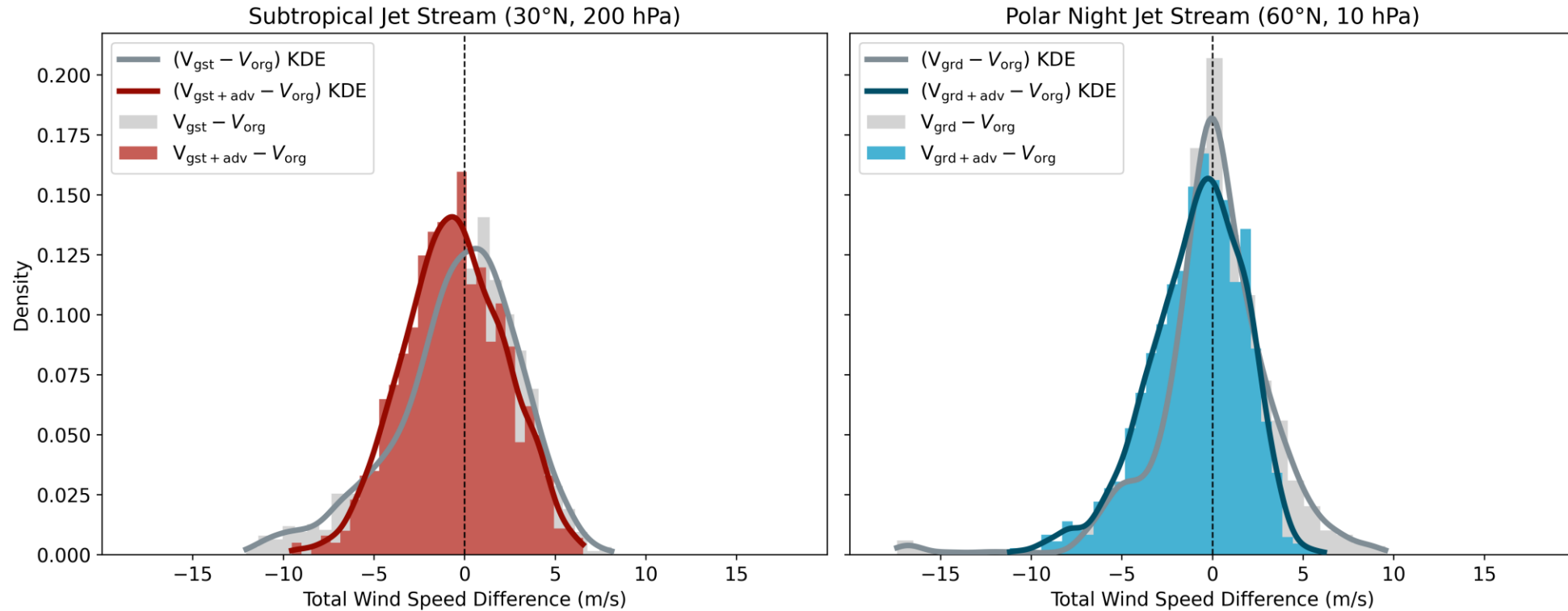
Approximation Bias (2014-01, 10 hPa, 60°N)



Unegg et al., 2025 (in preparation)

Possible Applications (Jet Streams)

