

U200 & UV850

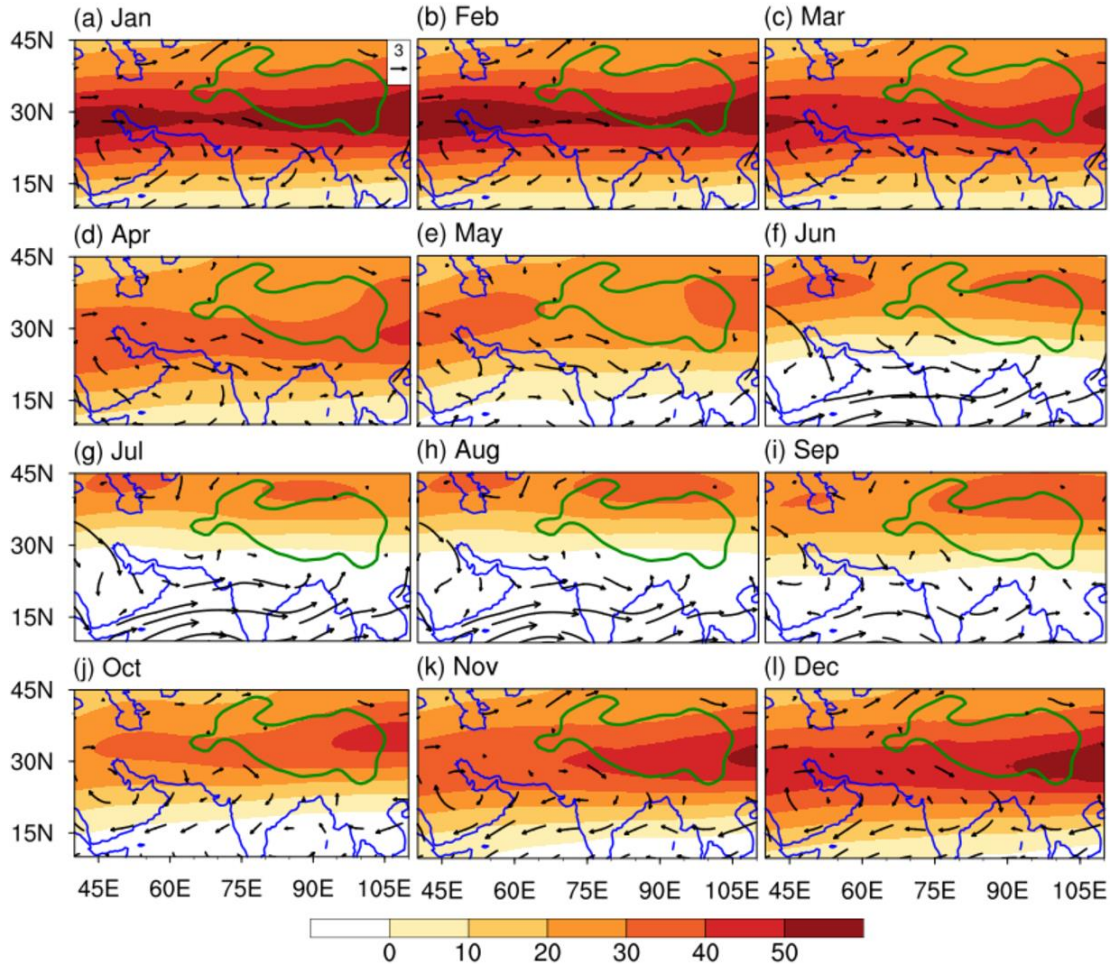


Fig. S1 Climatology of temperature (shadings; units: $^{\circ}\text{C}$), zonal wind (contours; units: m s^{-1}) and atmospheric circulations (vectors; units: m s^{-1}) at 850 hPa in **a** January, **b** February **c** March, **d** April, **e** May, **f** June, **g** July, **h** August, **i** September, **j** October, **k** November, and **l** December. Green solid contours denote the terrain height of 2000 m.

