



Characteristics of visibility around a Weir over the Nakdong River in Korea Peninsula

- A case study : Fog day's temperature and humidity

Jun-Sang Park*, Chang-Bum Cho, Jae-Young Byon, Kyu-Rang Kim, Byoung-Choel Choi

National Institute of Meteorological Research , Korea Meteorological Administration, South Korea

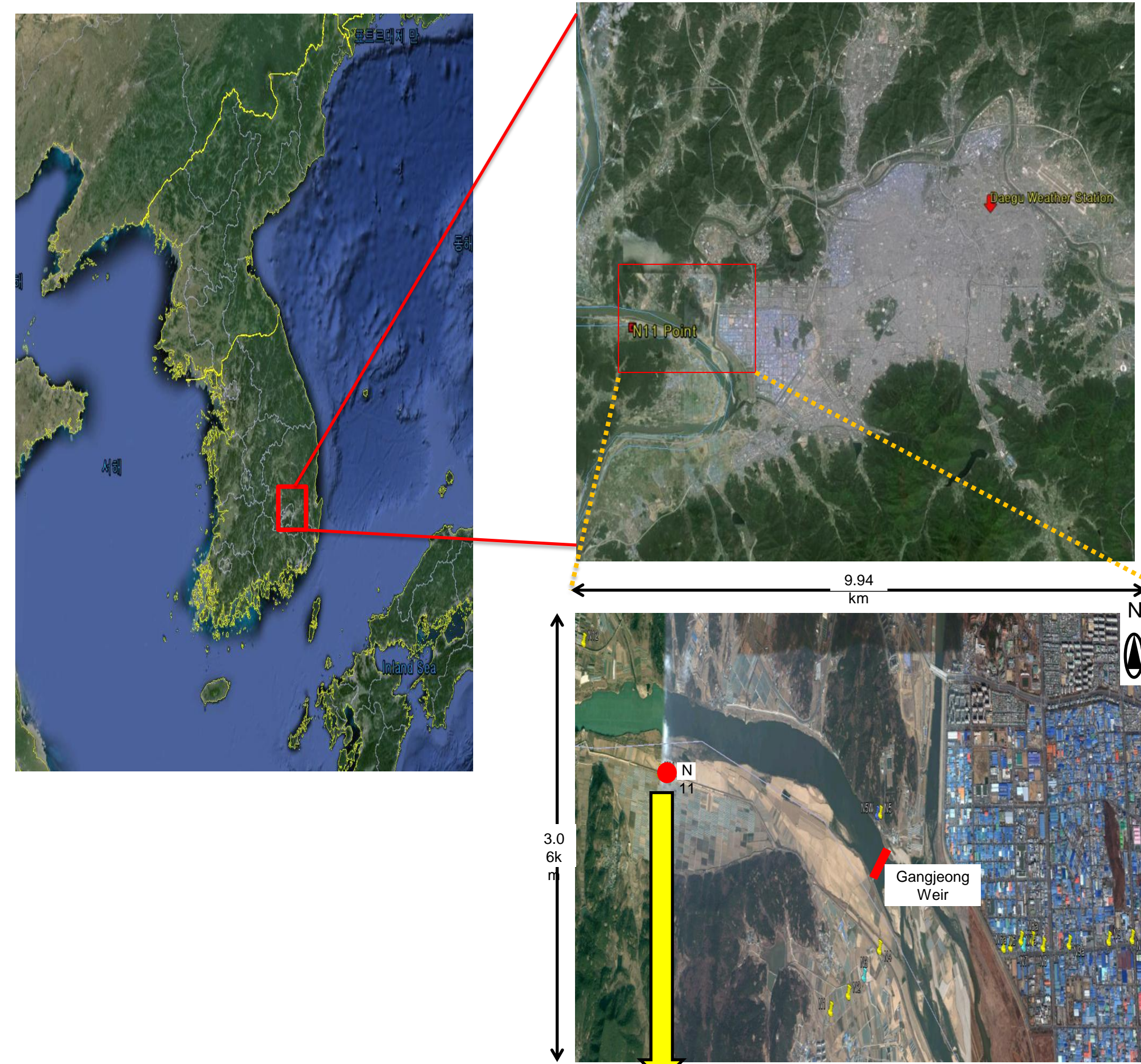
*happy3424@korea.kr



Introduction

A number of weirs were constructed in the Nakdong River in Korea Peninsula for the purpose of water resource security and disaster prevention of the area near the river. Reservoirs formed by the weirs increased the water surface area of the Nakdong River. It was requested to assess the local meteorological impact due to the change. In order to analyze the impact on visibility by weather factors, visibility meters were installed around the Gangjeong–Goryeong Weir in Nakdong. The purpose and objectives of this study are to assess the bad-visibility factor of the surrounding area and to analyze the effect of the atmospheric factors on the surrounding area.

