Configuration	Region	Western Edge	Eastern Edge
Single Mountain (SingleMtn)	East	0˚	90˚ E
	Other	90˚ E	0˚
Two Mountains (TwoMtn)	Wide Basin East	0˚	90˚ E
	Wide Basin Other	150˚ W	0˚
	Short Basin	90˚ E	150˚ W

Table 1: Regions used for subsetting blocks in the compositing and duration analysis. Each region spans 30˚- 65˚ N, for the longitudes listed in the table.

Configuration	Area Averaged Block Frequency (%), 30° N- 90° N	Number of Events
Aquaplanet	3.24	387
1 km single mountain	3.17	365
2 km single mountain	3.67	400
3 km single mountain	3.74	438
4 km single mountain	3.84	433
Two 3 km mountains (TwoMtn)	4.01	423

Table 2: Cool season area-averaged block frequency and number of events in the idealized model integrations.

	Mean block duration (days) and number of events			
	All Midlatitude Blocks	East blocks		Other blocks
Aquaplanet	7.53 (227)	-		-
1 km mountain	7.78 (206)	8.65 (58)		7.44 (148)
2 km mountain	7.93 (234)	8.54 (75)		7.64 (159)
3 km mountain	7.55 (266)	7.91 (103)		7.31 (163)
4 km mountain	7.78 (244)	7.99 (81)		7.68 (163)
Two 3 km mountains (TwoMtn)	8.17 (238)	Wide Basin	8.35 (81)	8.47 (86)
		Short Basin	7.65 (68)	

Table 3: Mean block duration and number of events in parentheses for midlatitude, cool season blocks in each idealized model configuration.

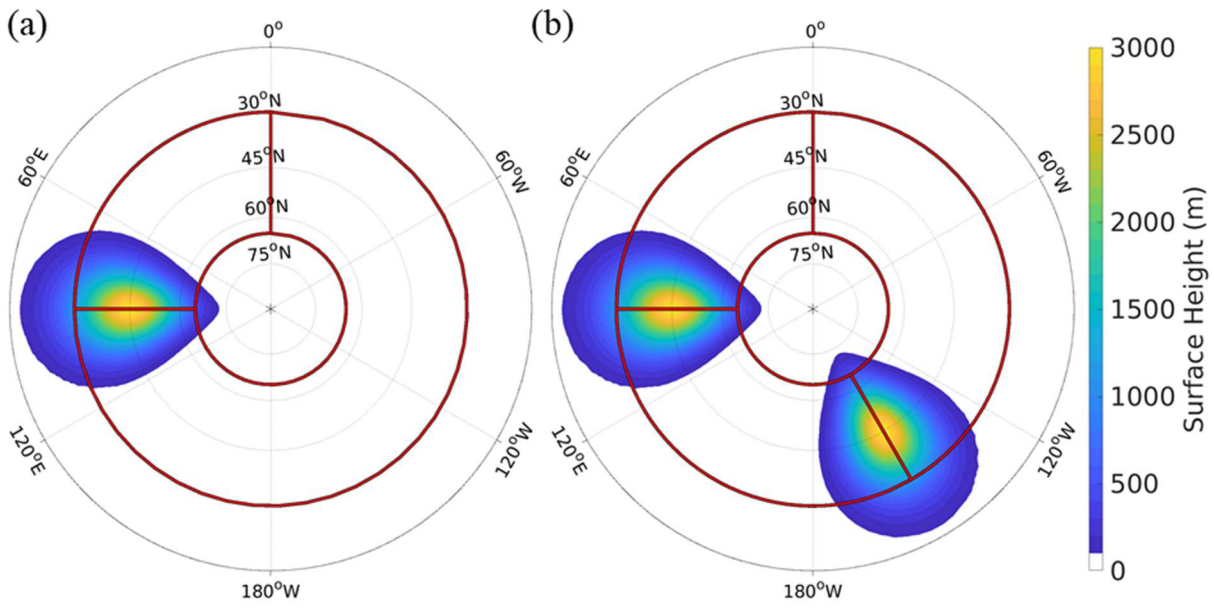

Figure 1: Surface height (shading) of the idealized model integrations with (a) a single 3 km high Gaussian mountain centered at 45 N, 90E and (b) two 3 km high Gaussian mountains centered at 45 N, 90E and 45 N, 150 W, respectively. The red outlines indicate the block genesis regions described in Table 1.