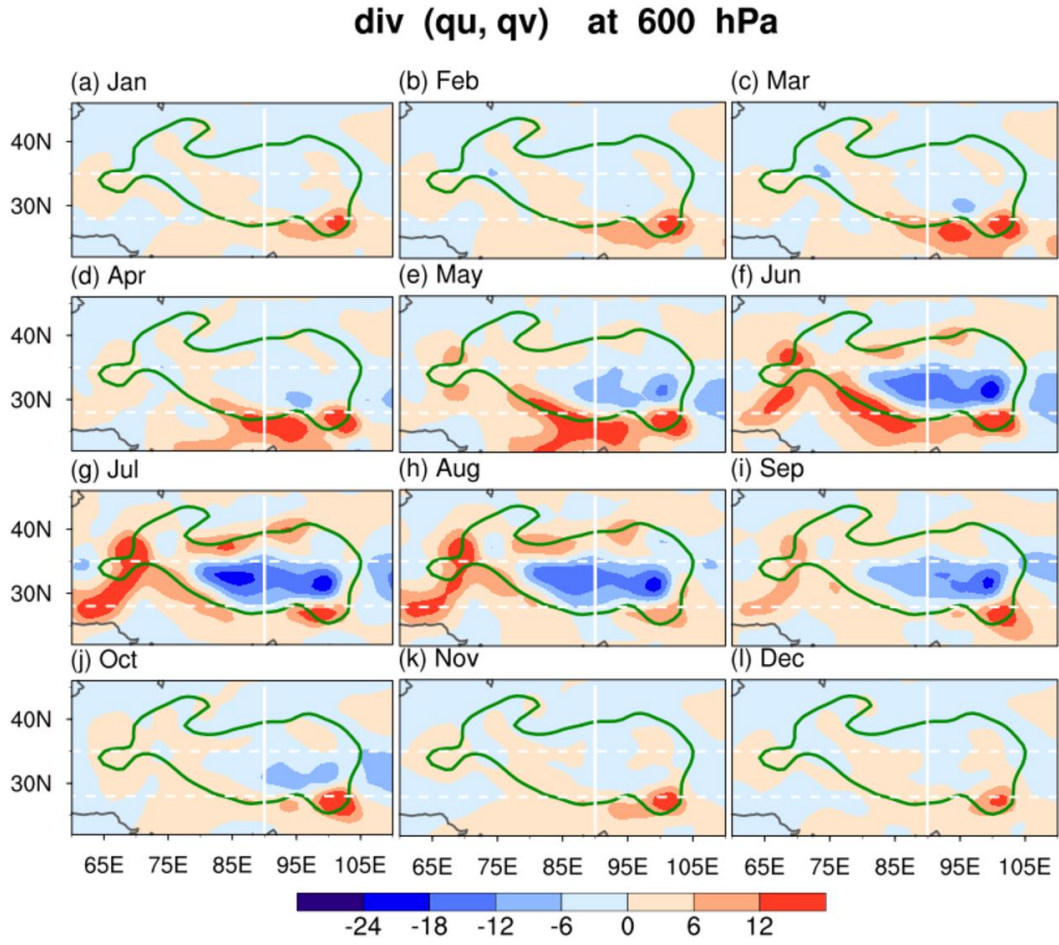


Fig. S2 Climatology of divergence of moisture flux at 600 hPa (units: 10^{-10} s^{-1}) in **a** January, **b** February **c** March, **d** April, **e** May, **f** June, **g** July, **h** August, **i** September, **j** October, **k** November, and **l** December. Green solid contours denote the terrain height of 2000 m. White horizontal dashed lines denote where latitude is 28°N or 35°N . White vertical solid lines denote where longitude is 90°E .