Study Area



(a) N11 Point of Gangjeong–Goryeong Weir in Nakdong River
(b) Visibility measurement: OWI-430 DSP-WIVIS

Observation

We selected a test-bed region for this project near Daegu. Three visibility measurement stations (N3, N11, N12) along with 15 automatic weather systems(AWS) were installed. Visibility data from one (N11) of three sites and Deagu weather station (DWS) were selected for this study; N11 is located near (350 m) the Gangjeong Weir and DWS is located 14,000 m away from the Gangjeong Weir.

Visibility station near Gangjeong Weir	
N11	Located at 2 m in an agricultural field near a paddy field using a steel pipe
Dae-gu Weather Station(DWS)	10 m tower in a standard observatory field with grass cover. it is located at the east side of Daegu, which is the industrial zone of the city

In addition to the standard meteorological elements by the AWS, visibility, and surface temperature are observed at each site.

Data and Methods

Data Period

- N11 & DWS : Jan. 01, 2012 – Dec. 31, 2013

Data interval

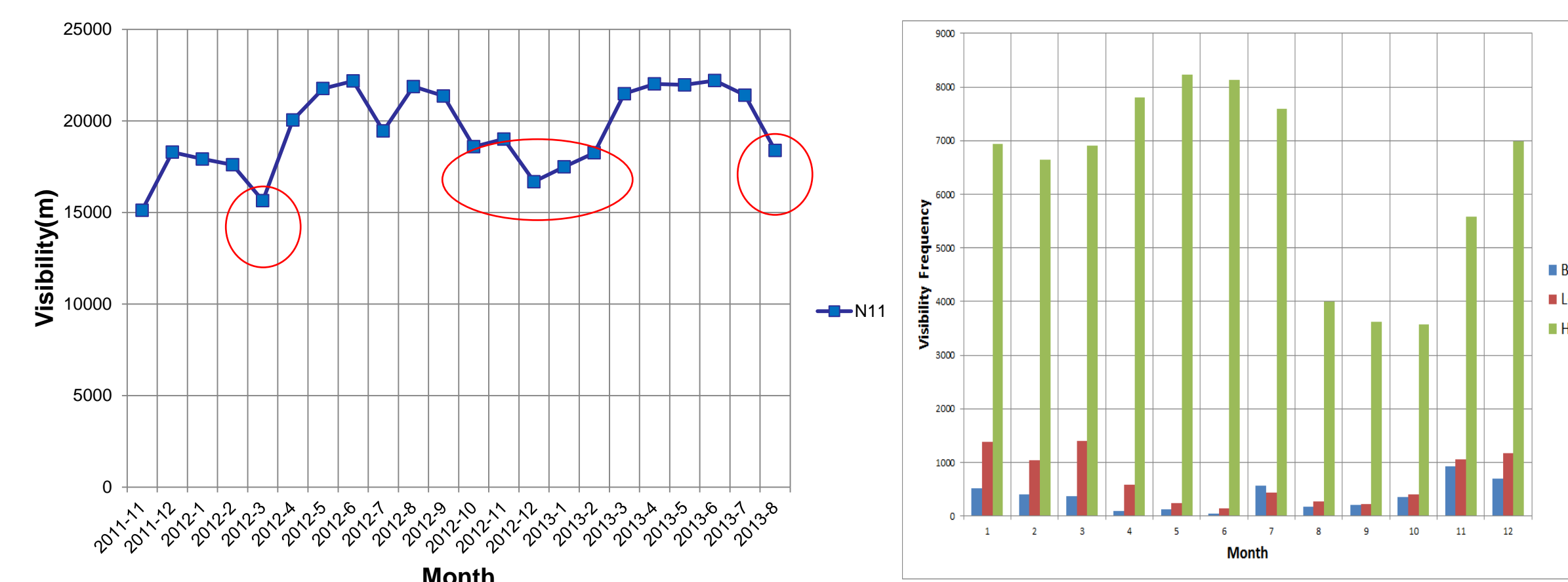
- N11 : 1 minute for all data
- DWS : 1 hour for all data

Quality control of the data and Data processing

- Except data : Observation data in excess of the limit and 1 minute data showing constant the DWS data.
- To analyze fog data, rainy days were excepted.

