

Supplementary Materials: Variations in wave energy and amplitudes along the ray paths of barotropic Rossby waves in horizontally non-uniform basic flows

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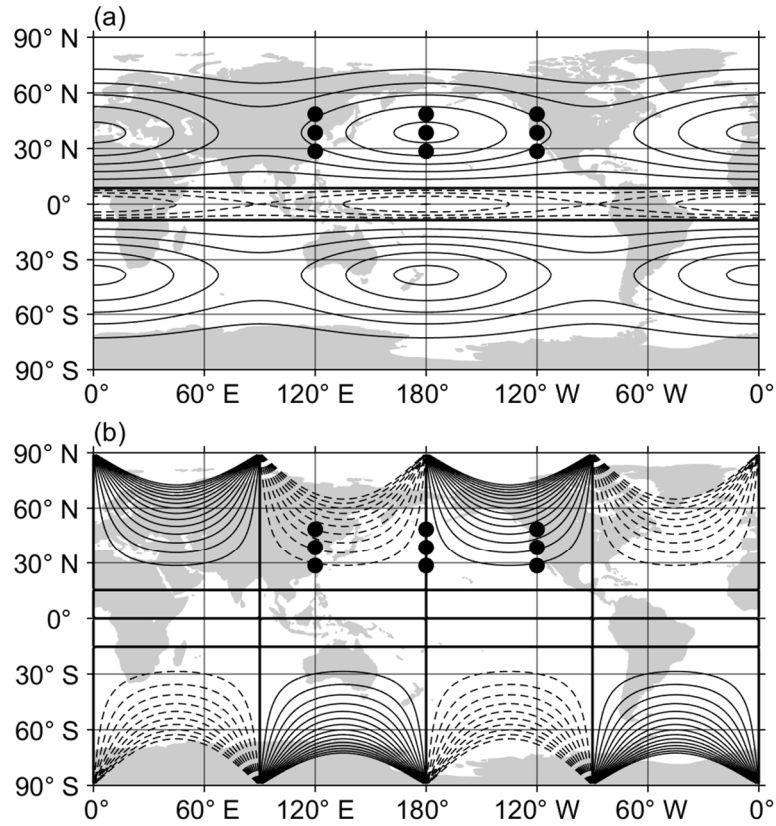


Figure S1. The zonal component u (a) and the meridional component v (b) of the analytical basic flow. The contours in (a) is 5m/s or the westerly and 1m/s for the easterly while the contours in (b) is 2m/s. The easterly in (a) and northerly in (b) are dashed contoured and the zero values are bold. The black dots are a wave source array of 9 points. The points locations are 120° E, 28.5° N; 120° E, 38.5° N; 120° E, 48.5° N; 180°, 28.5° N; 180°, 38.5° N; 180°, 48.5° N; 120° W, 28.5° N; 120° W, 38.5° N; 120° W, 48.5° N.