Total Wind Speed Differences, GNSS-RO - ERA5, NH January 2007-2020

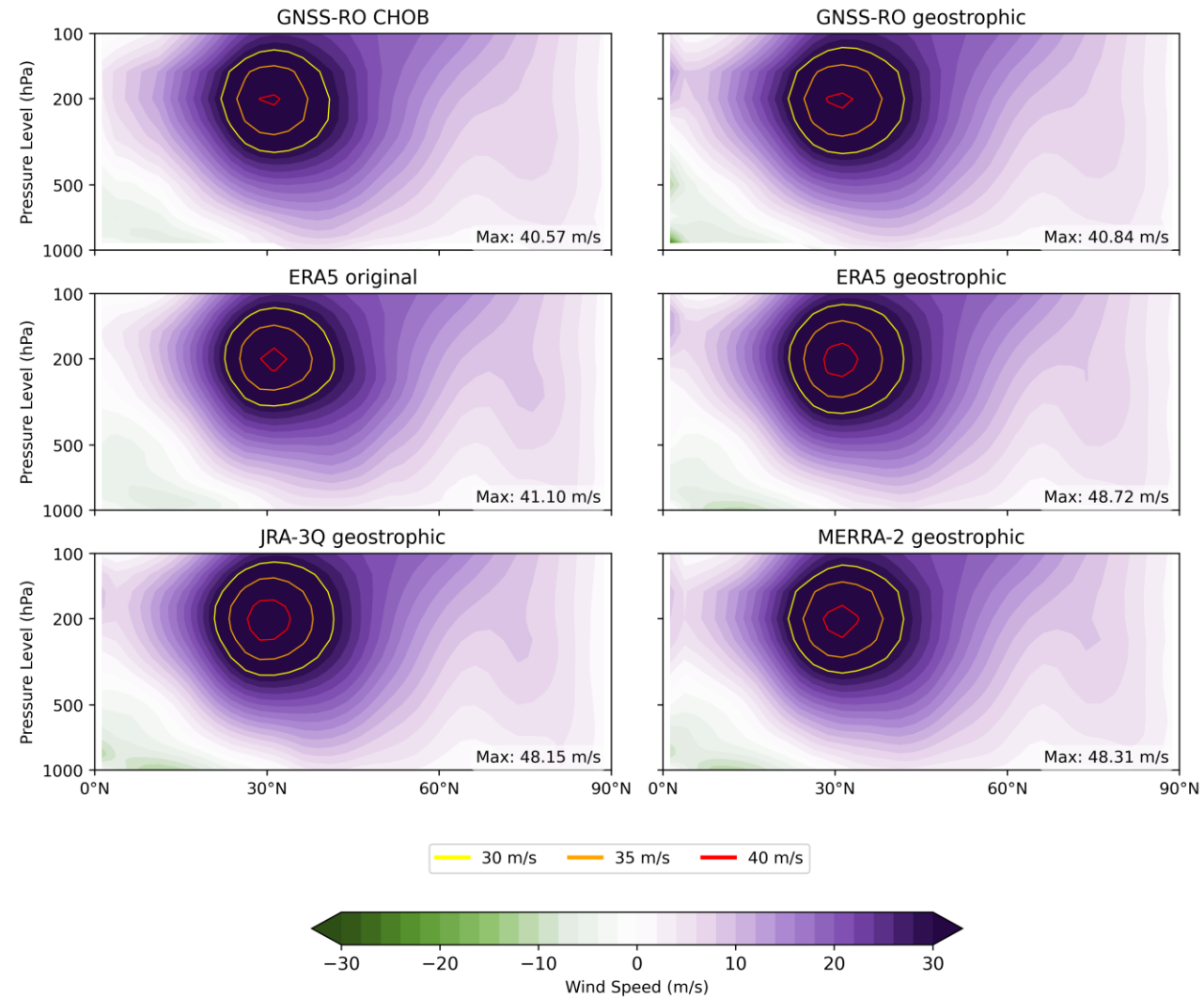


Unegg et al., 2025 (in preparation)

	STJ			PNJ		
$\Delta_{\min}$ (m/s)	$V_{\text{gst}} - V_{\text{org}}$	-12,06	-20,90%	$V_{\text{grd}} - V_{\text{org}}$	-17,41	-35,73%
	$V_{\text{gst+adv}} - V_{\text{org}}$	-9,54		$V_{\text{grd+adv}} - V_{\text{org}}$	-11,19	
$\Delta_{\max}$ (m/s)	$V_{\text{gst}} - V_{\text{org}}$	8,11	-19,61%	$V_{\text{grd}} - V_{\text{org}}$	9,54	-35,43%
	$V_{\text{gst+adv}} - V_{\text{org}}$	6,52		$V_{\text{grd+adv}} - V_{\text{org}}$	6,16	
σ (m/s)	$V_{\text{gst}} - V_{\text{org}}$	3,44	-19,48%	$V_{\text{grd}} - V_{\text{org}}$	3,27	-18,96%
	$V_{\text{gst+adv}} - V_{\text{org}}$	2,77		$V_{\text{grd+adv}} - V_{\text{org}}$	2,65	

