

## Comparative Observation on Ice Valleys in Korea and Mongolia

Hi-Ryong Byun<sup>1</sup>, Dolgorsuren Azzaya<sup>2</sup>, Do-Woo Kim<sup>1</sup>, Sang-Min Lee<sup>1</sup>

<sup>1</sup>*Pukyong National University, Busan, Rep. of Korea*

<sup>2</sup>*Institute on Meteorology and Hydrology Juulchny gudamj-5 Ulaanbaatar-46, Mongolia*

### 1. Introduction

Ice valleys in Miryang Korea and Yolín-am in Mongolia are comparatively observed with 3 years and 1 year observation respectively.

Yolín-am in Mongolia is long narrow valley surround by tall rocks. The number of rocks reaches about 2000–5000 and the lengths of them are about 50m high. It is located at 43° 31'953" N, and 102°10'715"E with 1619meter elevation. Highest surface temperatures are recorded as 20 C (in the valley) and 10.5 C (at the rock top) that are observed 5th and 7th Aug 2005. Lowest surface temperatures are -19.0C (in the valley) and -20.5C (at top of rocky hills), those are recorded at 16 Dec, 3005 and 05 Jan 2006. The minimum air temperature in the valley is recorded as -24.3 that is recorded at 15 Dec. 2005. One more ice valley near Yolín-am is Dung-gu-ne ice valley.

Yolín-am is characterized as the remained ice until summer. In winter, snow over the rocks melts by solar radiation and water flow down to the narrow valley between tall rocky hills in day time. But in night time, water flows over the water freezes again over the ice. Finally at the end of the winter, ice becomes 6~10 m high. In summer, ice melts slowly only by air temperature. However, because it is located near desert, air is very dry, precipitation is little, and warm wind is hard to penetrate into the valley, ice remains until summer and melt out at September. Unfortunately no academic researches were found on this ice valley.

Miryang ice valley in Korea is located at 35° 29'N, 128° 45'E. The cold wind hole in the valley is located

at 400m elevation in one valley of the Jaeyak Mountain (1019m high). The highest temperature of the area is record as 39.8C in summer and -21.9C in winter. It is one of more than 15 ice valleys that are scattered in Korea. Through whole summer cold wind blows out from the talus in the valley and sometimes new icing occurs also. In winter it is very hard to find ice in the talus and warm wind blows out through whole winter. The mechanisms of these abnormal phenomena are investigated. The one is the accumulation of cold wind in the talus during winter. Another one is the positive feedback mechanism of cold wind generation proceeding in the talus through summer, which shows another mechanism that water can freeze in summer without electric power supply. Many Scientists (Bae 1990; Jung 1992, Kim 1968, Tanaka, 1997, Tanaka and others, 2000 2006; Whang and others 2005) have tried to investigate the abnormal phenomena of this valley. Especially what is the origin of the warmth of winter time warm wind and what is the cause of the cold of summertime cold wind and icing.

### 2. Observed Data

#### 2.1. Observation of Miryang ice valley

Temperatures of Miryang ice valley were observed more than 20 points. However 4 points of them (Table 1) will be used to compare. The results are shown in many other articles. (Byun, 2003, Byun and others, 2003, 2004, 2006)

Table 1. Geographic locations of observations and equipment. TMT denotes the air temperature at the summit of Jae-Yak Mountain. WWH warm wind hole, CWH1 cold wind hole-1, and CWH2 cold wind hole-2.

No. Name	Lat.	Long.	Alt.(m)	Equipment
1. TMT	35°33'42.8"	128°59'00.9"	1,062	Hobo-pro series S1819
2. WWH	35°33'54.4"	128°59'05.7"	759	Smart button
3. CWH1	35°34'18.2"	128°59'10.8"	401	Smart button
4. CWH2	35°34'18.3"	128°59'10.8"	400	Smart button

## 2.2. Observation of Yoliram ice valley

No academic records are available on the Yoliram ice valley though it is well known tour course in Mongolia. 4 kinds of temperature observations are carried out.

## References

- Bae, S. K., 1990: Hydrological study on the summer icing in the ice valley. *J. of Korean Hydrological Society*, 23(4), 459-466.
- Byun, H. R., and 22 persons, 2006: *Study on the mechanism of the Summer-time icing on the Ice-Valley* (In Korean). Miryang City Korea, 402p.
- Byun, H. R., K. S. Choi, K. H. Kim, and H.L. Tanaka, 2004: The characteristics and thermal mechanism of the warm wind hole found at the Ice valley in Mt. Jae-Yak. (In Korean with English abstract). *J. Kor. Meteo. Soc.*, 40, 453-465.
- Byun, H. R., 2003: The underground convection on the winter warm wind and summer icing of the Ice Valley (In Korean). *Daegi*, 13, 230-233.
- Byun, H. R., and D. I. Seo, 2003: For the increase of ices forming at spring and persisting to summer in The Ice Valley (In Korean). *Daegi*, 13, 376-377.
- Jung, C. H., 1992: The inspection report on the natural monument and the put-step of the dinosaurs. The study on the Ice Valley Miryang Nammyeong-ri (In Korean). *Kor. Geolog. Soc.*, 61-84, p200.
- Kim, S. S., 1968: On the cause of the summer icing in the Ice Valley (Miryang) (In Korean with English Abstract). *J. Kor. Meteo. Soc.*, 4, 13-18.
- Moon, S. E, and S. J. Whang, 1977: The study on the summer icing of The Miryang ice valley. Paper collections of Busan University (In Korean), Vol. 4, Part of natural sciences. 47-57.
- Song, T. H., 1994: Numerical simulation of seasonal convection in an inclined talus, *Proceedings of the 10th international heat transfer conference*, 2, 455-460.
- Tanaka, H. L., 1997: The numerical experiment on the summer icing on the Miryang Korea. *Jirihak-Pyeongron* (in Japanese), 70A, 1-14.
- Tanaka, H.L., D. Nohara, and M. Yokoi, 2000: Numerical simulation of the wind-hole circulation and summertime ice formation at Ice Valley in Korea and Nakayama in Fukushima, Japan. *J. Meteor. Soc. Jap*, 78, 611-630.
- Hwang, S. J., K. S. Seo, and S. H. Lee, 2005: Study on ice formation mechanism at the Ice Valley in Milyang, Korea. *J. Kor. Meteo. Soc.*, 41, 29-40.