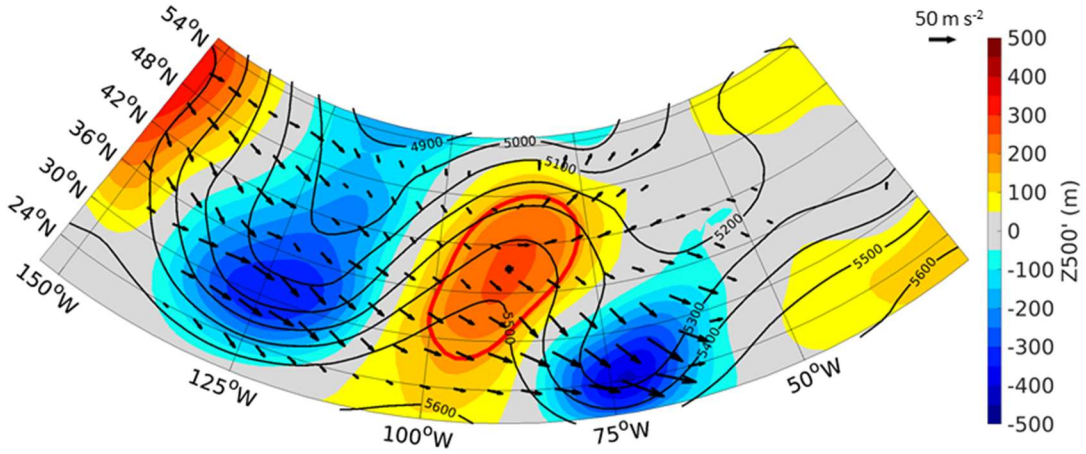

Figure 2: 500 hPa geopotential height (black contours), 500 hPa geopotential height anomaly (shading), outline of blocked area (red contour), and wave activity flux vectors $\vec{W}$ (black arrows), for the first day of a blocking episode in the aquaplanet run. The black dot inside the block denotes the block centroid. Geopotential height contours are in 100 m intervals. $\vec{W}$ with magnitudes less than 20 m^2 s^{-2} are removed.