Subtropical Jet Stream

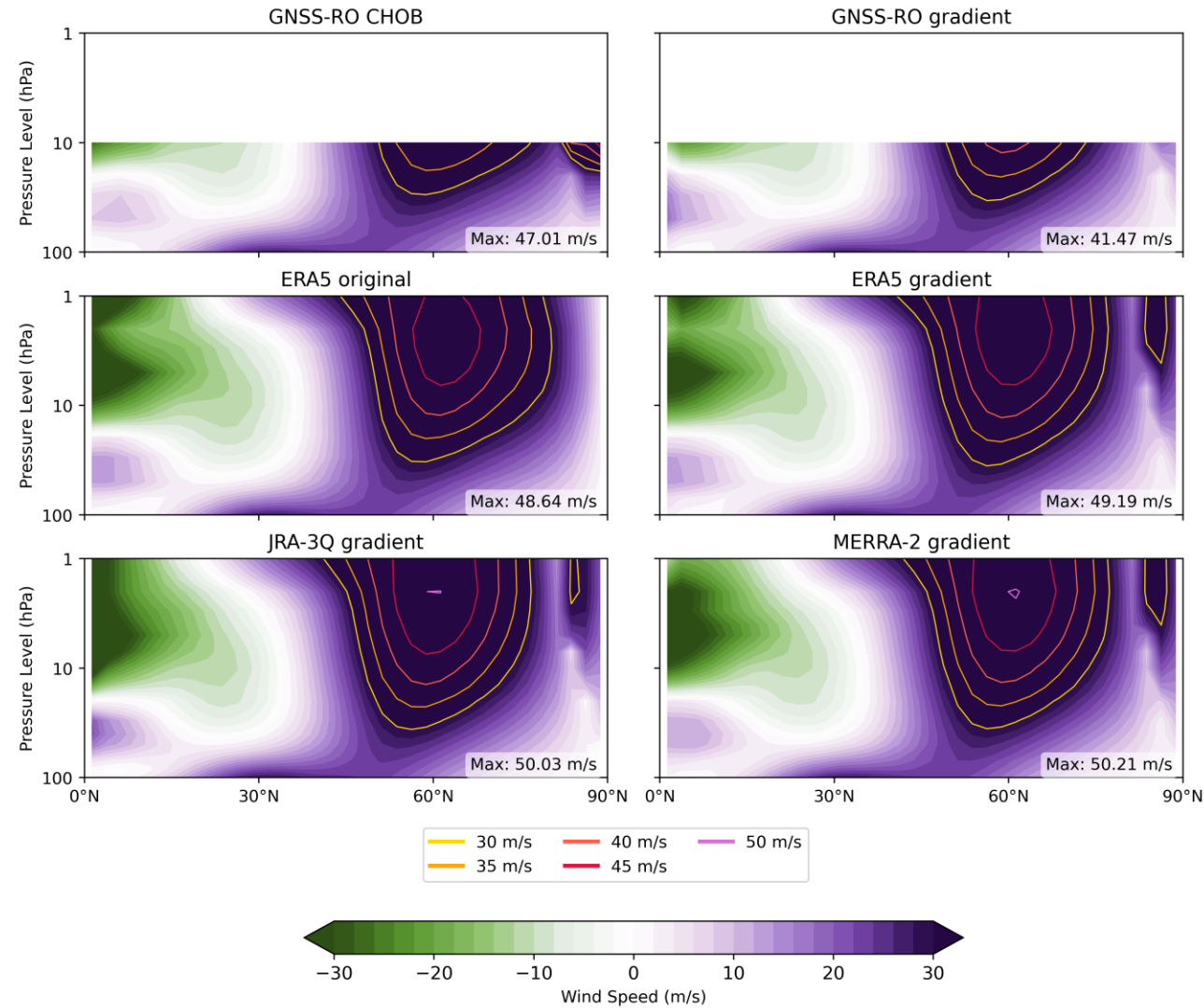
Zonal mean $\bar{u}$, 2009-01



Unegg et al., 2025 (in preparation)