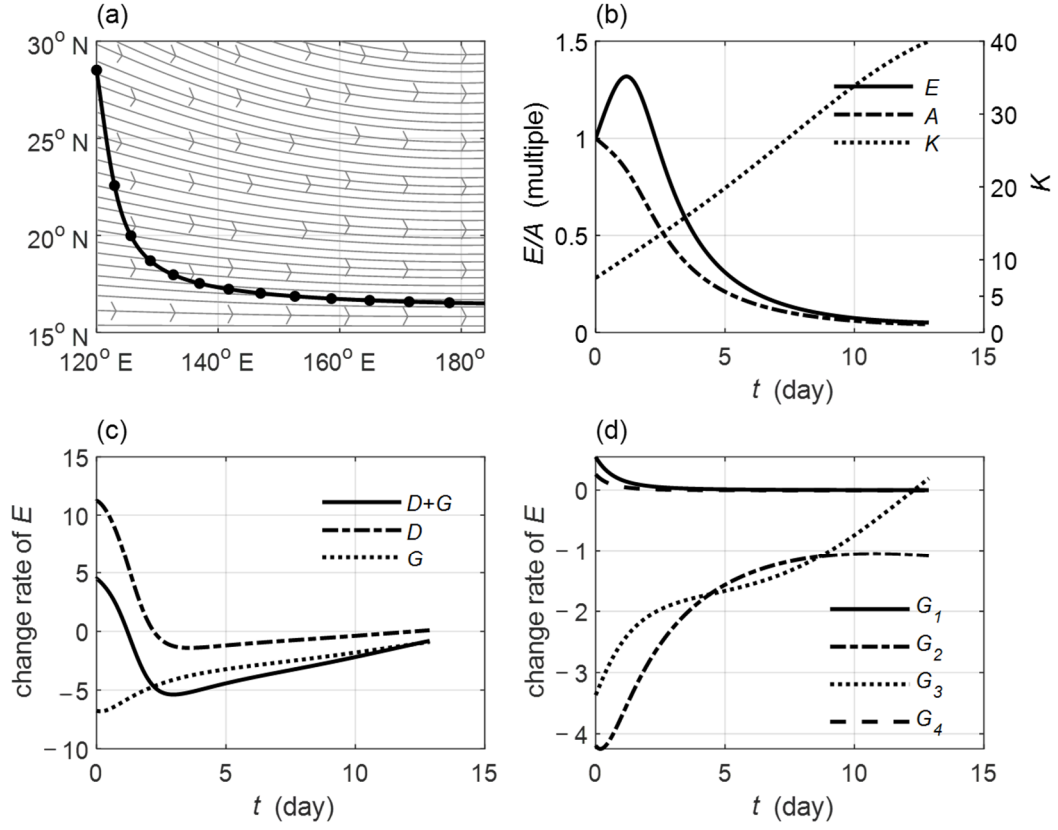


Figure S2. Ray path (solid black dots denoting the 1-day interval) of the wave (the source is set to 120° E, 28.5° N) with a period $T=30$ days (a). The variations in wave energy (solid line), amplitude (dash-dotted line) and the total wave number (dotted line) along the ray (b). The variations in the divergence of group velocity (dash-dotted line, shortened as D), the energy budget from the basic flow (dotted line, shortened as G), and the sum of them (change rate of the wave energy) along the ray (c). The variations in the four components of the energy budget from the basic flow (shortened as G_1 , G_2 , G_3 , and G_4 , respectively and their sum equals G) along the ray (d). D and G (G_1 , G_2 , G_3 and G_4) have been magnified 10^6 times to glory the figure.