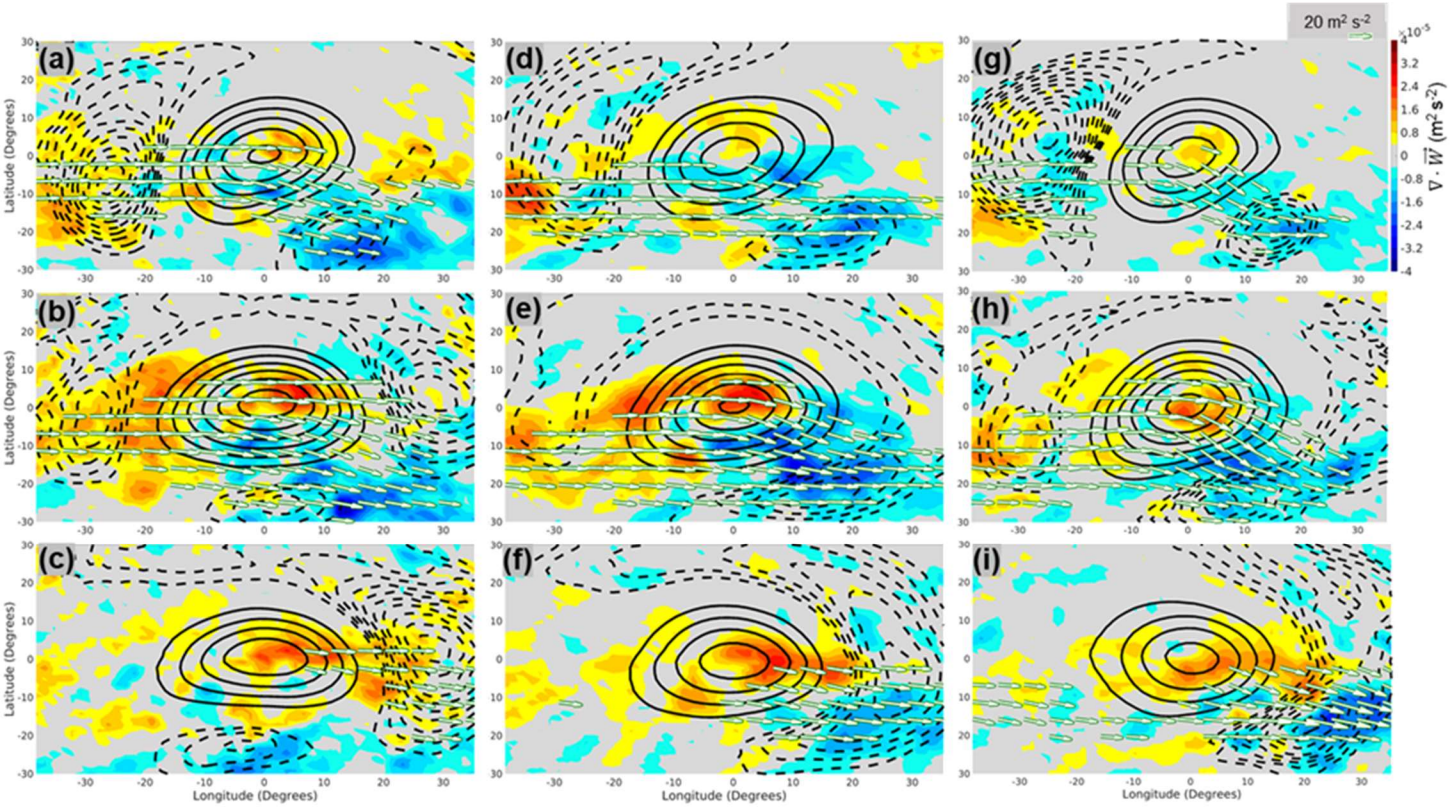

Figure 3: For cool season blocking events: Block centered composites of positive 500 hPa geopotential height anomalies (solid contours), negative 500 hPa geopotential height anomalies (dotted contours), $\vec{W}$ (arrows), and $\nabla \cdot \vec{W}$ (shading). (a-c) Left: Computed with SH blocks in ERA-Interim. (d-f) Centre: Computed with blocks in the aquaplanet integration. (g-i) Right: Computed with blocks in the 3 km single mountain integration. The top, middle, and bottom rows are composites over the first, strongest, and last timesteps of blocking episodes, respectively. Positive (negative) 500 hPa geopotential height anomaly contours are in 50 m (-10 m) intervals with outer contour 50 m (-30 m). $\vec{W}$ with magnitudes less than 20 $m^2 s^{-2}$ are removed. Latitude and longitude are defined relative to the composite block center.