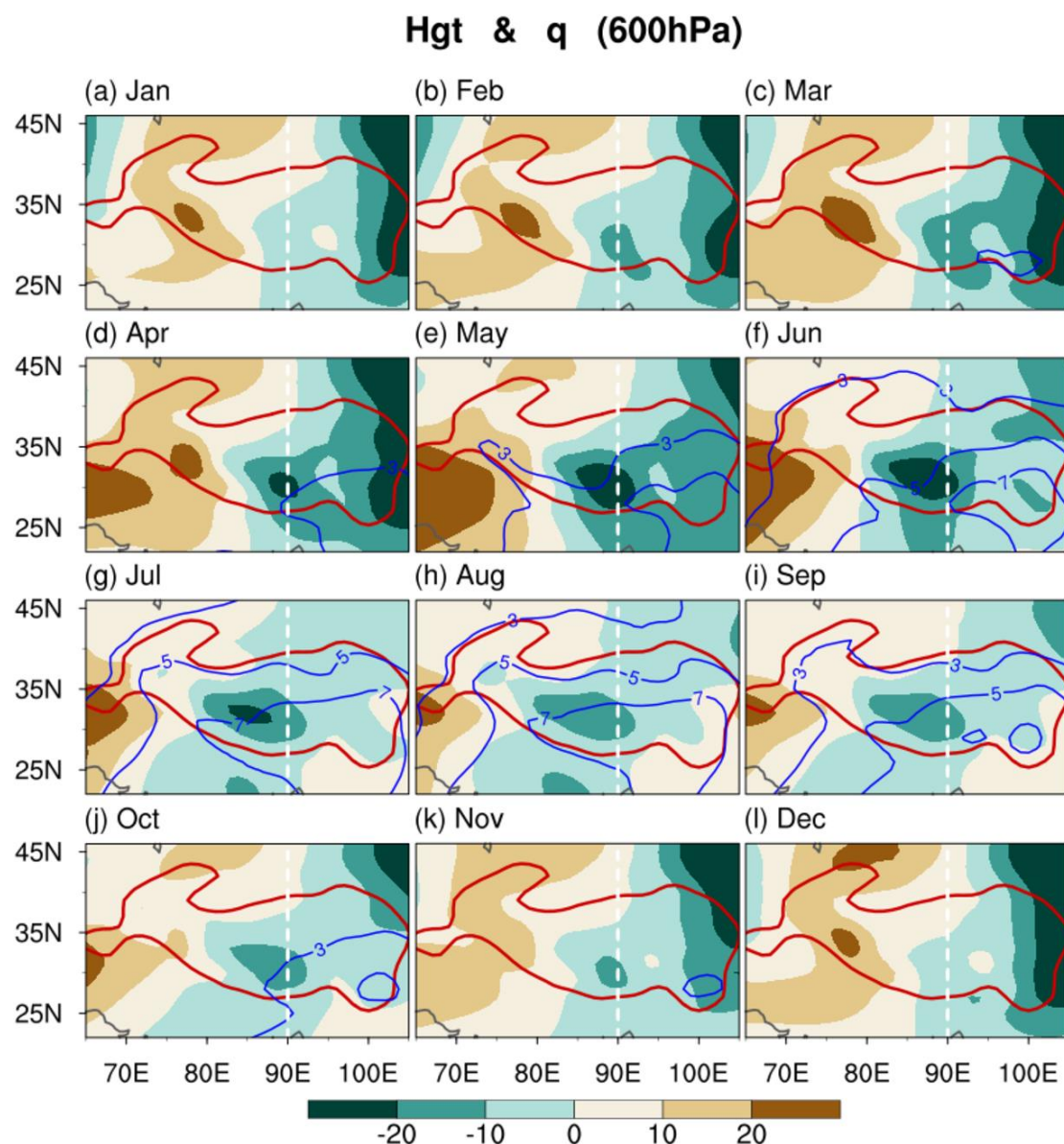


Fig. S3 Climatology of geopotential height (shadings; units: gpm) and specific humidity (contours; units: g kg^{-1}) at 600 hPa in **a** January, **b** February **c** March, **d** April, **e** May, **f** June, **g** July, **h** August, **i** September, **j** October, **k** November, and **l** December. Red solid contours denote the terrain height of 2000 m. White vertical dashed lines denote where longitude is 90°E .

Temp & Temp adv (500hPa)