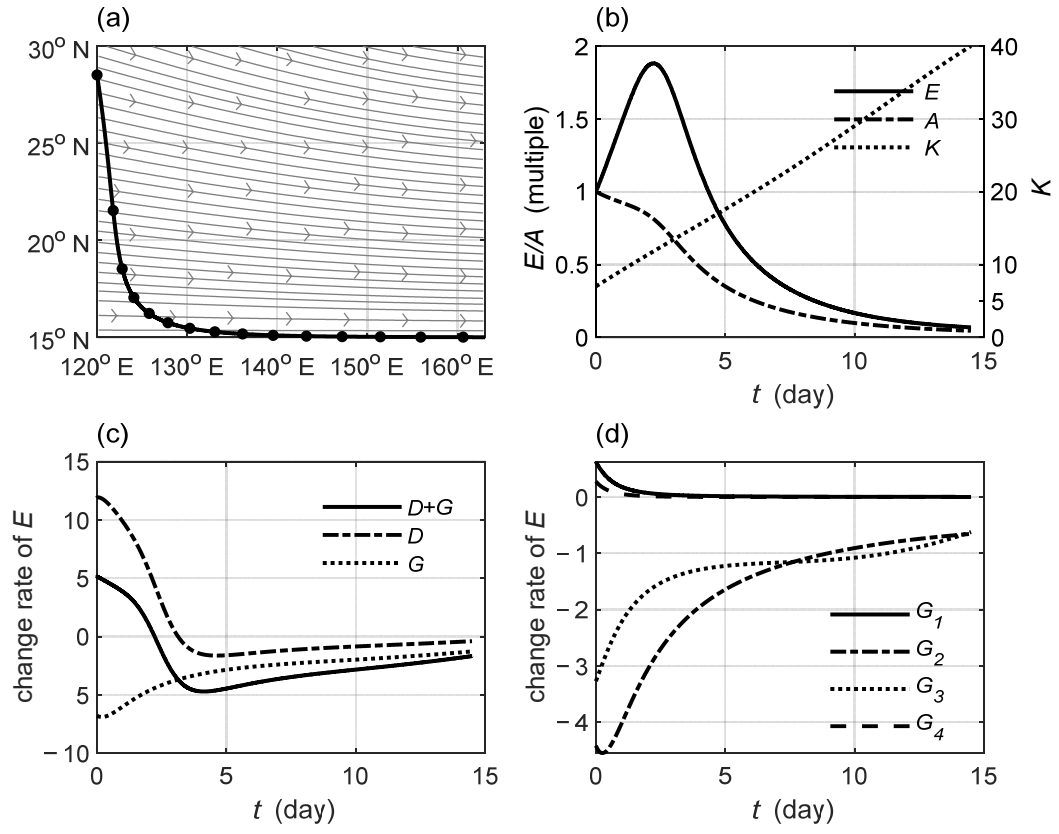
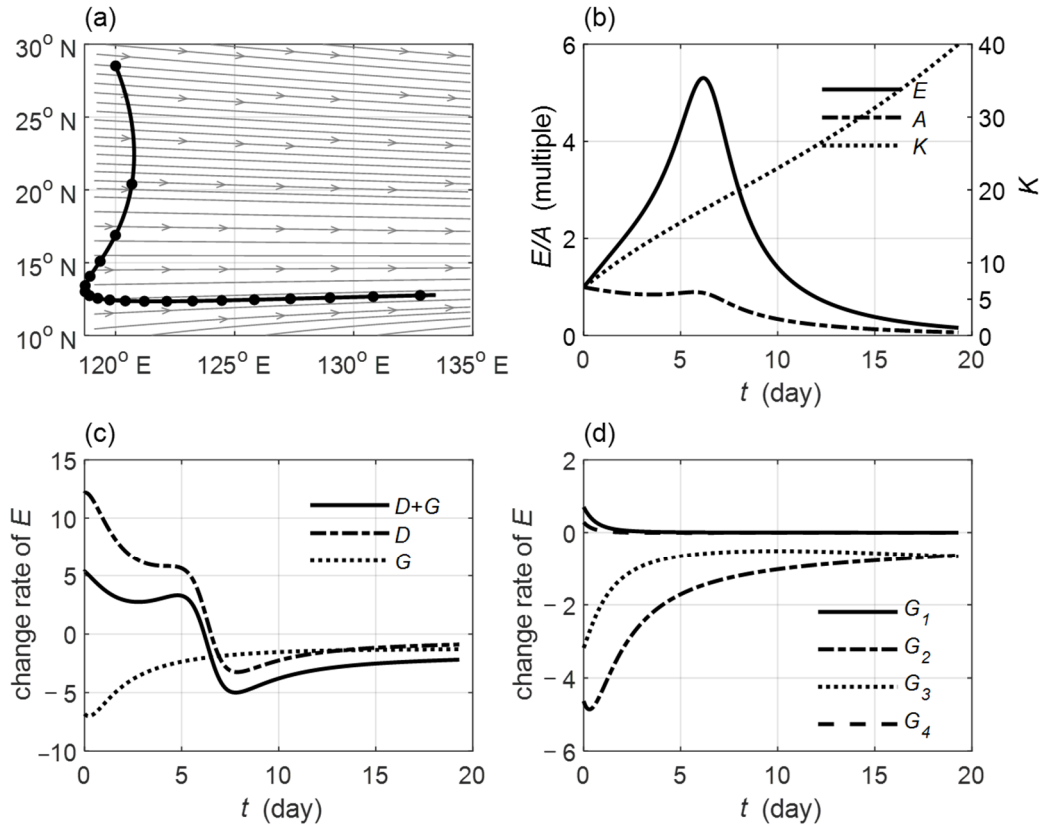