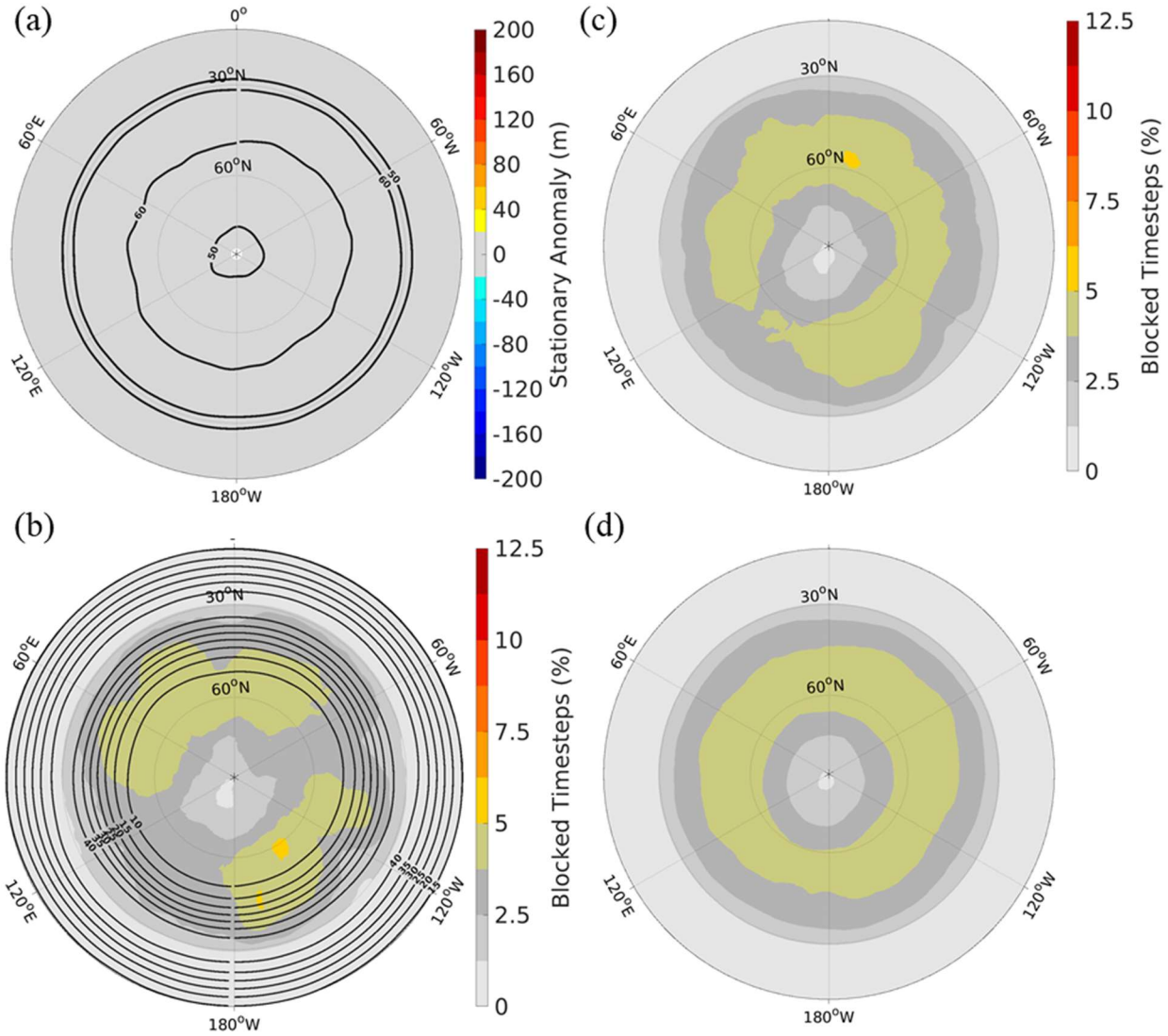

Figure 4: (a and c) Top: For 30 cool seasons (Nov.-Mar.) in the aquaplanet, (a) the stationary wave (shading) and storm track (heavy black contours), and (c) the blocking climatology (shading) and $\overline{U250}$ (heavy black contours) for the idealized model aquaplanet integration. (b and d) Bottom: Blocking climatology (shading) for (c) 100 and (d) 250 cool seasons in the aquaplanet. In (a) storm track contours are in 10 m intervals where the outer contour is 50 m. In (c) $\overline{U250}$ contours are in 5 m/s intervals where the outer contour is 30 m s^{-1}