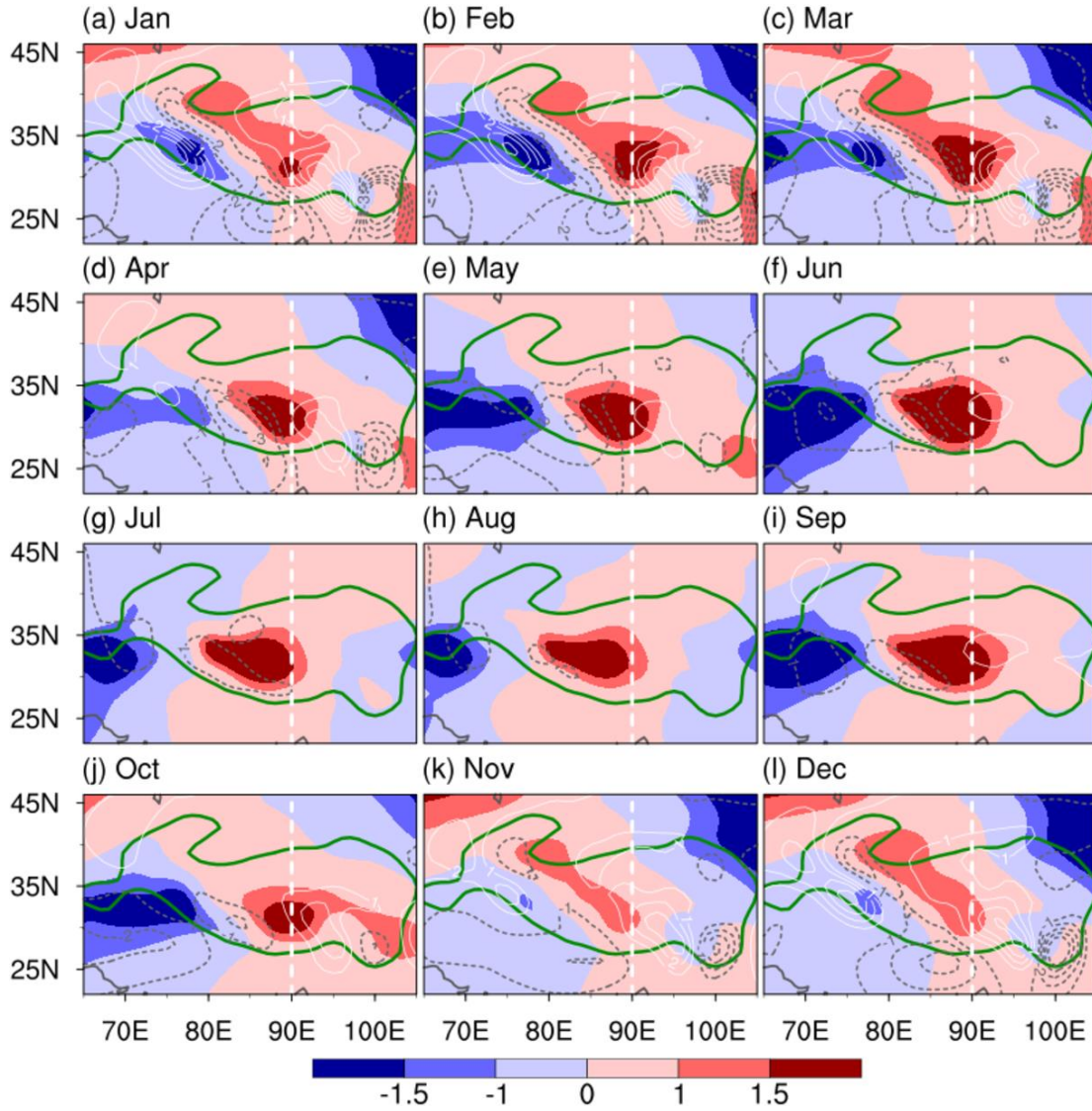


Fig. S4 Climatology of atmospheric temperature (shadings; units: °C) and its advection ($-u \frac{\partial T}{\partial x}$; contours; units: 10^{-6} K s^{-1}) at 500 hPa in **a** January, **b** February **c** March, **d** April, **e** May, **f** June, **g** July, **h** August, **i** September, **j** October, **k** November, and **l** December. Green solid contours denote the terrain height of 2000 m. White vertical dashed lines denote where longitude is 90°E.