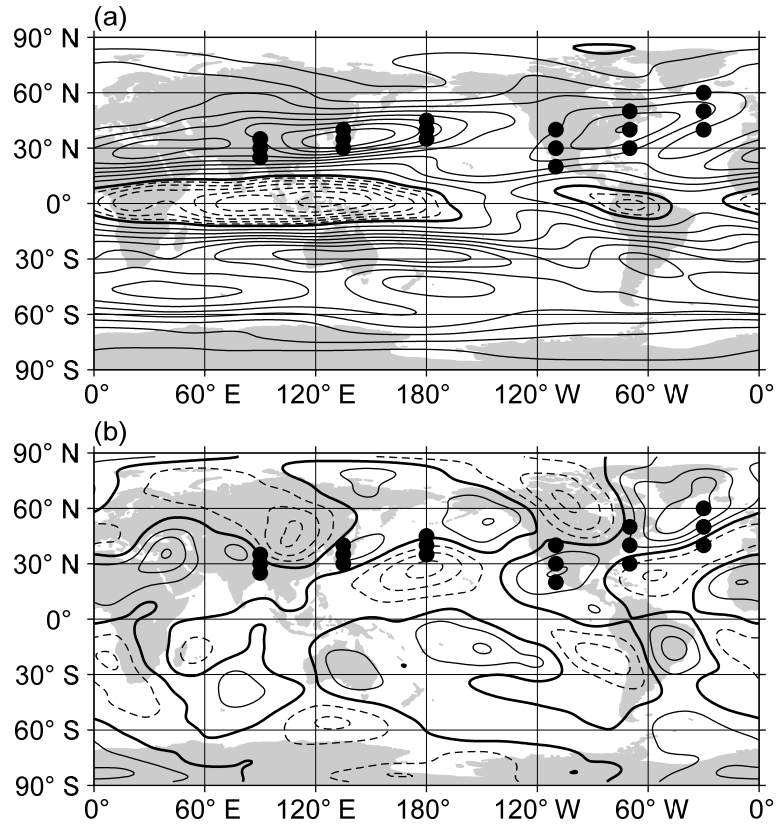
Figure S3. Same as Fig. S2 but for the wave with a period $T=60$ days.

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3 **Figure S4.** Same as Fig. S2 but for the stationary wave.



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Figure S5. The zonal component u (a) and the meridional component v (b) of the 200hPa basic flow derived from long term mean NCEP reanalysis. The contours in (a) is 5m/s or the westerly and 2m/s for the easterly while the contours in (b) is 2m/s. The easterly in (a) and northerly in (b) are dashed contoured and the zero values are bold. The black dots are two wave sources arrays of 18 points. The points locations are 90° E, 25° N; 90° E, 30° N; 90° E, 35° N; 135° E, 25° N; 135° E, 30° N; 135° E, 35° N; 180°, 25° N; 180°, 30° N; 180°, 35° N in the first array; and 110° W, 20° N; 110° W, 30° N; 110° W, 40° N; 70° W, 30° N; 70° W, 40° N; 70° W, 50° N; 30° W, 40° N; 30° W, 50° N; 30° W, 60° N in the second array.

