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Introduction

According to the IPCC report, greenhouse gas emissions continue to increase, resulting in frequent extreme weather phenomena worldwide. In particular, heat waves are often strong during extreme weather events. In Korea, the heat wave has been included in natural disasters since 2018 but not only social damage but also human casualties have occurred. In this study, weather observation data related to the summer (June to August) heat wave in Busan, Ulsan and Gyeongsangnam-do were analyzed to identify the weather conditions for the heat wave. In addition, the effects of heat wave by sector were analyzed in relation to the heat wave impact forecast currently being implemented by the Korea Meteorological Administration. Meanwhile, from 2018, cold waves will also be included in natural disasters, and research will be needed to match local characteristics. Weather conditions of cold wave occurrence were identified by dividing cold air mass in Busan, Ulsan, and Gyeongsangnam-do into various temperature ranges depending on the time of occurrence of cold-related patient-related forecast for the cold wave impact forecast service that will take effect in December, the government plans to investigate cases of damage from cold wave in different areas and analyze the impact from each vulnerable area to set the critical values for cold wave impact forecast in Busan, Ulsan and Gyeongsangnam-do.

Data and Method

- Analysis of heat wave and cold wave characteristics
- Analysis of the Temperature Correlation between High-Rise Observation Data and Ground Meteorological Observation Data in the last 4 Years (2015-2018)
- [High-rip] Temperature data from Changwon point 925hPa, 850hPa(09, 15, 21KST)
  (ground) maximum temperature at Changyeong point, lowest temperature at Gyeongpung point, wind direction and wind speed(excluding measured values)
- Analysis of the impact of Heat Wave Vulnerabilities
  - Analysis of impact by sector (health, livestock, fisheries, agriculture and industry) in the last 7 years(2012-2018)
  - Risk levels of heat-related patient-related forecast for the heat wave

Weather Conditions in areas with frequent hot and cold events in Gyeongsangnam-do

- High probability relationship
- Analysis in 1
- When the number of cold disease patients continued for 10 days in a row
- The number of cold disease patients is 

waves in Busan, Ulsan and Gyeongsangnam-do

- High probability
- Analysis of the latest maximum temperature and ground maximum temperature
  - 850hPa Tem. - Ground Max. Tem. - 21KST > 15KST > 09KST
  - 925hPa Tem. - Ground Max. Tem. - 15KST > 21KST > 09KST
- Cumulative percentage (%)

Analysis of the Heat Wave Impact in Busan, Ulsan and Gyeongsangnam-do

- [The field of health]
  - Cumulative Percentage of heat-related patients by maximum temperature
    - A tendency to increase rapidly in four sections
      - 31°C (cumulative 10%), 33°C (cumulative 20%), 35°C (cumulative 50%), 37°C (cumulative 90%)
    - Same as the risk level for heat wave impact forecast except for the ‘Take Action’
- [The field of livestock]
  - Cumulative Percentage of livestock deaths by maximum temperature
    - Similar trend to the field of health
      - 30°C (cumulative 5%), 33°C (cumulative 20%), 35°C (cumulative 50%), 37°C (cumulative 80%)
    - Compared to Forecast of heat wave impact standard temperature by risk level
    - ‘No Severe Weather’ is 1 degree lower and ‘Take Action’ is 2 degree lower

Analysis of the Cold Wave Impact in Busan, Ulsan and Gyeongsangnam-do

- [The field of health]
  - Analysis of the latest temperature and ground maximum temperature
    - 850hPa Tem. - Ground Max. Tem. - 21KST > 15KST > 09KST
    - 925hPa Tem. - Ground Max. Tem. - 15KST > 21KST > 09KST
- Analysis of the latest maximum temperature and ground maximum temperature
- Cumulative percentage (%)

Result

This study analyzed the weather conditions of heat and cold weather in Busan, Ulsan and Gyeongsangnam-do using high-rise temperature, ground temperature, wind direction, and wind speed. The heat wave appeared to be related to the temperature of 21 KST at 850 hPa and the correlation between the temperature of 15 KST at 925 hPa and the maximum temperature(Changyeong) at R²=0.42 and R²=0.61, respectively. The risk levels of the heat wave impact forecast for each sector were the same based on the health sector, but they differed by 1 to 2°C. Cold waves appeared to be linked a day earlier with the correlation between 21 KST temperatures of 850 hPa and 925 hPa and the lowest temperature(Gyeongpung) at R²=0.42 and R²=0.56, respectively. The possibility of cold wave was high when wind direction was close to north wind and wind speed was weak. Cold-related patient numbers surged when the cold spell lasted 10 days in a row. Cold-related patients tended to develop in Ulsan and Gyeongsangnam-do from 0°C and in Busan from -2°C.