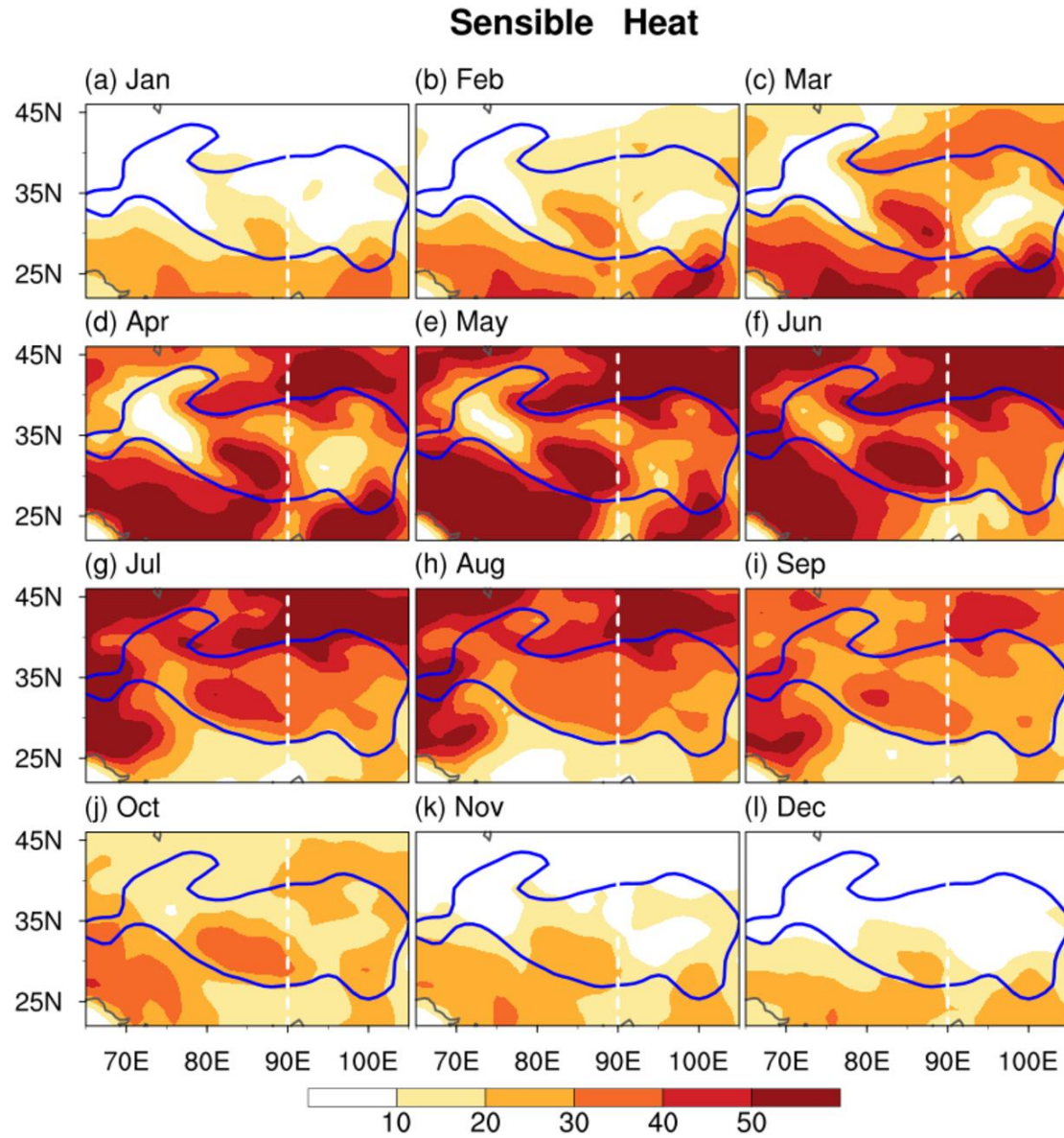


Fig. S5 Climatology of surface upward sensible heat flux (shadings; units: 10^{-5} W m^{-2}) in **a** January, **b** February **c** March, **d** April, **e** May, **f** June, **g** July, **h** August, **i** September, **j** October, **k** November, and **l** December. Blue solid contours denote the terrain height of 2000 m. White vertical dashed lines denote where longitude is 90°E .

Rainfall & UV500 (experiment NG)