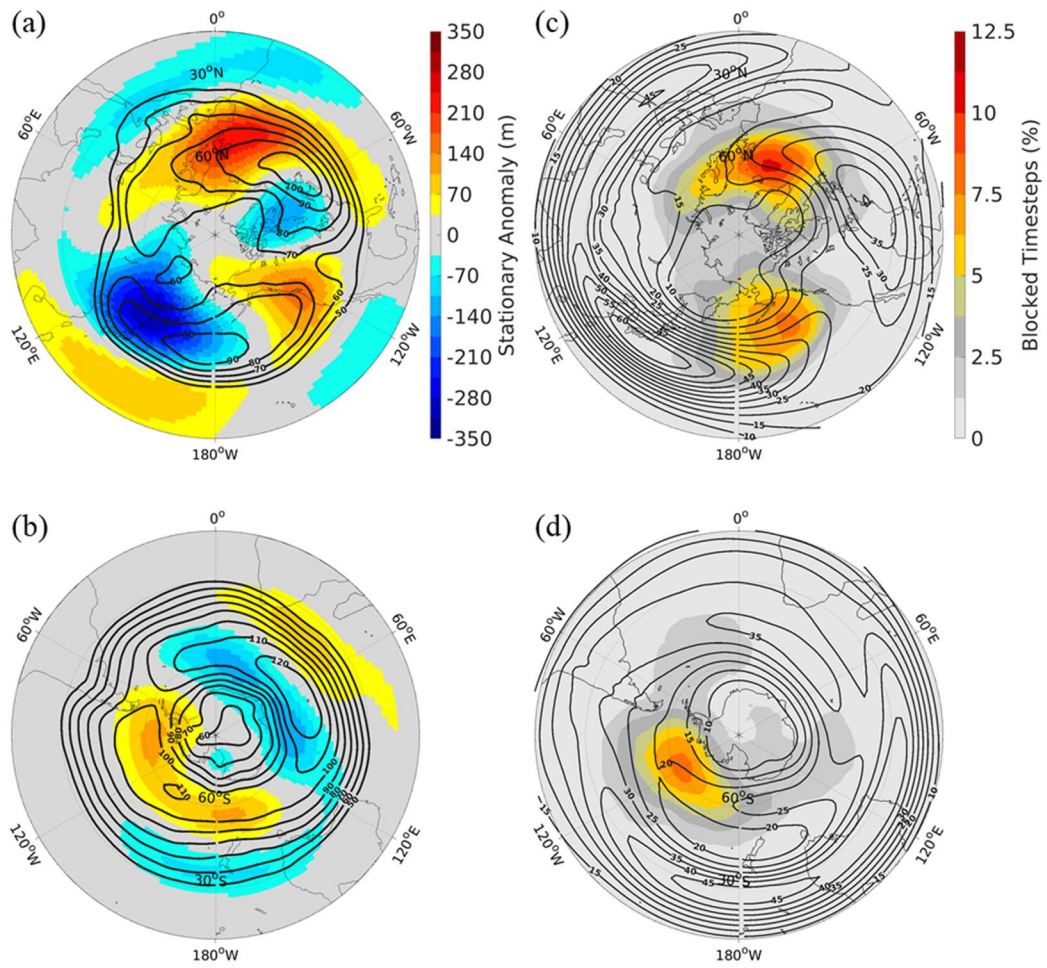

Figure 5: (a-b) Left: Cool season stationary wave (shading) and storm track (heavy black contours) for the (a) northern and (b) southern hemispheres in ERA-Interim. Storm track contours are in 10 m intervals where the outer contour is 50 m. (c-d) Right: Cool season blocking climatology (shading) and $\overline{U250}$ (heavy black contours) for the (c) northern and (d) southern hemispheres in ERA-Interim. $\overline{U250}$ contours are in 5 m/s intervals where the outer contour is 10 m s^{-1}.

