Thanks again to the editor and reviewer for their helpful comments, we are grateful to them for their time spent helping improve this manuscript. Please see our responses below.

Editor comments

Specifically, the comment about lines 6 and 86/87 - I agree with the reviewer that these sentences are confusing, and have a feeling that the main message is that the rolling zonalization requires PV on theta surfaces, which requires a further high-level diagnostic of calculating the PV on theta surfaces. This can add a lot of numerical noise if there is only daily data on pressure surfaces.
The reason for not using rolling-zonalization for the KS waveguides is as Volkmar noted, that inverting PV to get the zonal winds required for the Ks waveguides is a complex task. However, your point is also valid. The text has been reworded, as noted below for the specific sentences.

Abstract sentence - the bit after the ; "however, this can only be performed on PV, and so the KS-waveguides use time- and zonal- filtering" is not clear, especially if read before reading the paper itself. Also, why "and so"?
Thank you for this comment. This has now been reworded as follows:
We compare waveguides from potential vorticity (PV) gradients (`PV-waveguides') with barotropic waveguides based on what is known as the stationary wavenumber, or $K_S$ (`KS-waveguides'), which is calculated from the zonal wind. The PV-waveguides use a PV-rolling-zonalization method to separate the waves from the background flow. The background flow for the KS-waveguides is calculated using time- and zonal- filtering.

Also lines 86-87: "This method requires PV, however, and cannot be applied directly to the zonal wind data required for the KS-waveguides." is confusing. You can calculate PV from the zonal flow, no? is it indeed a matter of not having enough layers in the daily output to capture the contribution of the vertical derivatives of the flow to PV, so that the numerical errors are too large?
Yes, we could calculate PV from the zonal flow, and then zonalize it, but the issue is (as Volkmar noted) that inverting PV to get the zonal winds required for the Ks waveguides is a complex task. We have now made this clearer in the text:
To avoid this issue, Polster and Wirth (2023) develop a method of calculating a `locally-zonalized' flow for detection of the PV-waveguides on isentropic surfaces, an extension of the zonally symmetric zonalization method (Nakamura and Zhu, 2010; Nakamura and Solomon, 2011; Methven and Berrisford, 2015}. This method cannot be applied directly to the zonal wind data required for the KS-waveguides, and inverting the zonalized PV to produce (zonalized) zonal winds would be a complex task. Given that daily zonal wind on upper tropospheric pressure levels are available directly from many CMIP6 climate model simulations, KS-waveguides on time- and zonally-filtered zonal winds are easier to calculate for future climates than PV-waveguides. The interpolation of this daily pressure level data onto the isentropic surfaces required for the PV-waveguides could potentially introduce significant numerical noise.

Other comments I have on top of the ones raised by the reviewer:
The rolling zonalization is not quite a smoothing (c.f. line 127). I would maybe phrase: "Zonalization is a method of straightening out the wavy PV contours, essentially zonally smoothing.."
A good point, thanks – text changed as suggested.

The diagnostic description is missing details about the levels used for the calculation. Is it 300mb U for Ks? What theta surface is used in figures 2-3? I would also explicitly note that the climatological U is different between Ks and Pv based subplots in these figures because of the differences between isentropic and pressure level U (assuming this is the cause for the difference).
These details were given at the beginning of section 2 (300hPa for Ks, 330K for PV in winter, 345K for PV in summer). The zonal wind contours in the PV panels are still at 300hPa (as noted above, inverting the PV to get the zonal winds is not done in this study. These details have now been added to the captions of Figs 2 and 3.

Reviewer comments

Abstract line 6 and main text lines 86/87: The text reads as if the technique of rolling zonalization precludes the computation of Ks-waveguides. This is not really true. Assuming a balance condition, the knowledge of PV allows one to compute the wind through so-called PV inversion. Of course, PV inversion in the framework of the primitive equations is cumbersome (see e.g., Nakamura and Solomon 2011), but at least in principle it would be possible. Having said this, I do NOT suggest that this should be done here.

Agreed – I have reworded the text to make this clearer:

Abstract: We compare waveguides from potential vorticity (PV) gradients (`PV-waveguides') with barotropic waveguides based on what is known as the stationary wavenumber, or $K_S$ (`KS-waveguides'), which is calculated from the zonal wind. The PV-waveguides use a PV-rolling-zonalization method to separate the waves from the background flow. The background flow for the KS-waveguides is calculated using time- and zonal- filtering.

Line 86/87: To avoid this issue, Polster and Wirth (2023) develop a method of calculating a `locally-zonalized' flow for detection of the PV-waveguides on isentropic surfaces, an extension of the zonally symmetric zonalization method (Nakamura and Zhu, 2010; Nakamura and Solomon, 2011; Methven and Berrisford, 2015}. The zonalization method cannot be applied directly to the zonal wind data required for the KS-waveguides. Calculating KS-waveguides on zonalized background flow would therefore require inverting zonalized PV to produce zonalized zonal winds; this PV inversion on daily data would be a complex task. Given that daily zonal wind on upper tropospheric pressure levels are available directly from many CMIP6 climate model simulations, KS-waveguides on time- and zonally-filtered zonal winds are easier to calculate for future climates than PV-waveguides, or KS-waveguides on zonalized data. The interpolation of daily pressure level data onto the isentropic surfaces required for the PV-waveguides could potentially introduce significant numerical noise, adding further complexity to the PV-waveguide calculation for CMIP data.

Figure caption Fig 2: Units of \nabla ln PV must be m-1

Good point, thanks – corrected.

Line 185, the definition of w_s: this seems somewhat unclear, since K_s is a function of latitude. Are you considering the maximum value of K_s-k over the waveguide, i.e., the range of latitudes where K_s>k?

This has been reworded to hopefully make it clearer that it is indeed the maximum value of Ks-k over the range of latitudes within the waveguide:

the maximum waveguide strength, $w_S = \max(K_S - k)$ across all latitudes within the waveguide

Line 257: the formula given for W_s is somewhat ambiguous: do you mean the sum of (K_s-k) or do you mean the (sum of K_s) minus k?

Added parentheses to clarify:

Line 283, what is the “second meridional gradient”? Do you mean the second derivative of U in the meridional direction?

Yes – text clarified.

Line 348: what is an “in-season seasonal cycle”?

We meant differences between June and August, for example, distinct from the larger differences between December and July, however it seems perhaps that is confusing. Changed to just seasonal cycle.