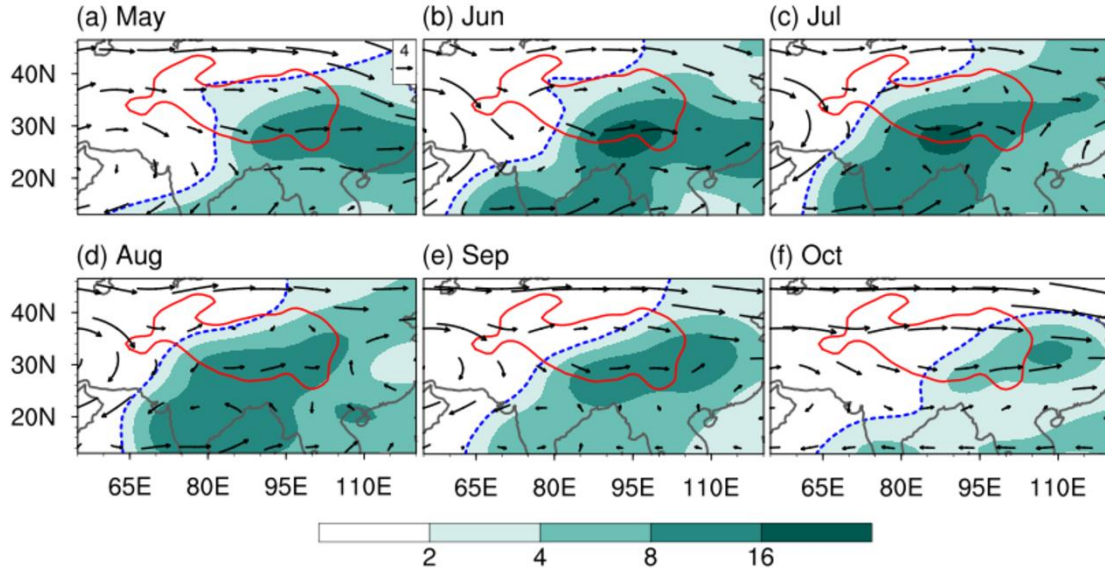


Fig. S6 Climatological monthly precipitation (shadings; units: mm day⁻¹) and atmospheric circulations at 500 hPa (vectors; units: m s⁻¹) in experiment NG. **a–f** show the results in May, June, July, August, September and October, respectively. Red solid contours denote the terrain height of 2000 m. Blue dashed contours are 2 mm day⁻¹ isoline of rainfall.

