

Flow blocking can be estimated from the nondimensional Froude number $Fr = U/NH$ (Miranda and James 1992) where U is the incoming wind speed, N is the buoyancy frequency and H is the terrain height. In this case, $H = 2$ km is the height of the Taihang Mountain, and $U = 9.1 \text{ m s}^{-1}$ and $N = 0.0096 \text{ s}^{-1}$ are the mean upstream (at point B in Figure S1(Top)) wind speed and buoyancy frequency averaged between ground surface and H . This yields a low Froude number of $Fr = 0.47$, indicating significant flow blocking.

As the ambient southeasterly flow is blocked when impinging on the Taihang Mountain, the low-level flow turns to be southwestward, that is, parallel to the southeastern flank of the Taihang Mountain. The maximum wind speed occurs on the windward slope of the mountain at a height of about 1 km, i.e., below the Taihang Mountain top. All these features agree with that of barrier jet (see AMS Glossary of Meteorology at https://glossary.ametsoc.org/wiki/Barrier_jet).

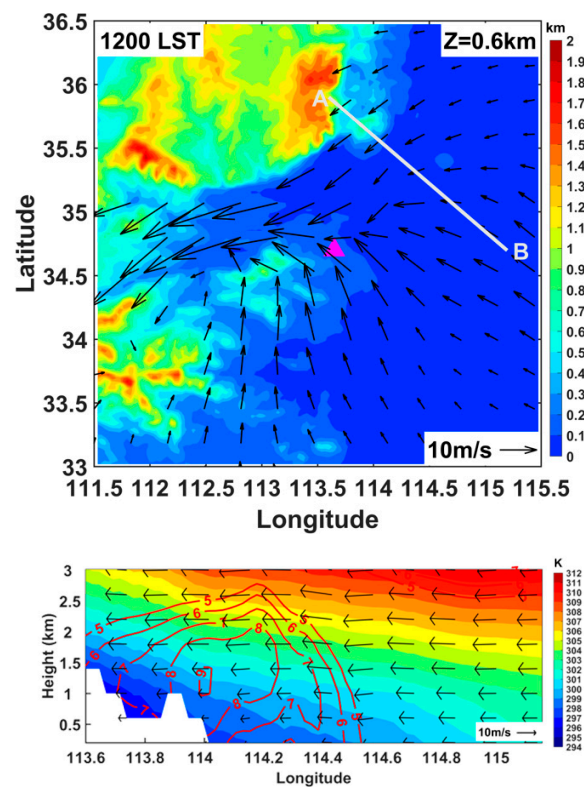


Figure S1. (Top) Terrain elevation (shading) and VDRAS analysis horizontal winds at 0.6 km MSL (vector) at 1200 LST on 20 July 2021. (Bottom) Potential temperature (shading) and VDRAS analysis wind field in the vertical plane along line AB at 1200 LST on 20 July 2021. Red contours indicate the speed of horizontal wind normal to the vertical plane (i.e., nearly parallel to the Taihang Mountain).

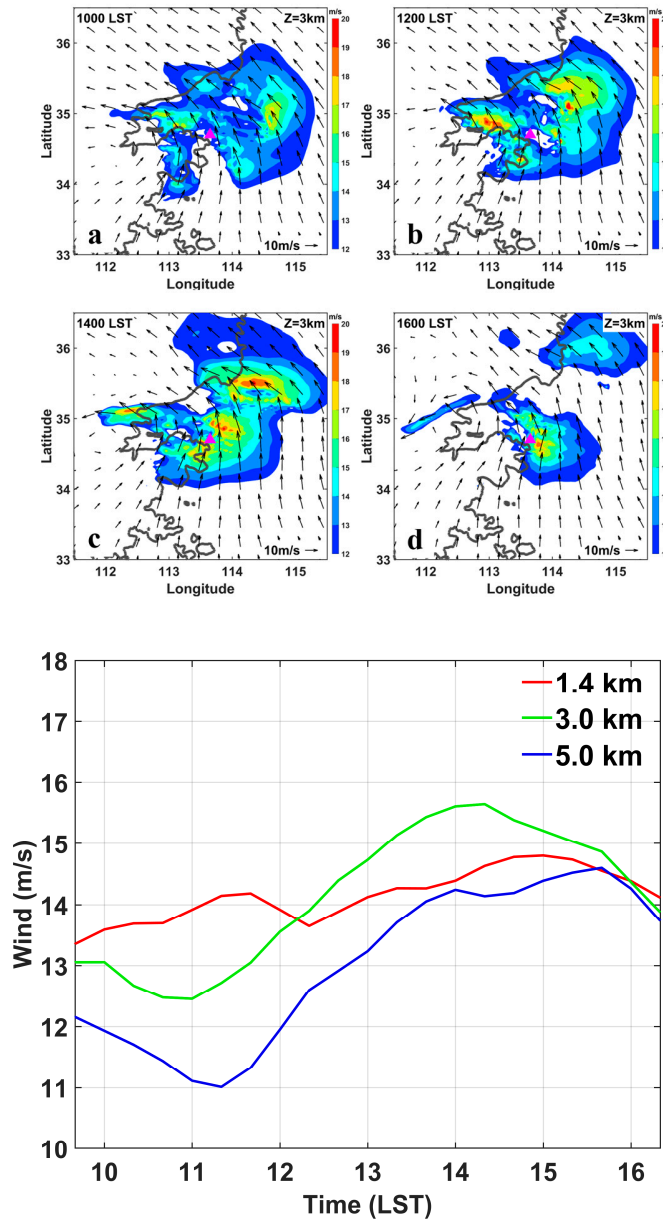


Figure S2. (Top) Horizontal wind vectors and speed (shading) at 3 km MSL in the VDRAS analysis from 1000 to 1600 LST on 20 July 2021. (Bottom) Time evolution of the mean horizontal wind speed over ZZ at different heights.

Reference:

Miranda, P. M. A., and I. N. James, 1992: Non-linear three- dimensional effects on gravity-wave drag: Splitting flow and breaking waves. *Quart. J. Roy. Meteor. Soc.*, 118, 1057–1081.