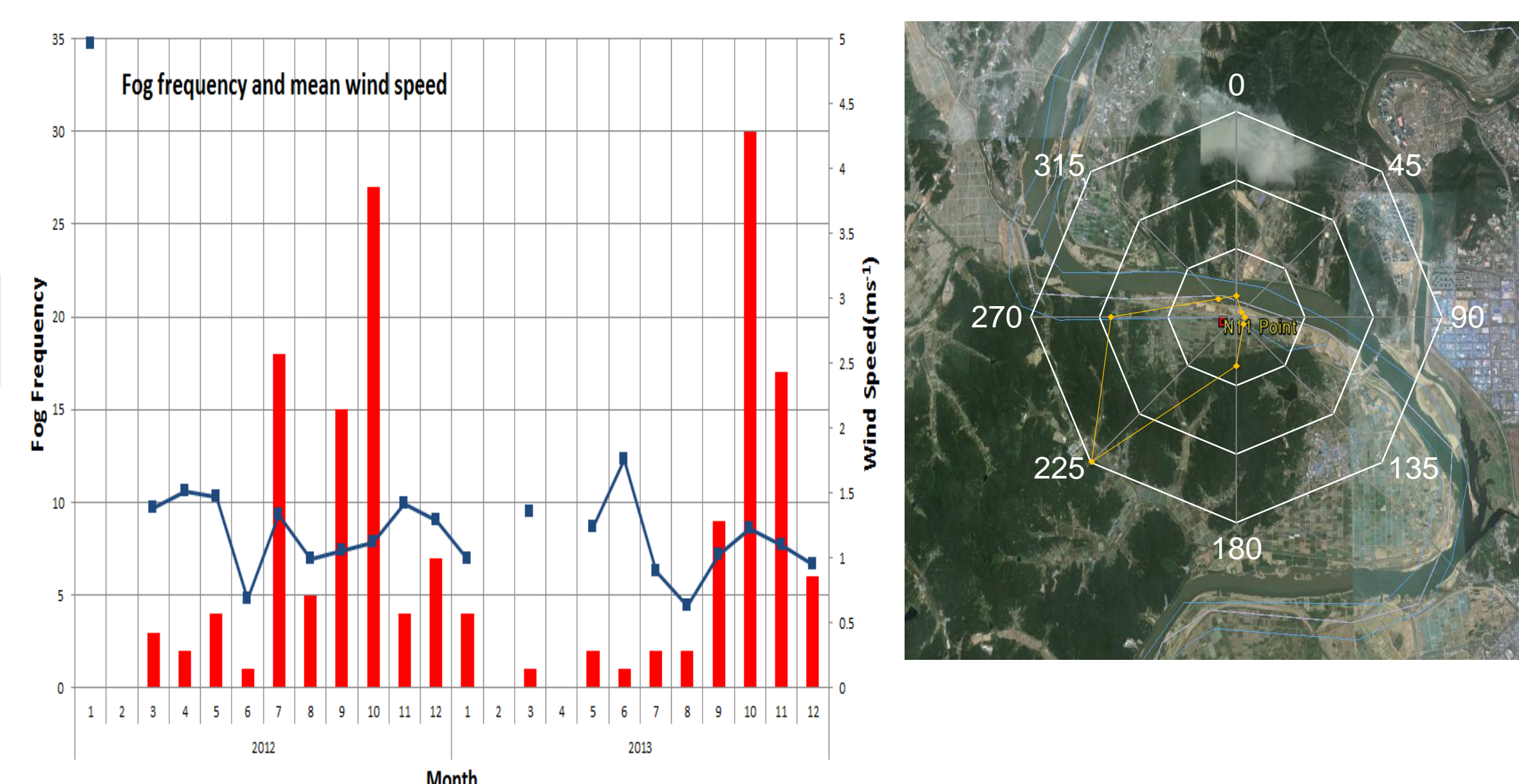
Results

N11 Monthly average visibility and frequency



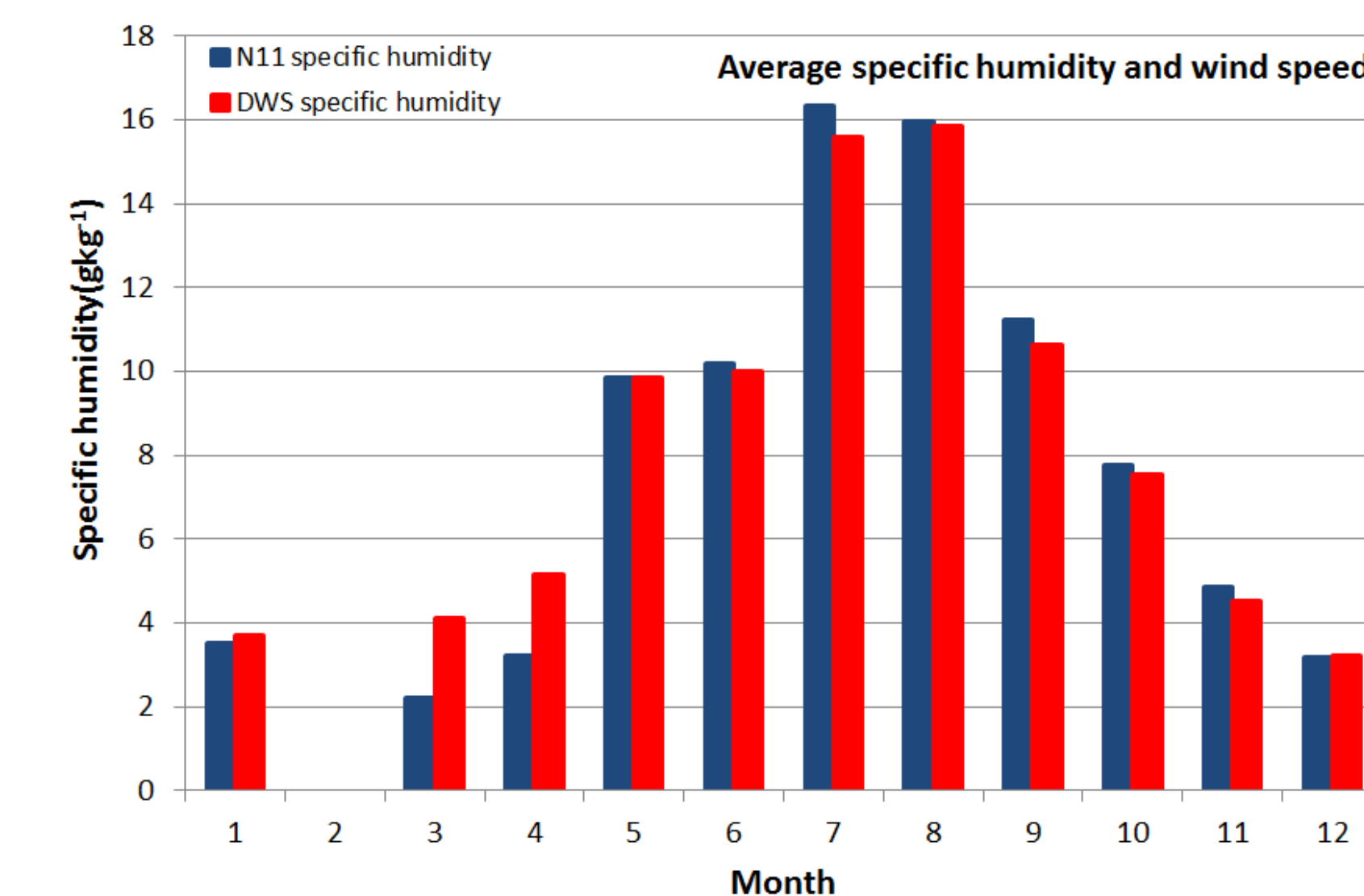
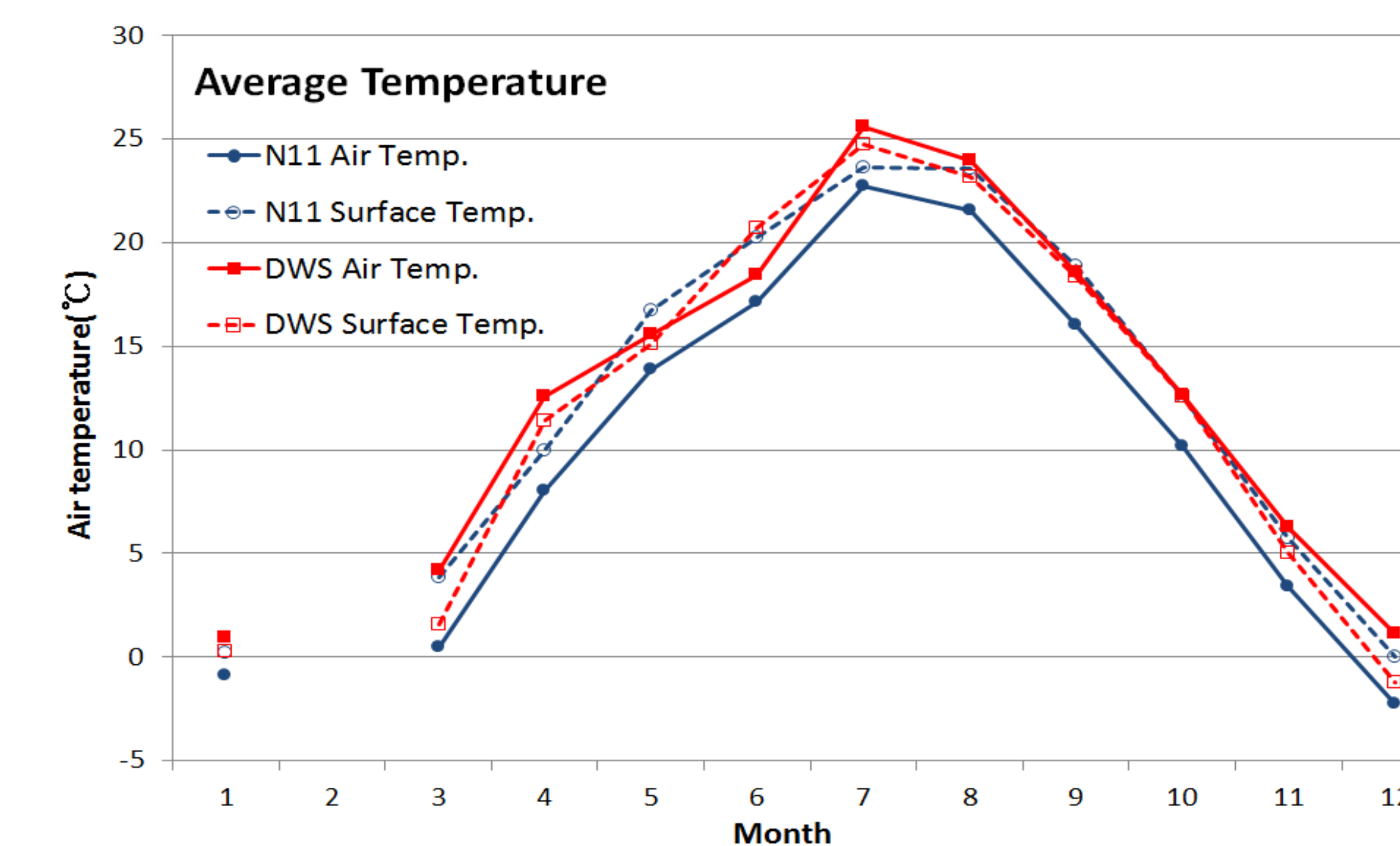
- The average monthly visibility of Fall and Winter was observed less than the Summer and Spring.
- The visibility of Fall and Winter were worsened by radiation fog in inland area.
- Observation station, N11 is one(Dae-gu) of inland city which shows high temperature in Summer, it is not easy to condense in the high air temperature.