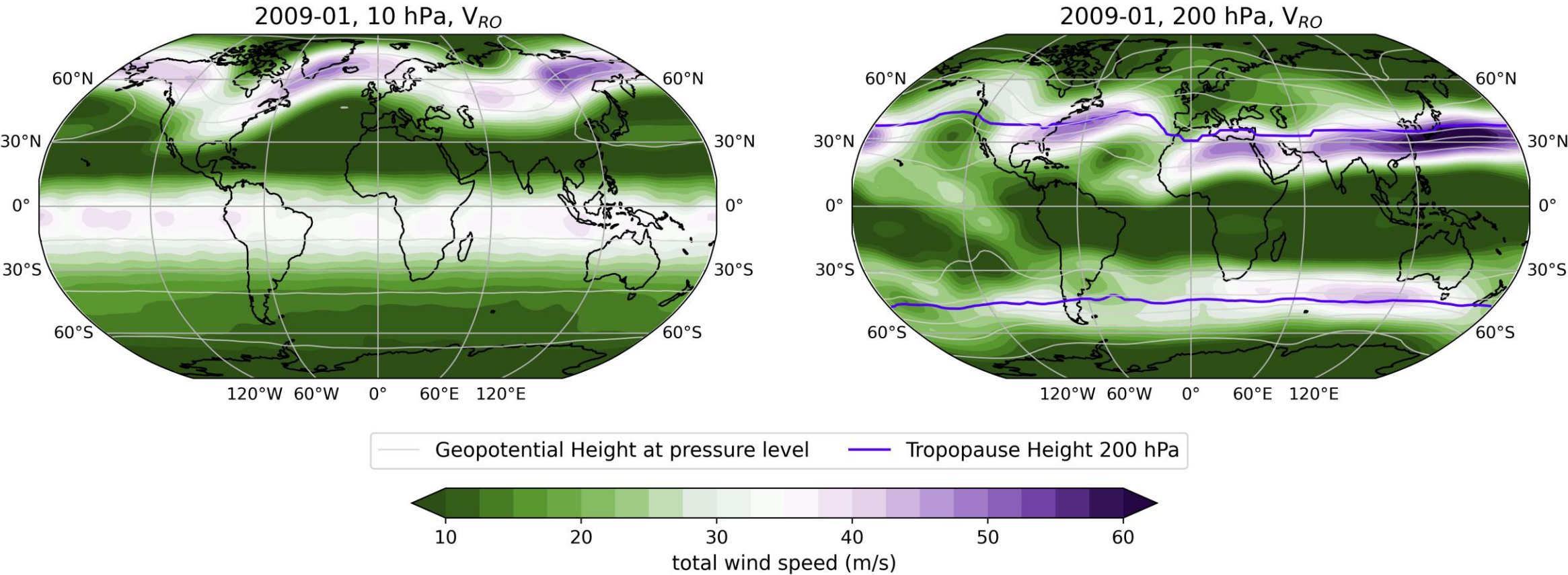
Polar Night Jet

Zonal mean $\bar{u}$, 2014-01