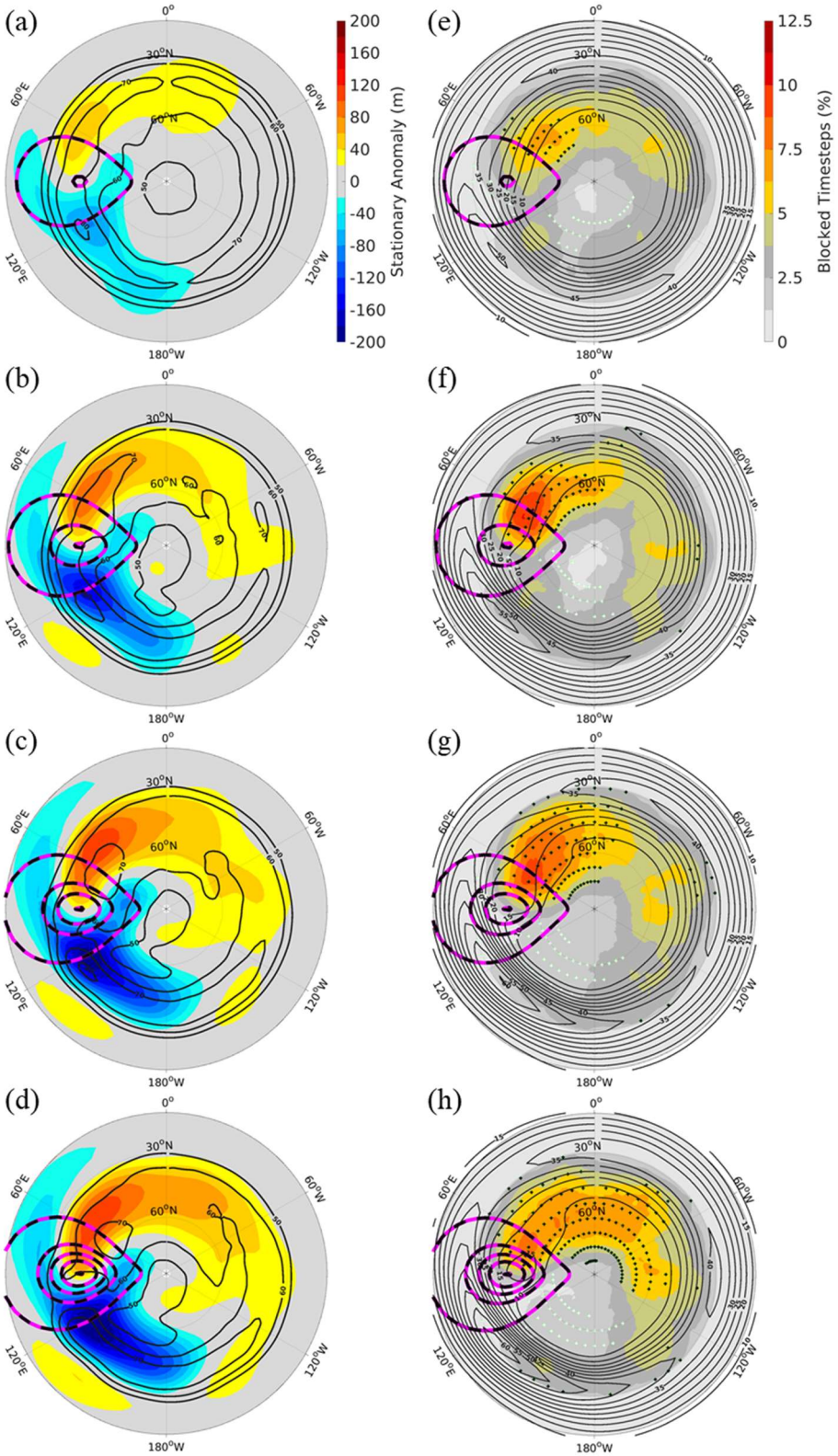

Figure 6: (a-d) Left: Cool season stationary wave (shading) and storm track (heavy black contours) for the (a) 1 km, (b) 2 km, (c) 3 km, and (d) 4 km mountain height integrations. Storm track contours are in 10 m intervals where the outer contour is 50 m. (e-h) Right: Cool season blocking climatology (shading) and $\overline{U250}$ (heavy black contours) for the (e) 1 km, (f) 2 km, (g) 3 km, and (h) 4 km mountain height integrations. $\overline{U250}$ contours are in 5 m/s intervals where the outer contour is 10 m s^{-1}. Black (white) stippling in (e-h) indicates significantly greater (less) block frequency at nearby gridpoints when compared to a 250-year aquaplanet integration. Pink and black dotted contours represent surface height, where the outer contour is the edge of the land-mask and the inner contours are in 1 km intervals.

