Fig. S1. Same as Fig. 4b but constructed using 41 years of hourly data (1979-2019).
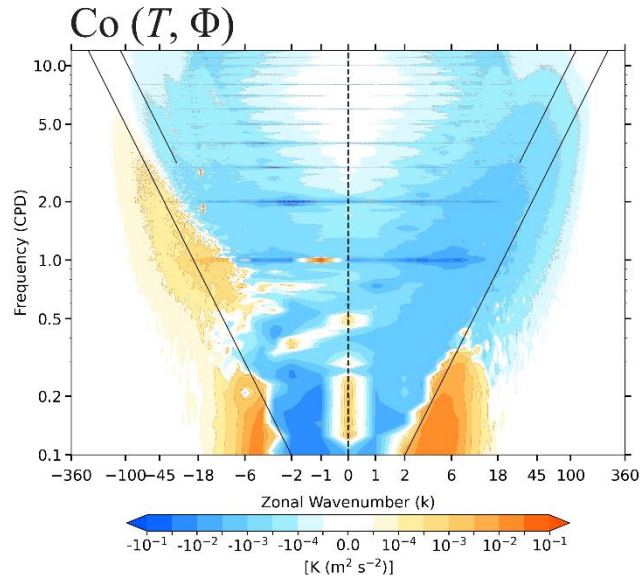
Fig. S2. Same as Fig. 5c but showing the cospectrum (Co) between temperature and geopotential at the 50 hPa level. It is evident that their corresponding quadrature spectrum shown in Fig. 5c is several orders of magnitude stronger for the gravity waves. The signal of external Rossby waves is evident here as the patches of orange in the low frequency part of the spectrum.
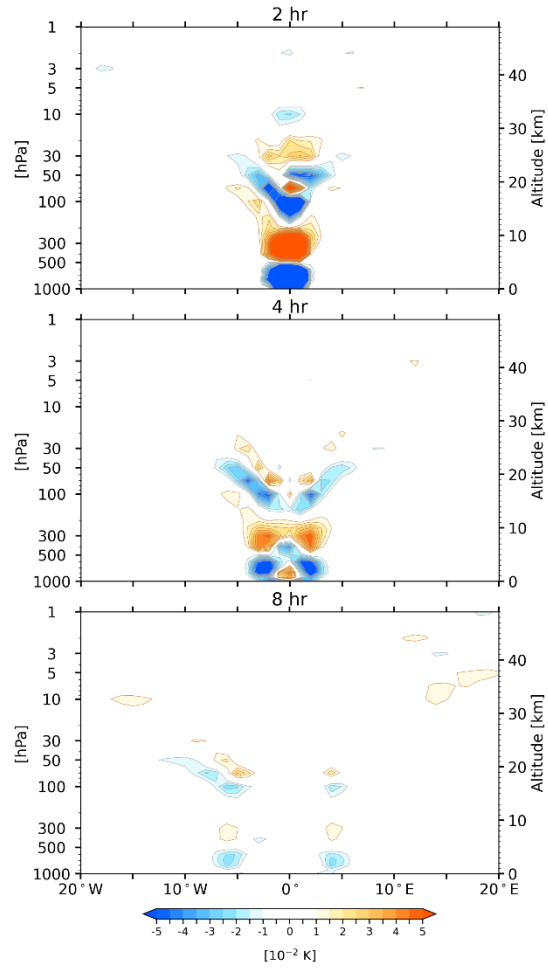
Fig. S3. Same as the right column of Fig. 11 but the reference timeseries is the difference of vertical velocity at 300 and 700 hP, representing the second baroclinic mode of diabatic heating.
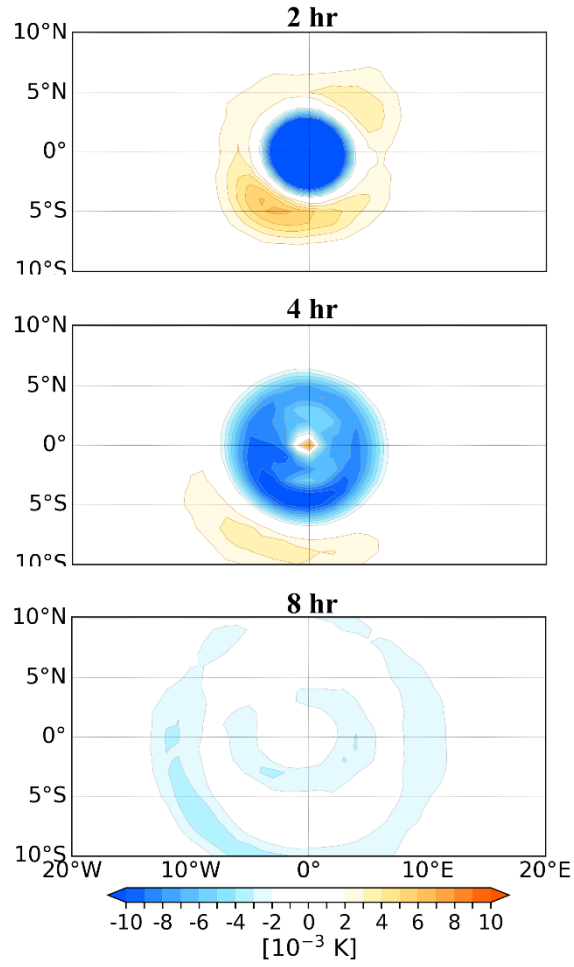
Fig. S4. Same as the left column of Fig. 9 but based on the on the top 10% of strongest *upwelling* events at individual referenced grid points along the equator.