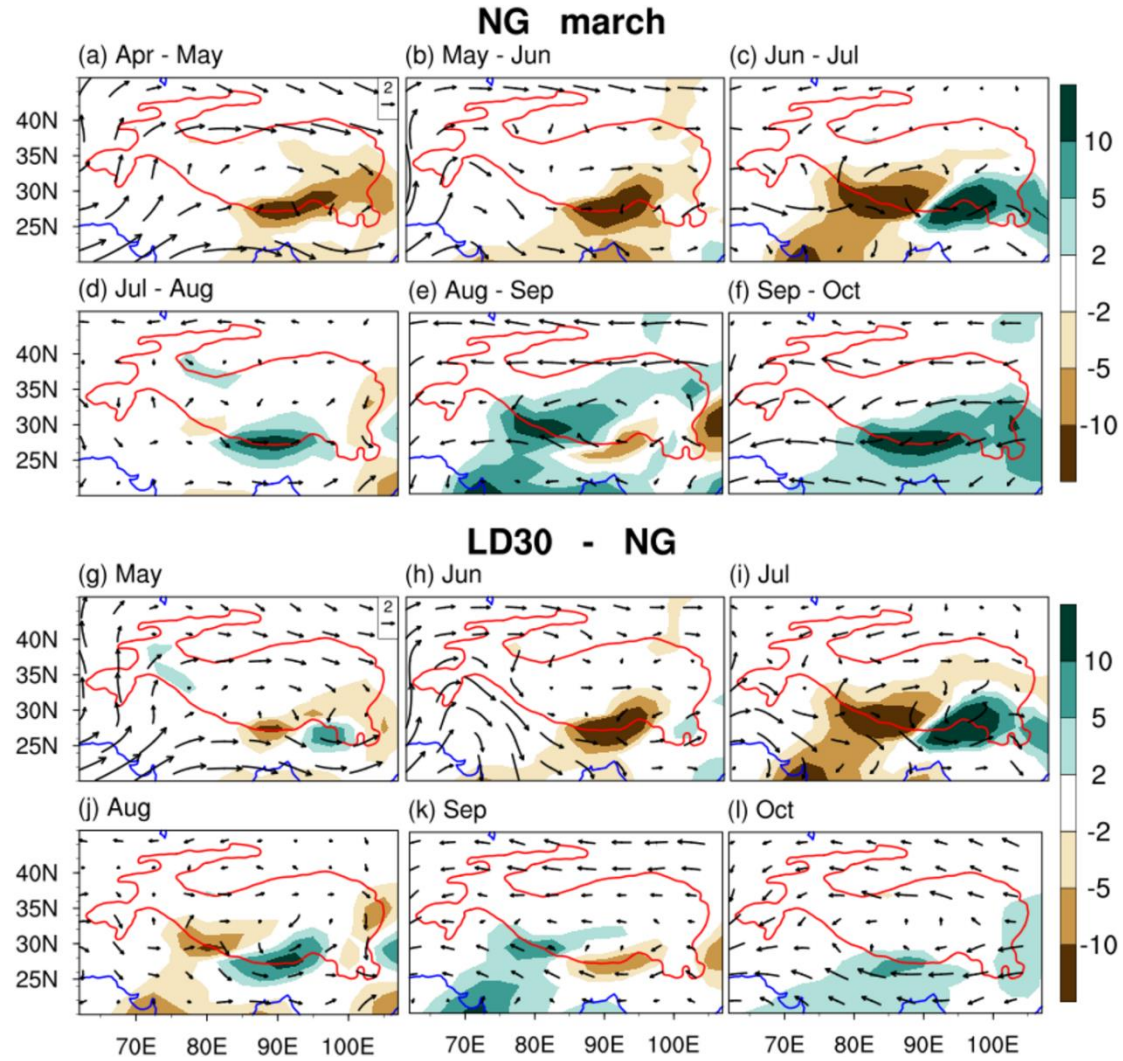


Fig. S7 a–f Seasonal march in experiment NG, and **g–l** differences between experiment LD30 and experiment NG. The shadings show the results of precipitation (units: mm day⁻¹), while vectors show the results of atmospheric circulations at 500 hPa (units: m s⁻¹). **a–f** shows the results of April minus May, May minus June, June minus July, July minus August, August minus September, and September minus October, respectively. **g–l** show the results in May, June, July, August, September and October, respectively. Red solid contours denote the terrain height of 2000 m.

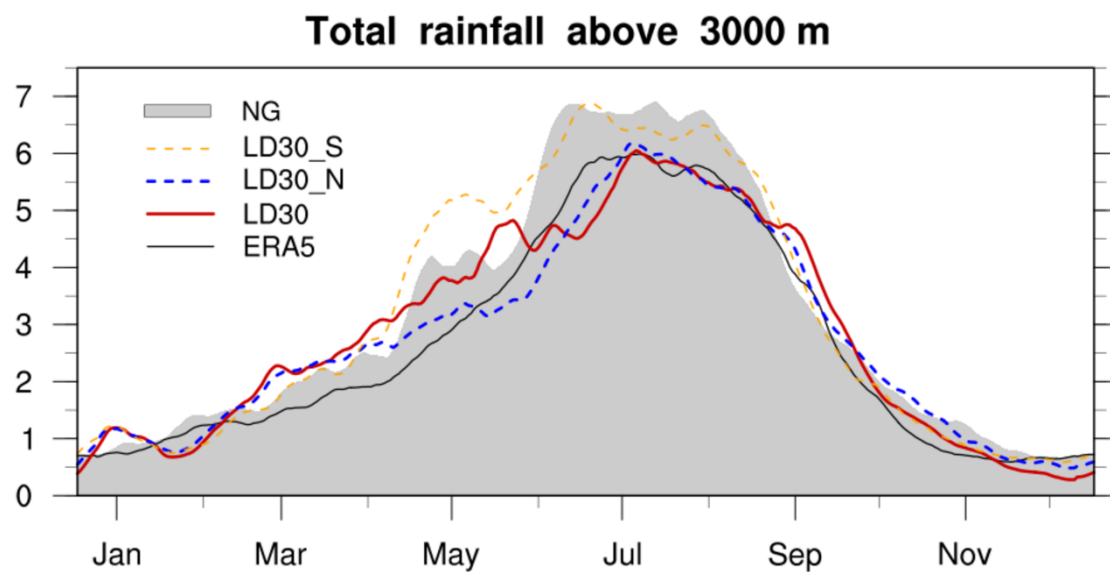


Fig. S8 Averaged rainfall (units: mm day⁻¹) over the area with terrain height above 3000 m. Black solid line denotes the result of ERA rainfall, while gray shading for averaged rainfall in experiment NG. Red solid line represents the result of averaged rainfall in experiment LD30, while blue (orange) dashed lines for experiment LD30_N (LD30_S).