N11 Fog frequency and average wind rose



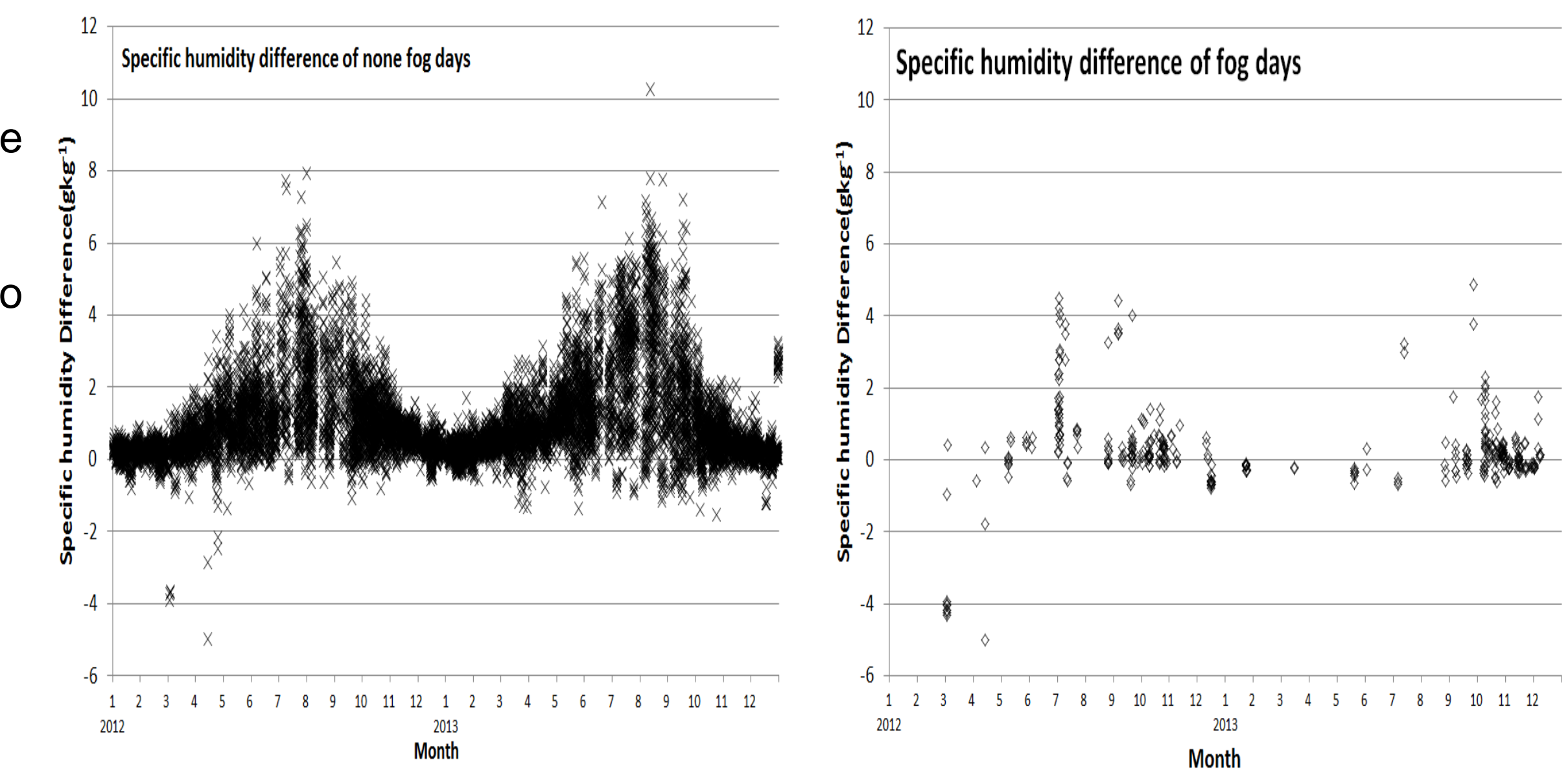
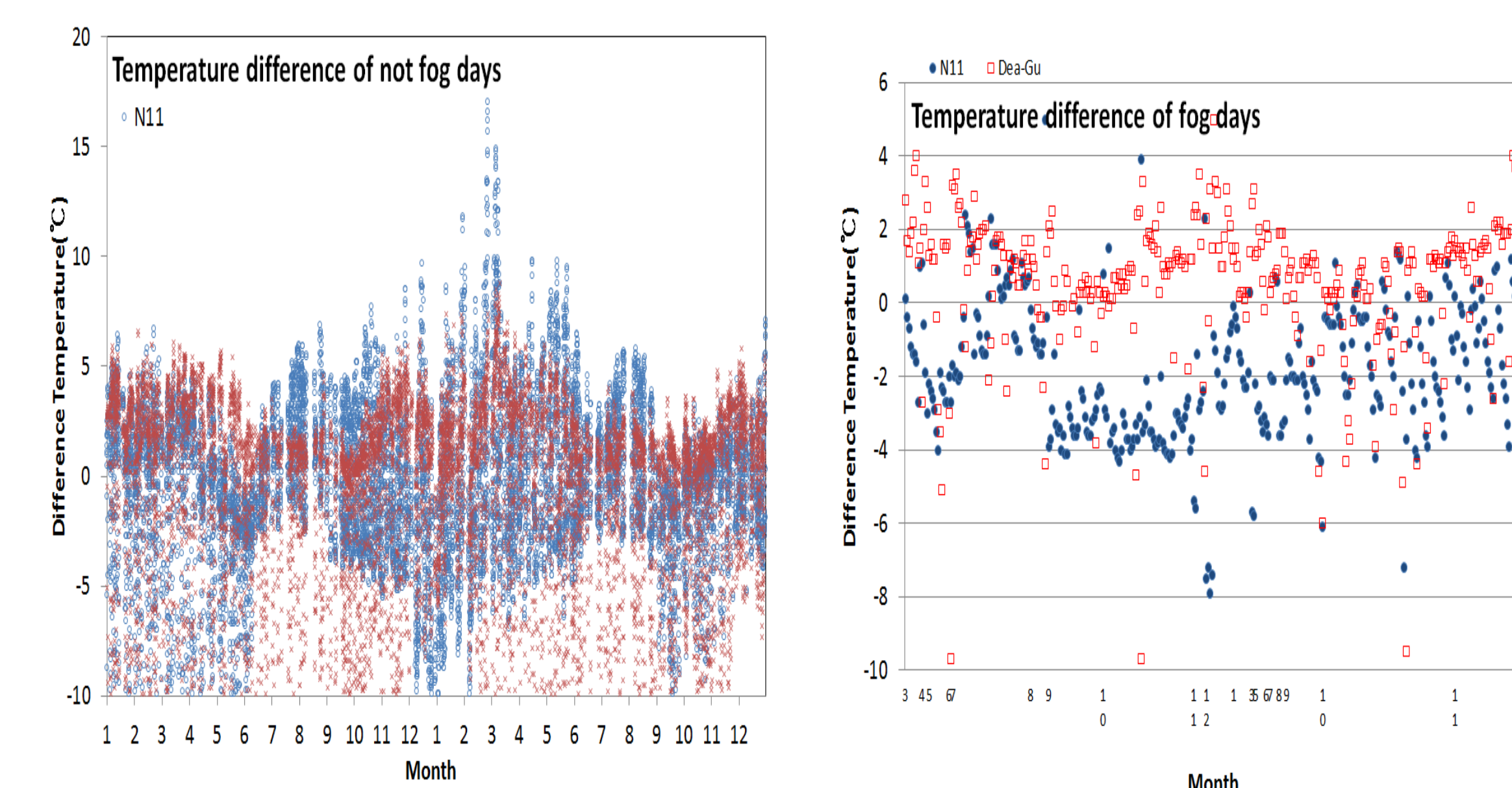
- The fog was not occur in Jan. and Feb. of 2012 and Feb. and Apr. of 2013.
- It observed lots of fog in Fall and Winter for 2 years.
- When observed overall average wind speed was 1~1.5 ms⁻¹, the occurrence rate of fog was high.
- The wind rose was mainly southwester wind for a foggy day.
- Through the influence of geographical, Cool wind from mountain came to river and it generated advection fog.

