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Plain Language Summary: We examined the essential features and formation mechanism of the strong local “Suzuka-oroshi” winds, which are located leeward of the Suzuka Mountains in Japan. Climatological analysis revealed when and where strong winds mainly occur. Numerical simulations supported this finding. Additionally, simulation results demonstrated that the strong Suzuka-oroshi comprised downslope windstorms with transition of flow regime.

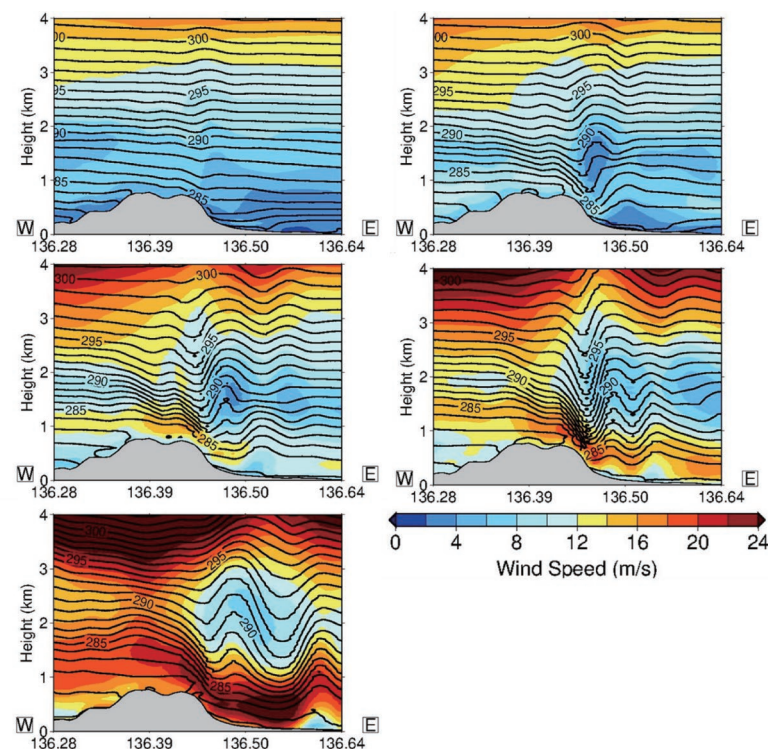


Figure 1. Vertical cross section of isentropes from CTRL simulation across the northern Suzuka Mountains (line A in Fig. 3) on March 5, 2014 (CTRL simulation). (a) 1200 JST. (b) 1300 JST. (c) 1400 JST. (d) 1500 JST. (e) 1600 JST. Shade and contour indicate horizontal wind speed (m/s) and potential temperature (K), respectively.

- Climatological analysis revealed that Suzuka-oroshi mainly occurred after an extratropical cyclone with a cold front and passed the Sea of Japan (55 % of all occurrences) and inversion layers (1-5 km level) were observed in 74 % of cases.
- Climatological analysis using spatially dense observational data showed that the strongest winds tended to blow in the northern part of the plain on the leeward side.
- The strong Suzuka-oroshi in the northern part of the plain comprised downslope windstorms with transition of flow regime (internal Froude number was less than 1.0 at the windward of mountains and larger than 1.0 above the leeward slope).