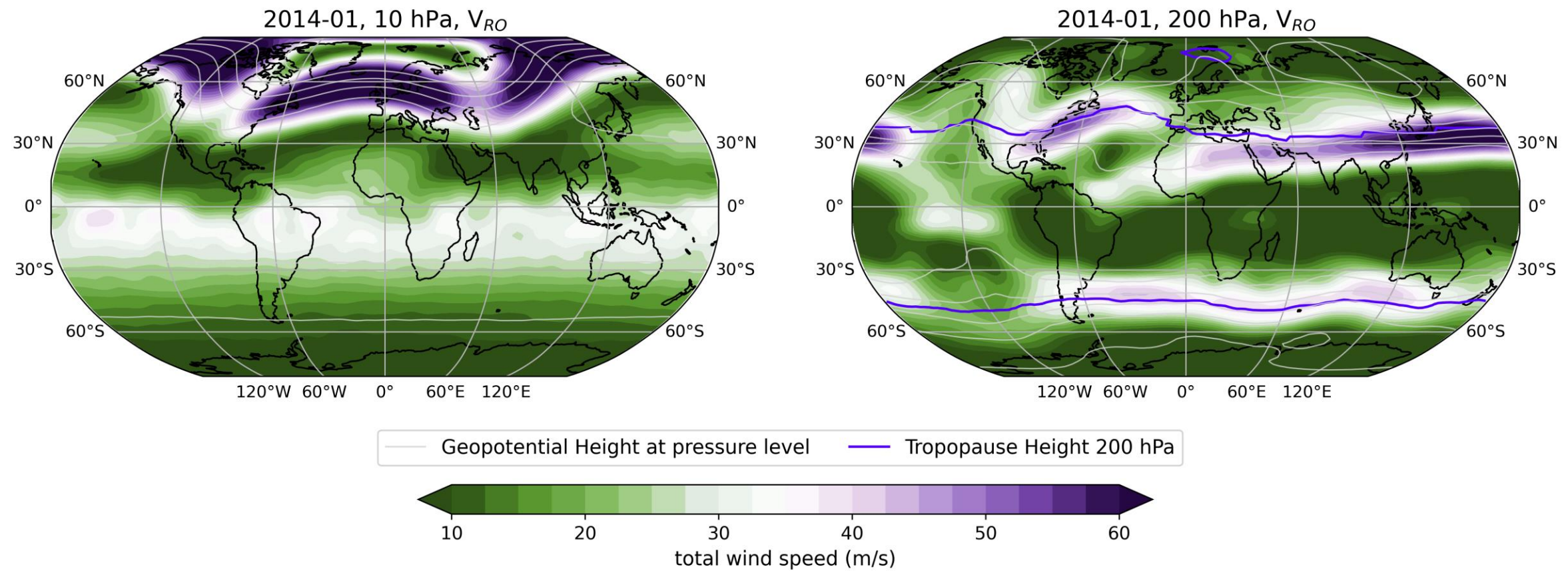
Unegg et al., 2025 (in preparation)