N11 and DWS fog days average variables



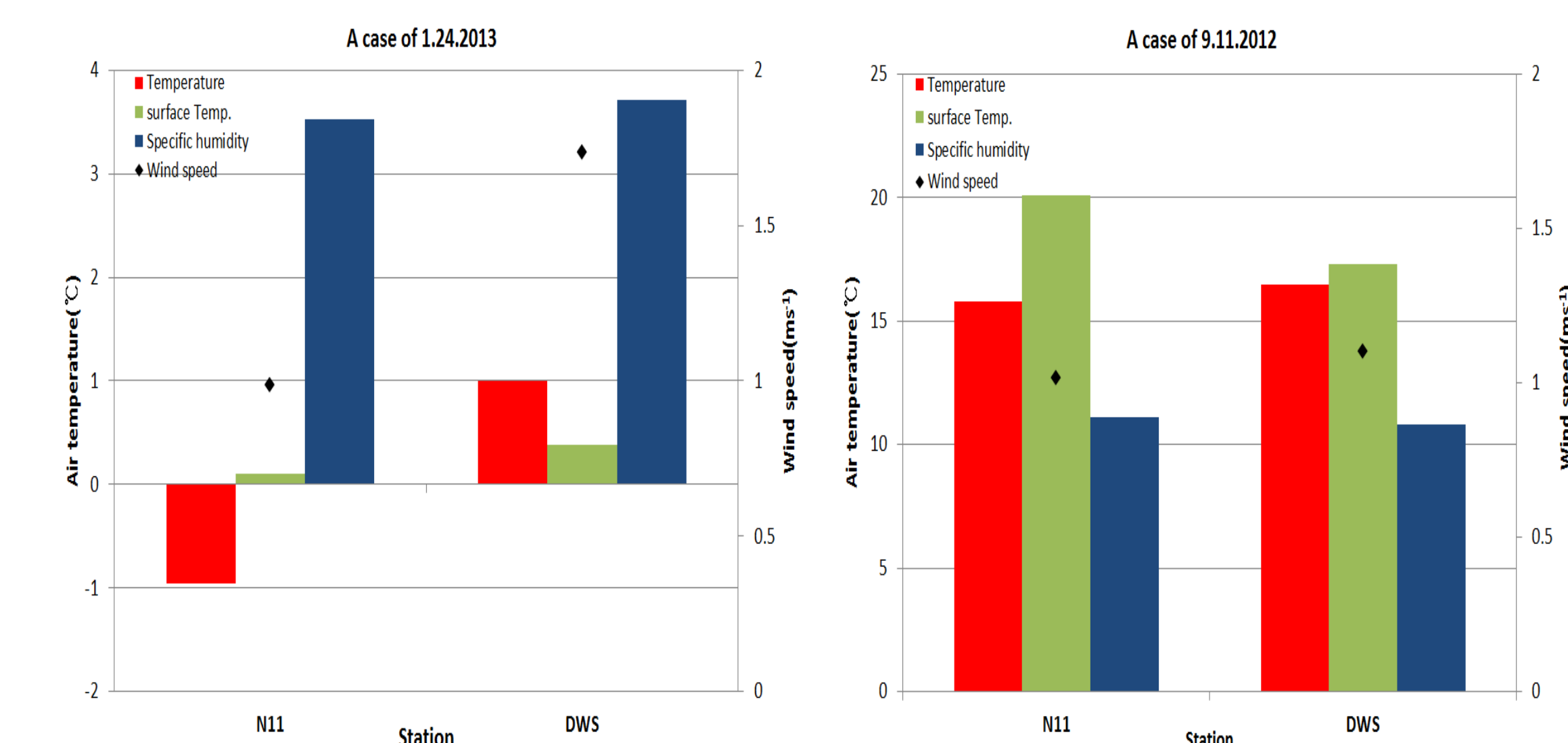
- Located in inner city, DWS air temperature was higher than N11.
- N11 surface temperature was higher than DWS in 2012 and N11 surface temperature is similar to DWS in 2013.
- DWS air temperature was higher than surface temperature and temperature gradient is stable between surface and atmospheric.
- On the other hand, the N11 surface temperature is higher than air temperature.
- The Specific humidity difference of 2013 between N11 and DWS was less than 2012.

Difference of fog days and none fog days



- Difference between air and surface temperature in N11 were 5°C ~ -5°C from Agu. to Oct.
- When the air temperature was lower than surface temperature, the occurrence rate of fog was high.
- The specific humidity in DWS was higher than N11 because of low air temperature and river influence.
- Specific humidity difference for fog days follows none fog days pattern.
- For fog generation, it needs vapor in air and more characteristic environment.

Case of fog days - N11 and DWS



- It was high specific humidity of N11 at 09.11.2012.
- When fog occurred, the specific humidity of DWS was higher than N11 at 01.24.2013.
- This radiation fog was occurred when the warm air passed through the cold surface.
- The N11 surface temperature of both 9.11 and 1.24 was higher than air temperature.
- The DWS air temperature was lower than surface temperature at 9.11 7a.m. and was highly surface temperature at 1.24 2a.m.

Summary

- N11 of Fall visibility was low and the occurrence rate of fog was higher in Fall and Winter.
- The average wind direction for N11 fog days was southwester and the cold air from mountain meet warm surface near Nakdong river.
- When surface temperature was higher than air temperature, fog occurred easily.
- Advection fog seems to occur when approaching to cold air and warm river.

Acknowledgment: This research was supported by the NIMR/KMA project, "Development of Assessment Techniques on Micro-Meteorological Impact."