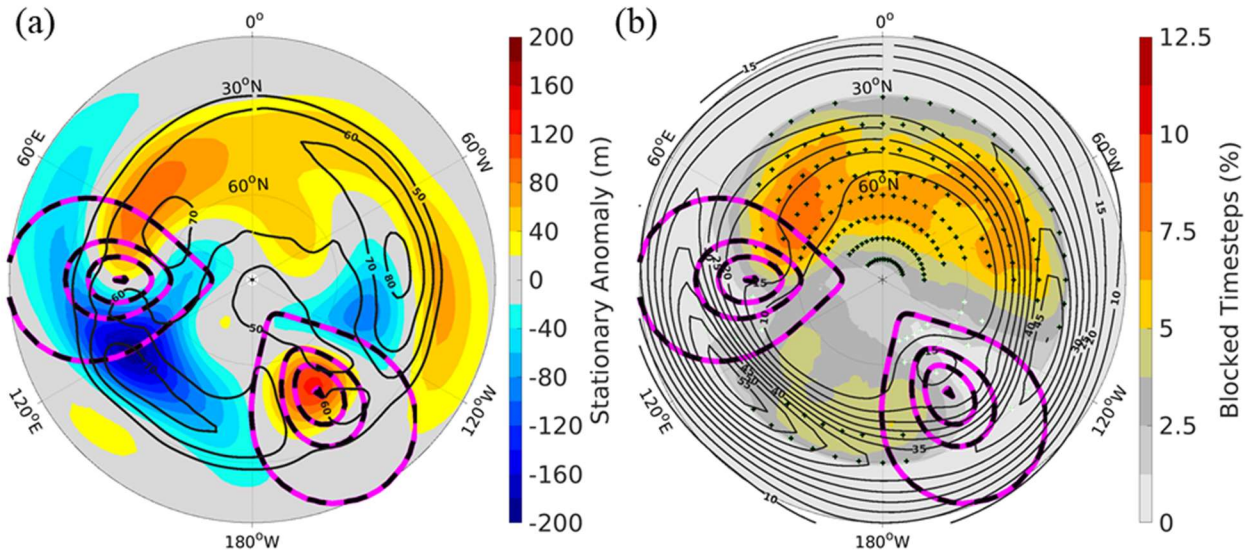

Figure 7: For the 2-mountain idealized model integration, (a) the cool season stationary wave (shading) and storm track (heavy black contours), and (b) the cool season blocking climatology (shading) and $\overline{U250}$ (heavy black contours). In (a) storm track contours are in 10 m intervals where the outer contour is 50 m. In (b) $\overline{U250}$ contours are in 5 m/s intervals where the outer contour is 10 m s^{-1}. Black (white) stippling in b indicates significantly greater (less) block frequency at nearby gridpoints when compared to a 250-year aquaplanet integration. Pink and black dotted contours represent surface height, where the outer contour is the edge of the land-mask and the inner contours are in 1 km intervals.

