

Table S1. Main specification of Doppler LiDAR (DIABREZZA_W; Mitsubishi Electric Corporation).

Items	Characteristics	Remarks
Measurement range	40 m–250 m altitude	Varies according to the atmospheric condition
Scanning pattern	Digital switching	
Scanning direction	0°/90°/180°/270°/Vertical	5 directions
Range resolution	Selectable from 20 m/25 m/30 m	Each resolution mode can be divided into 1/2 to 1/5 using the Range overlap function
Number of range	Selectable from 20 bins/40 bins	
Output/Display data	• Horizontal wind speed/ direction, - vertical wind speed of each range • 10 min. average data	
Measurable wind speed range	0 to 60 m·s ⁻¹	
Data update rate	2 seconds or less	
Doppler velocity range	-30 m·s ⁻¹ to + 30 m·s ⁻¹ (head wind : minus)	
Doppler velocity accuracy error	±0.1 m·s ⁻¹ or less	
Laser wavelength	1.55 μm single frequency	Class 1M standard (JIS C 6802)
Size/Weight (Main unit)	W551 × H516 × D551 mm, 45 kg	Excludes projections

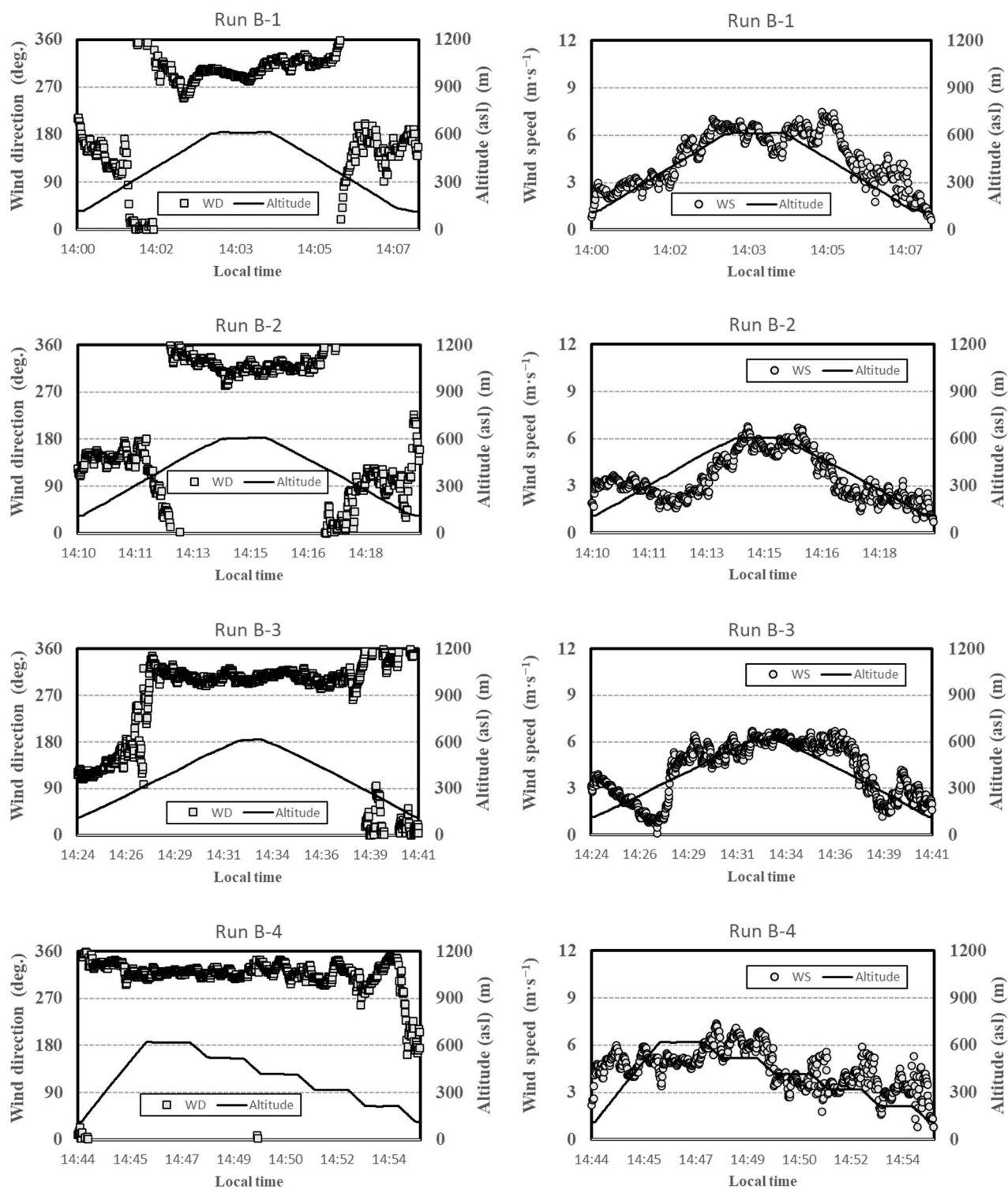


Figure S1. (a) Time series data of drone-measured wind direction (left) and speed (right) for each flight to compare vertical profiles with Doppler LiDAR (Runs B-1 to B-4).

