## Review and prospect of strong local wind "Matsubori-kaze" blowing at the western foot of Mt. Aso.

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"Matsubori-kaze" (hereafter referred to as MK) is strong local wind blowing at the western foot of Mt. Aso. It is likely to blow when a depression with warm front is located off the southwestern part of Kyushu. In this presentation, we reviewed the studies on MK and their future.

The first study that investigated MK is Hayamizu and Yamashika (1950). They observed wind speed and temperature at Tateno and Ozu from 10th to 21st November, 1949. Strong local wind blew at night when Kyushu was prevailed by an anticyclone. Because Aso-caldera is located at east, they considered cold air pooled at the caldera flew through Tateno Valley. This study was introduced in the textbook of Yoshino (1961). Yoshino (1968) investigated the distribution of wind breaks around Tateno Valley. They were densely distributed around Tateno Valley, and he estimated MK was the strongest there.

Onodera (1975) opposed to the proposed blowing mechanism of MK . He investigated the diaries of Ozu-higashi elementary school, located at the strongest area of MK. He found MK blew more frequently in spring than in autumn-winter. He also found that a depression with warm front was located at 300 km south of Kyushu when strong MK blew. Onodera (1975) concluded that the inversion layer around the top of Mt. Aso, along with the existence of warm front, was important for the occurrence and intensification of MK.

Ozu-higashi elementary school stopped keeping diaries after October 1971. Because meteorological stations were not located there, we could not know when and how MK blew after October 1971. Yoshino (1986) cited Onodera (1975), however, he still explained MK originated from cold air pooled at Aso-caldera as in Yoshino (1961).

Based on long-term meteorological and mobile observations, Kurose et al. (2002a, b) clearly distinguished two types of winds, i.e., "Aso-oroshi" (hereafter referred to as AO) and MK. Kurose et al. (2002a) found AO was outflow of cold air pooled at Aso-caldera that mainly occurred at calm night in autumn-winter. On the other hand, Kurose et al. (2002b) found MK was airflow over Mt. Aso that occurred in the specific weather condition, i.e., stable stratification was formed at lower part of the troposphere, and southeasterly wind over 10 m/s prevailed at 850 hPa level. Under this condition, the airflow over mountains converged at Tateno Valley, and its wind speed exceeded 10 m/s which usually caused damages in agriculture.

It was speculated that unique topography of Mt. Aso certainly affected MK. By using virtual topographies, Inamura et al. (2009) conducted numerical simulation using meso-scale model (RAMS). They clarified MK was composite wind of downslope wind at the southern slope of Tateno Valley as well as the gap wind through it. They also revealed that a critical layer around 850hPa was important for producing well-mixed stagnant layer and generating the strong wind beneath it.

Matsuyama et al. (2014) conducted questionnaire survey to families of the students at Ozu-higashi elementary school. Keywords in the answer sheets were summarized as "strength and mode of MK,

"agricultural damage in areas with strong winds", and "surrendering to MK". Matsuyama (2014) also analyzed written descriptions of the students' impressions to MK. As for children, keywords were summarized as "fear", "outdoor experiences", and "intellectual interest".

Sakamoto et al. (2014) caught MK blowing on 5th to 6th April, 2013. They conducted mobile observations and investigated the spatial extent to which MK reached. They also reproduced the phenomena by RAMS. The wind speed around Ozu town was on average 1.5 times as large as that at Nishihara village, closely located south of Ozu town. RAMS revealed that fluctuation of wind speeds depended on the relation between the position of Nishihara village and hydraulic jump caused by airflow over Mt. Aso.

Based on meteorological observations, Sagawa (2017) investigated the spatial extent to which AO reached. He also compared wind speeds at Tateno and Fuketa/Uchimaki where MK is the strongest. Sagawa (2017) clarified that AO blew from Fuketa to the Kikuchi-minami fire station. Wind speeds were significantly lower at Tateno both for AO and MK. It was clearly evident during the blowing of MK.

So far, characteristics of MK have been clarified fairly well. For the occurrence of MK, wind direction and wind speed at 850 hPa (about 1500 m a.s.l.) are important information. At central cone of Mt. Aso, Aso-san Meteorological Observatory (1142.3 m a.s.l.) had been operated whose data were frequently used. However, it stopped observations on 11th December, 2017, i.e., it is impossible to use these data in the future. This is a serious damage in the study of MK.

Keywords: Mt. Aso, local wind, Matsubori-kaze, Aso-oroshi, Meteorological observations in mountains