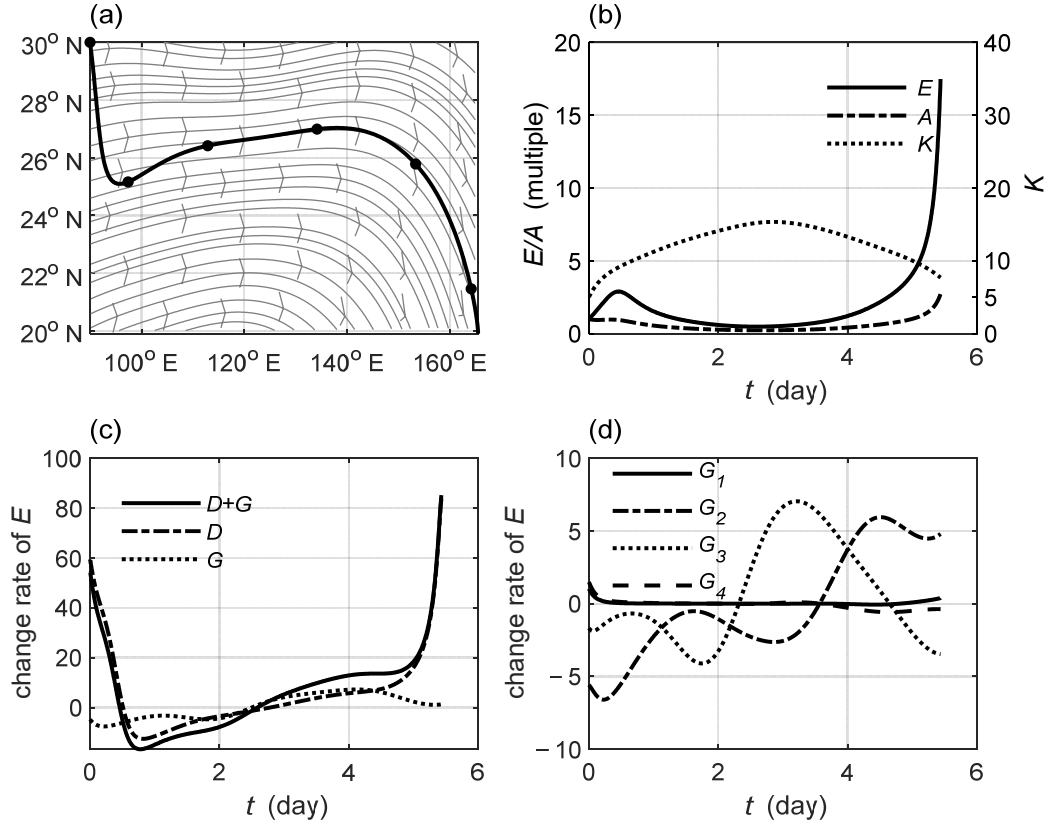


Figure S6. Ray path (solid black dots denoting the 1-day interval) of the wave (the source is set to 90° E, 30° N) with a period $T=30$ days in observed basic flow (a). The variations in wave energy (solid line), amplitude (dash-dotted line) and the total wave number (dotted line) along the ray (b). The variations in the divergence of group velocity (dash-dotted line, shortened as D), the energy budget from the basic flow (dotted line, shortened as G), and the sum of them (change rate of the wave energy) along the ray (c). The variations in the four components of the energy budget from the basic flow (shortened as G_1 , G_2 , G_3 , and G_4 , respectively and their sum equals G) along the ray (d). D and G (G_1 , G_2 , G_3 and G_4) have been magnified 10^6 times to glory the figure.