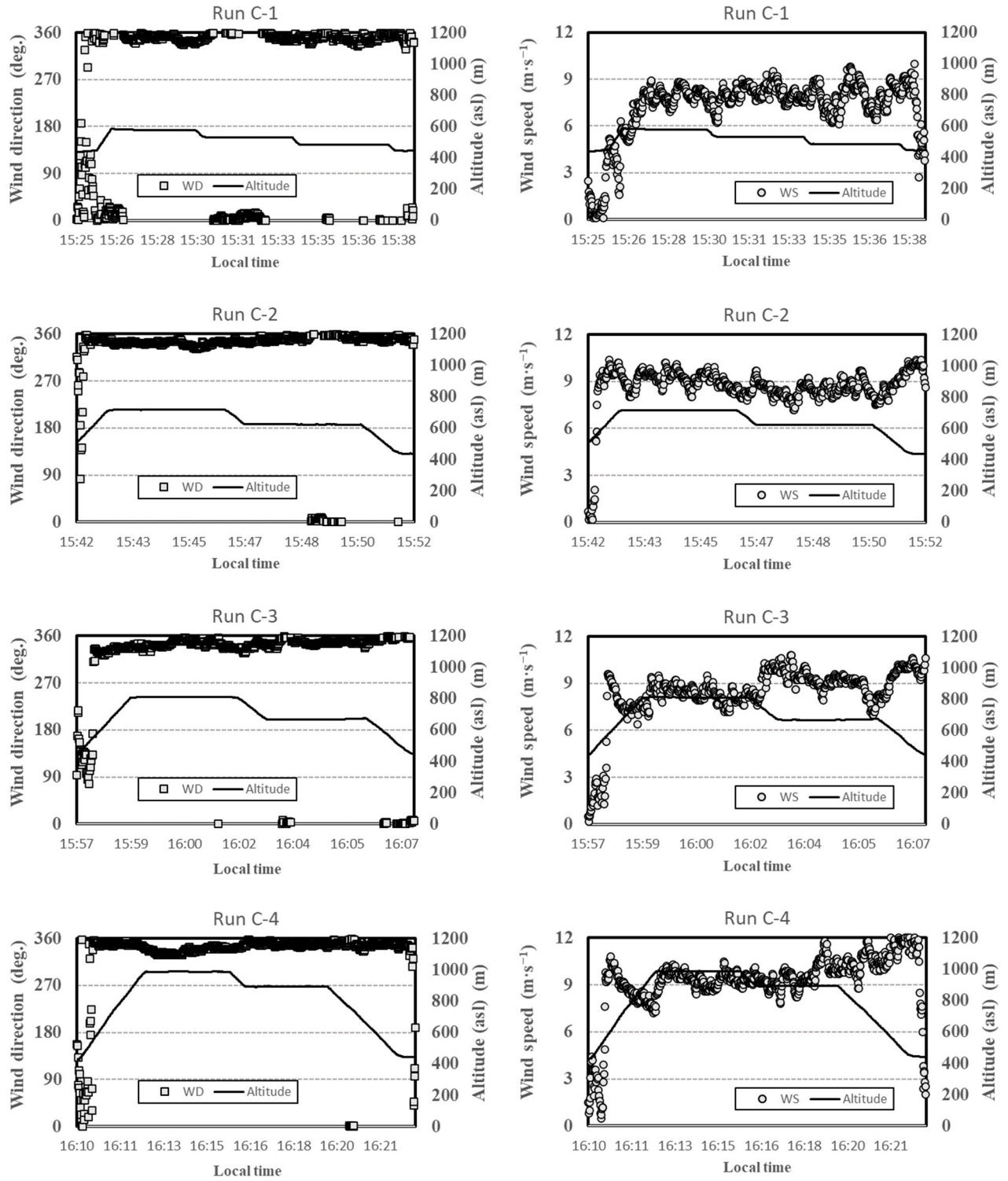


Figure S1. (b) Time series data of drone-measured wind direction (left) and speed (right) for each flight to compare vertical profiles with objective analysis value of JMA-MSM on January 30, 2020 (Runs C-1 to C-4).