Total Wind 2009-01



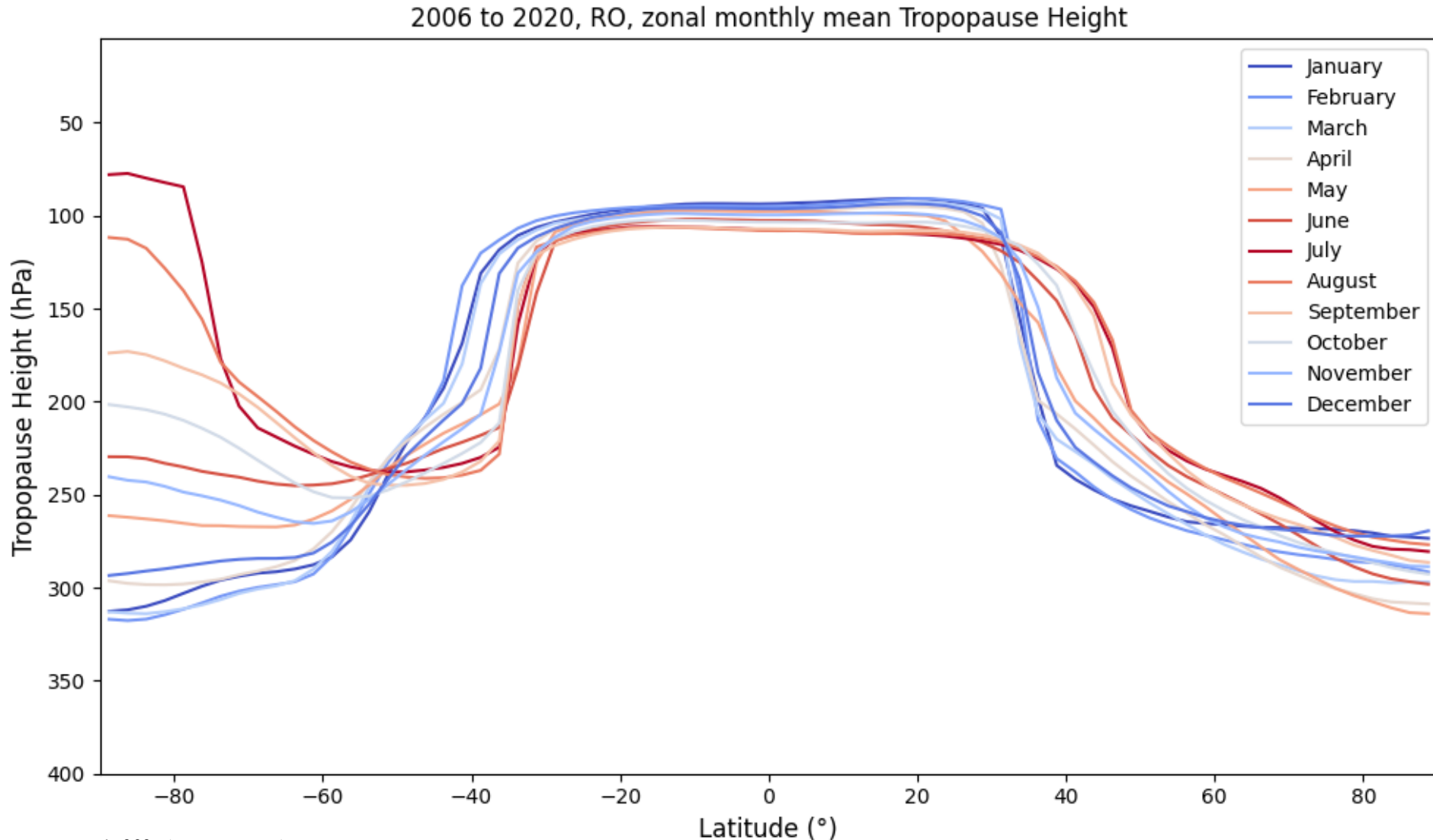
Unegg et al., 2025 (in preparation)

Total Wind 2014-01



Unegg et al., 2025 (in preparation)

Mean monthly Tropopause Height (2007–2020)



Unegg et al., 2025 (in preparation)



Publications from the Strato-Clim group:

Danzer, J., Pieler, M., and Kirchengast, G. (2024), Closing the gap in the tropics: the added value of radio-occultation data for wind field monitoring across the Equator. *Atmos. Meas. Tech.*, 17(16), 4979-4995, <https://doi.org/10.5194/amt-17-4979-2024>

Nimac, I., J. Danzer, and G. Kirchengast (2025), The added value and potential of long-term radio occultation data for climatological wind field monitoring. *Atmos. Meas. Tech.*, 18, 265-286, <https://doi.org/10.5194/amt-18-265-2025>

Nimac, I., J. Danzer, and G. Kirchengast (submitted), Climatic higher-order balanced winds beyond geostrophic and gradient wind fields.

Unegg, J., I. Nimac, and J. Danzer (in preparation), Beyond geostrophic and gradient wind: Enhancing the estimation of climatic wind fields from radio occultation.



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