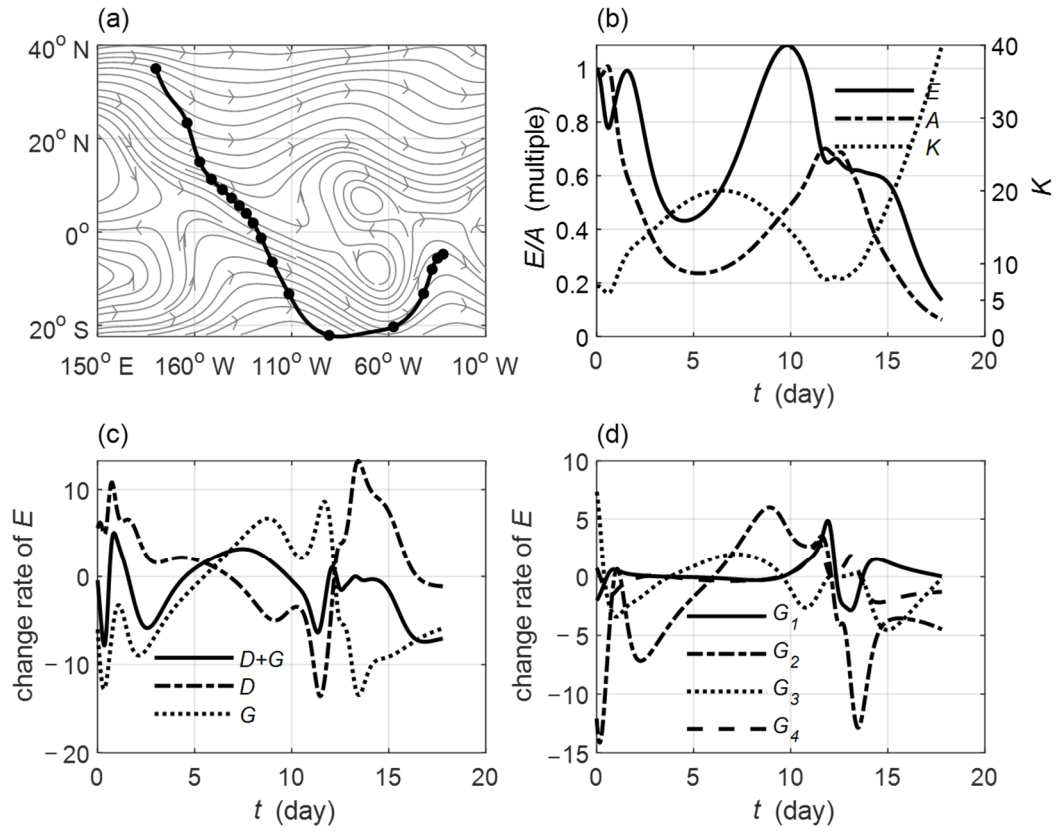


Figure S7. Same as Fig. S6, but for waves sourced from $180^\circ, 35^\circ \text{ N}$ with a period $T=10$ days.

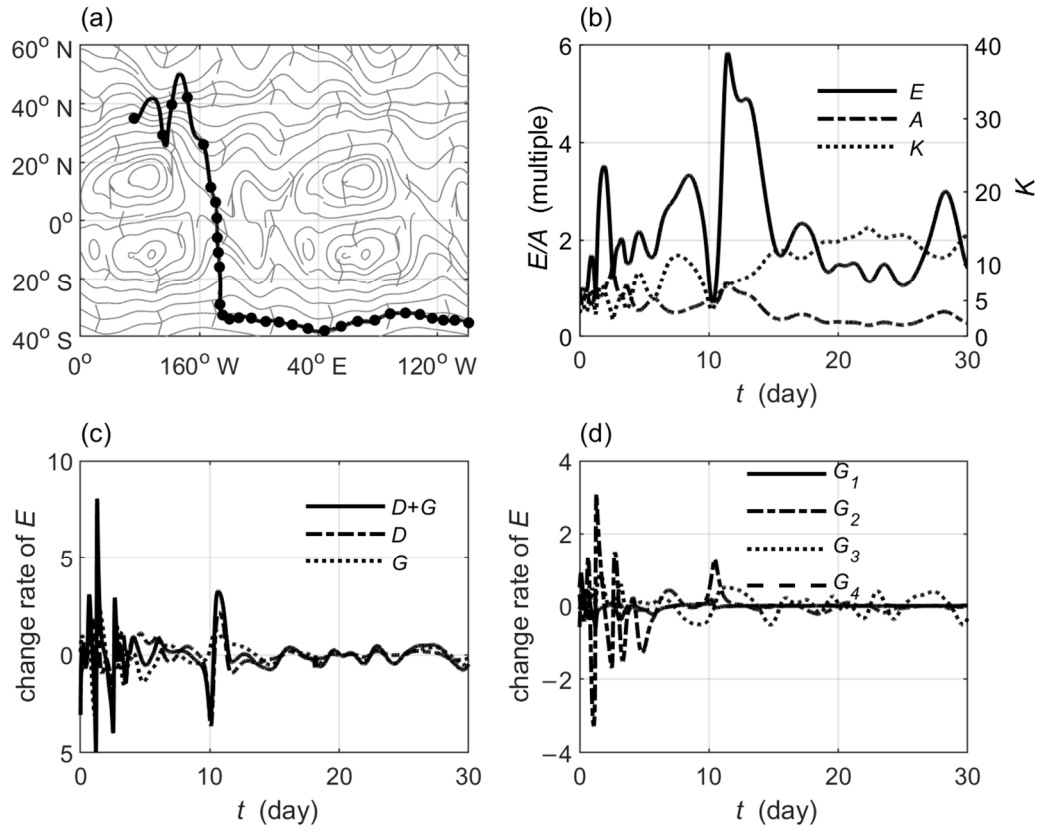


Figure S8. Same as Fig. S6, but for the stationary wave sourced from 90° N , 35° N . D and G (G_1 , G_2 , G_3 and G_4) have been magnified 10^5 times to glory the figure.