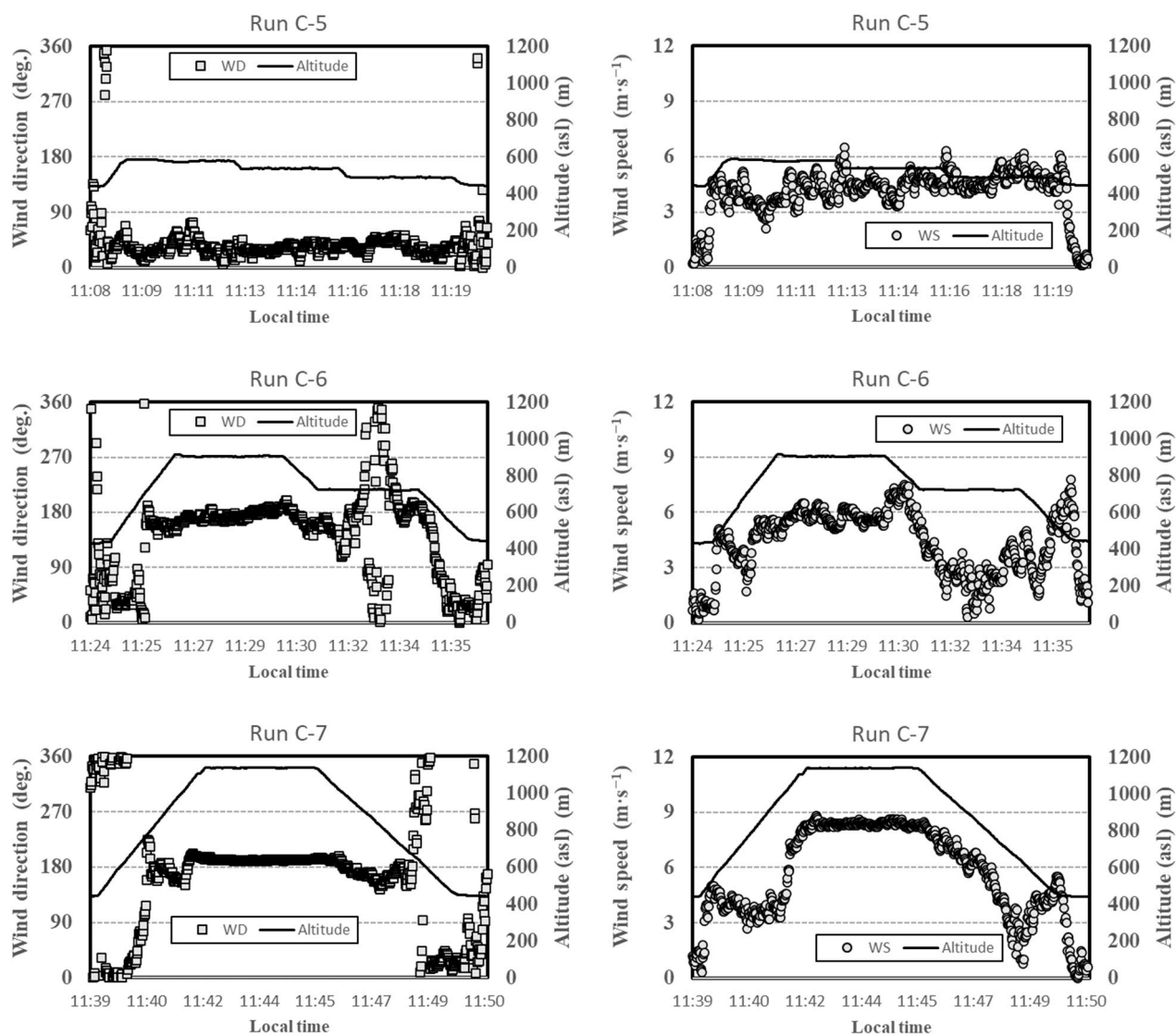


Figure S1. (c) Time series data of drone-measured wind direction (left) and speed (right) for each flight to compare vertical profiles with objective analysis value of JMA-MSM on January 31, 2020 (Runs C-5 to C-7).