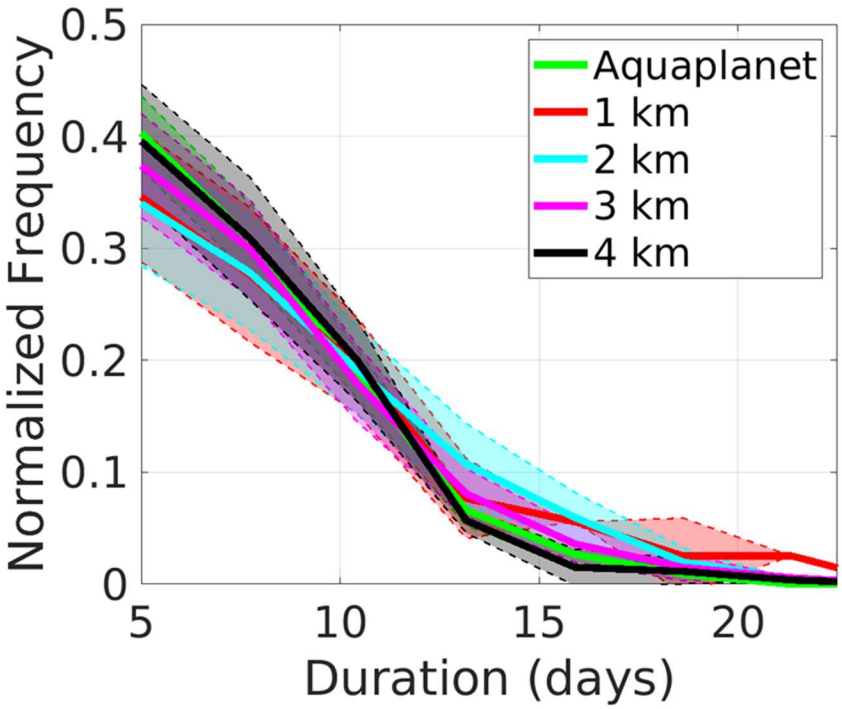

Figure 8: Block duration probability density distributions for the aquaplanet and "East" blocks (as defined in table 1) in the single mountain configurations. Thick lines denote the mean probability density distribution for each configuration. Shaded regions bordered by dotted lines outline +/- 1 full standard deviation from the mean.

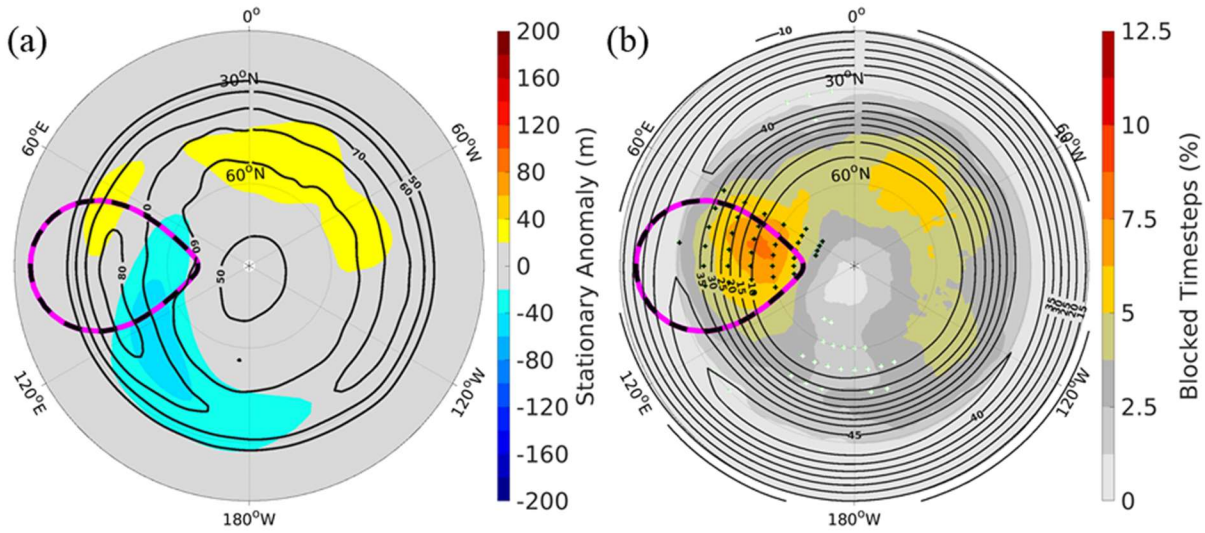

Figure 9: For an integration with 1 flat landmass, (a) the cool season stationary wave (shading) and storm track (heavy black contours), and (b) the cool season blocking climatology (shading) and $\overline{U250}$ (heavy black contours). In (a) storm track contours are in 10 m intervals where the outer contour is 50 m. In (b) $\overline{U250}$ contours are in 5 m/s intervals where the outer contour is 10 m s^{-1}. Black (white) stippling in b indicates significantly greater (less) block frequency at nearby gridpoints when compared to a 250-year aquaplanet integration. The pink and black dotted contours represent the outer edge