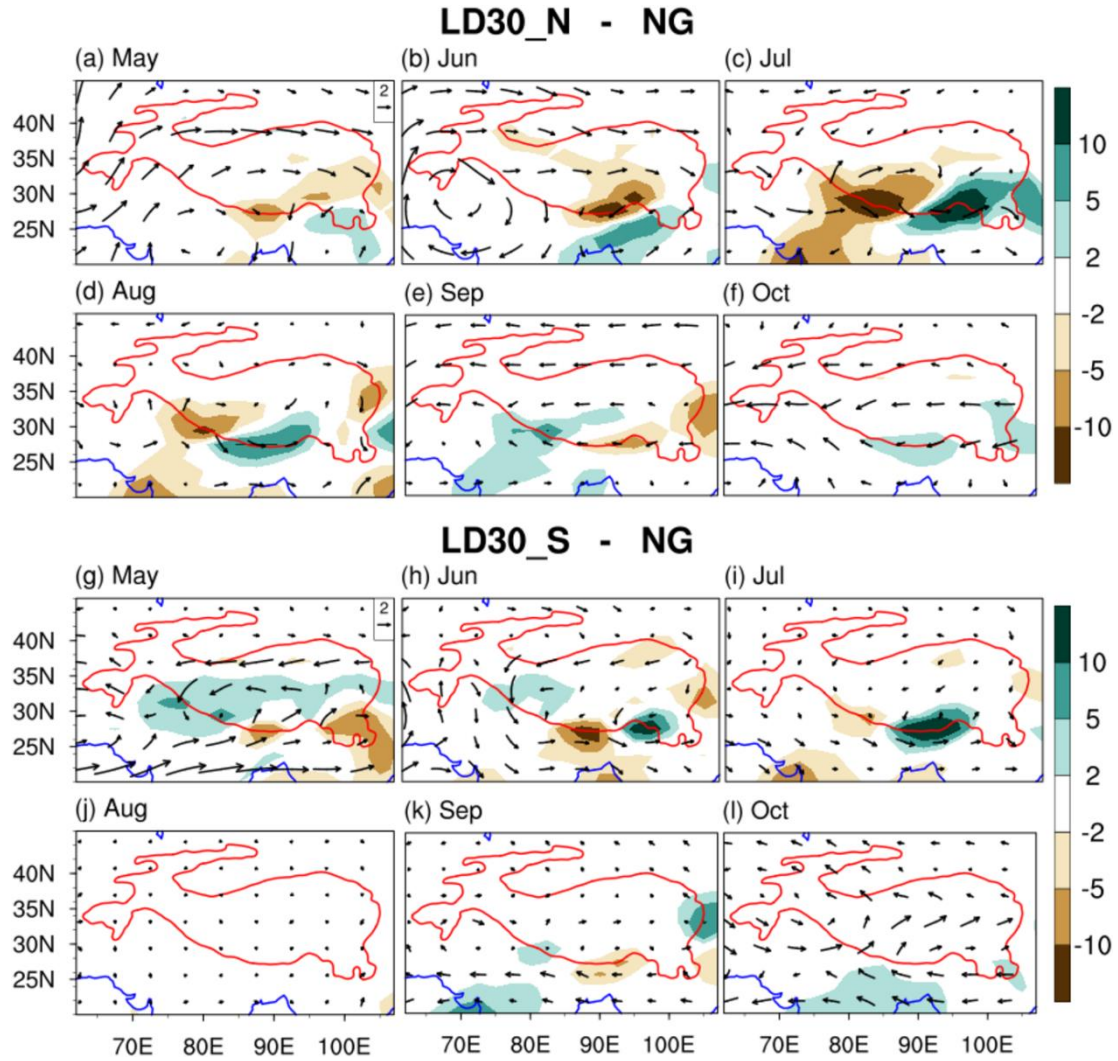


Fig. S9 a–f Differences between experiment LD30_N and experiment NG, and **g–l** differences between experiment LD30_S and experiment NG. The shadings show the results of precipitation (units: mm day^{-1}), while vectors show the results of atmospheric circulations at 500 hPa (units: m s^{-1}). (**a, g**), (**b, h**), (**c, i**), (**d, j**), (**e, k**), and (**f, l**) **a–f** show the results in May, June, July, August, September and October, respectively. The red solid contours denote the terrain height of 2000 m.