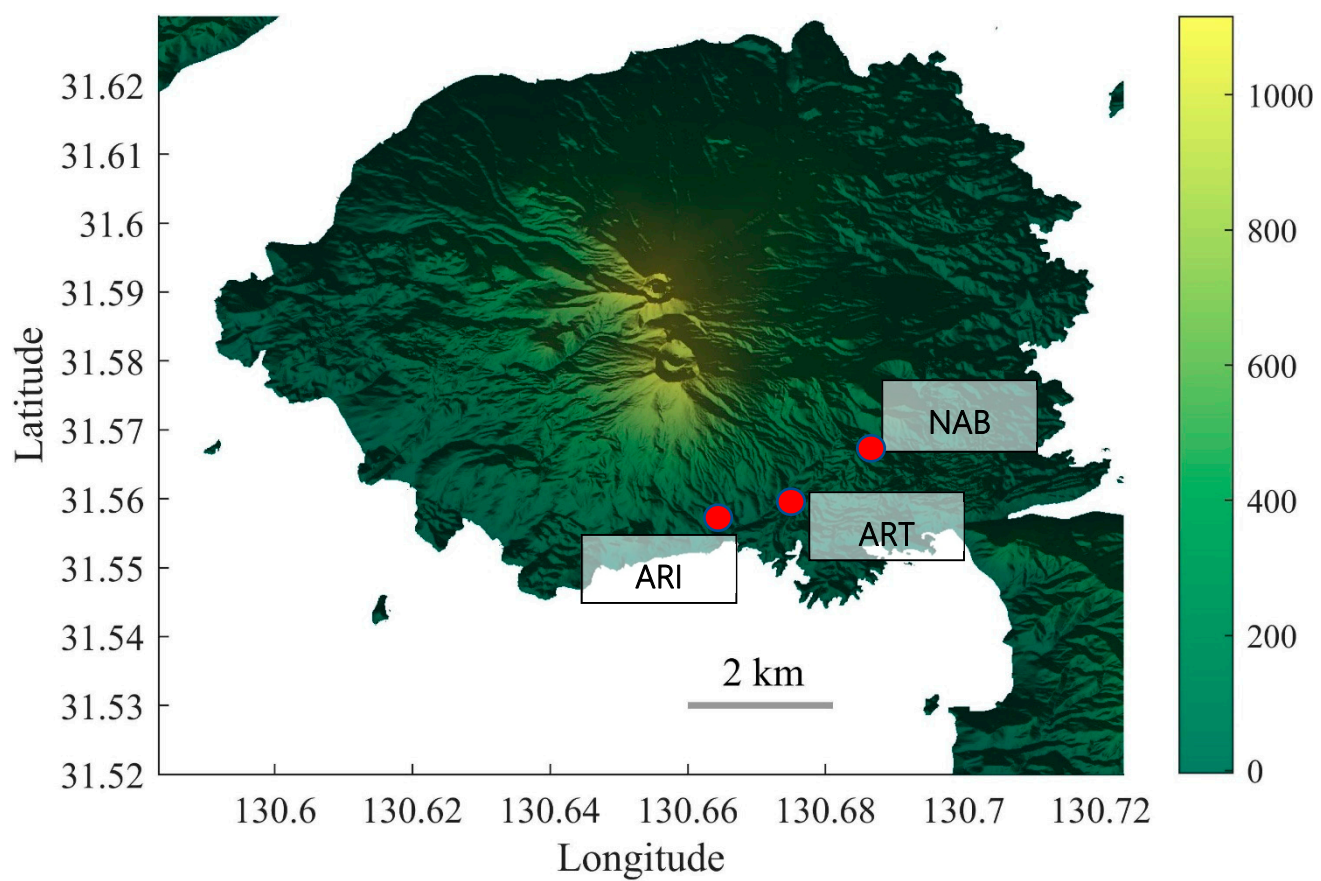


Figure S2. (a) Particle number concentration observation site by disdrometers (red circle). Color scale indicates elevation (m).

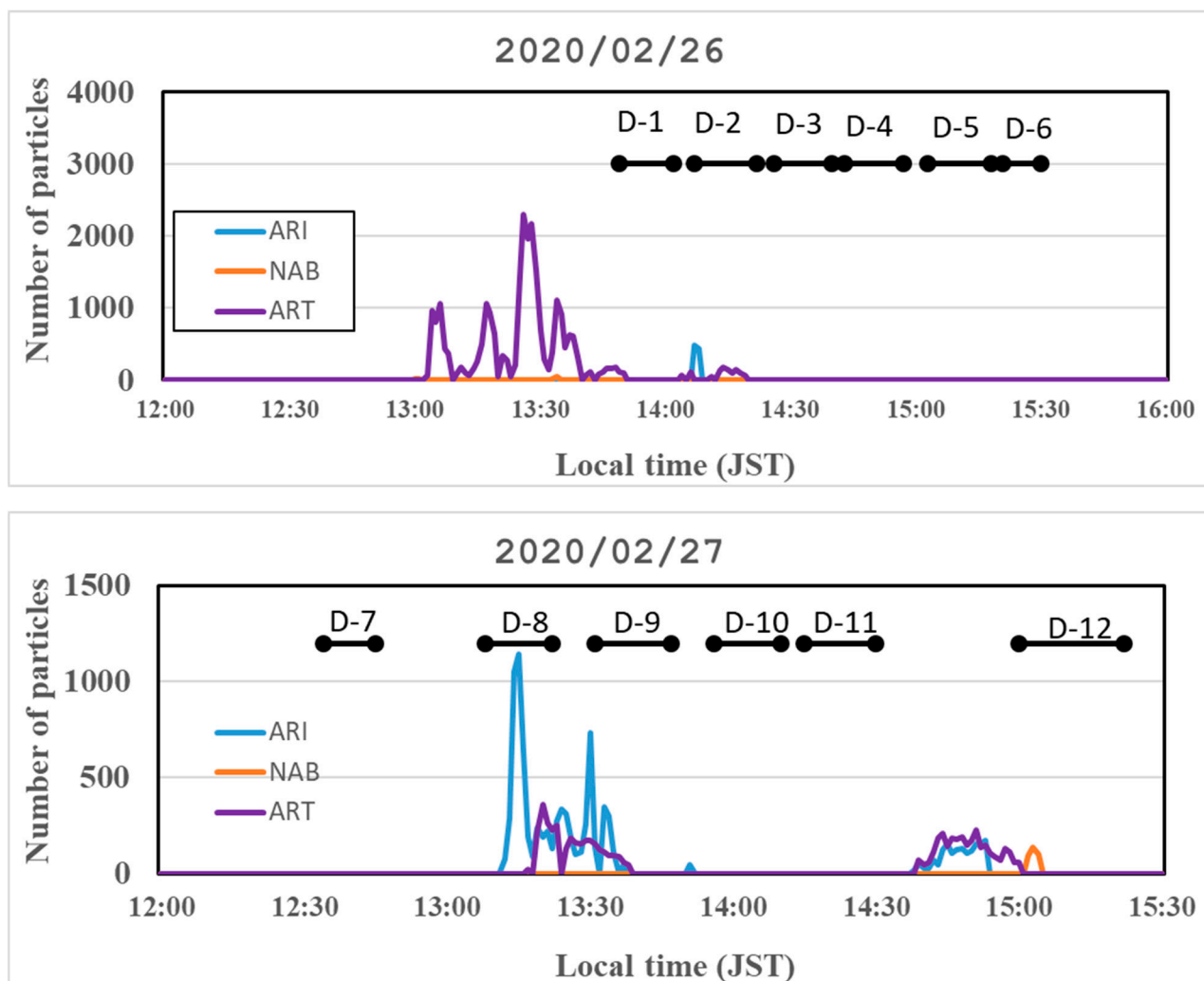


Figure S2. (b) Time series variations of particle number concentration observed by disdrometers on February 26–27, 2020, when observations of aerosol and volcanic gases were carried out.



(a)



(b)

Photo S1. (a) Rising plume of the eruption (E6) on February 27, 2020; (b) Volcanic ash that fell on the car after the eruption (E6). Photos were taken at Arimura site.