The Climatological Characteristics of the Landfall Typhoons on North Korea

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I. Introduction

- Recently, meteorological disasters have frequently occurred because of climate changes, and socio-economic scale of the damage is getting increased (*IPCC, 2007).
- According to UNISDR (UN International Strategy for Disaster Reduction), the cumulative damage (from 1991 to 2005) in North and South Korea was 5th, 17th, respectively, among the Top 50 countries.
- The world of natural disasters report in 2007 said,
  - The number of deaths caused by natural disasters in North Korea is ranked the world’s, and
  - North Korea’s annual Climate Risk Index (CRI) published by Germanwatch was ranked 2nd.
- North Korea has been reported to have serious damages by disaster annually and still very weak for disasters.
- However, there are no studies on landfall or affected typhoons on the North Korea.
- In this study, the climatological characteristics of the landfall typhoons on North Korea are examined to estimate the frequency, the intensity, the track, and their damage.

II. Data and Methodology

<table>
<thead>
<tr>
<th>DATA</th>
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<tbody>
<tr>
<td>Typhoon Information</td>
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<tr>
<td>- Resources : TC(Tropical Cyclone) best-track data of the Regional Specialized Meteorological Centers (RSMC) and Tokyo Typhoon Center</td>
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<tr>
<td>- Elements : Latitude, Longitude, and Central Pressure</td>
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<td>- Period : From 1951 to 2008</td>
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<td>Meteorological Analysis</td>
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<td>- Resources : 2.5° x 2.5° NCEP/NCAR (National Centers for Environmental Prediction/National Center for Atmospheric Research) Reanalysis</td>
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<td>- Elements : 500 hPa Geopotential Height</td>
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<td>- Period : From 1951 to 2008</td>
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<tr>
<td>Typhoon Disaster</td>
</tr>
<tr>
<td>- Resources : The ODFA/CRED International Disaster Database of EM-DAT (Emergency Events Data base)</td>
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<tr>
<td>- Elements : Deaths number, Total affected number, Est. Damage</td>
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<tr>
<td>- Period : From 1951 to 2008</td>
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Methodology

- Definition of “landfall typhoons on the NK”
  - North Korea’s territorial scope (Ministry of Education & Human Resources Development, MEHRD, 2001)
    - Passed in 37.4°N ~ 43°N, 124.1°E ~ 130.4°E
  - Grade of typhoons: Including typhoons to extra-tropical cyclone
- Characteristics analysis of typhoons landing on the NK
  - Frequency and intensity changes of the landfall typhoons using RSMC data from 1951 to 2008
- Track pattern analysis of typhoons
  - Track pattern is classified by Typhoon’s track using RSME data from 1951 to 2008
  - Figure out the relation between the typhoon track and the expansion of North Pacific High (NPH)
- Damage analysis of typhoon disasters
  - Using EM-DAT’s disasters data from 1951 to 2008
  - Examination for deaths and total affected number and Est. Damage by the landfall on NK

III. Result

- Frequency of typhoons
  - Yearly variation
  - Monthly variation
  - Total 53 for 58 years
  - Average : 0.9 per a year
  - Concentrating in July to September, the most landed in August

IV. Summary

- Even if a clear trend on the frequency of typhoon is not defined, it is noticeable the intensity has been weakened since the frequency of TS (Tropical Storm) decreased.
- More often than not, the characteristic of Type(I) is the case of a landfall after it becomes extratropical cyclone. Type(II) and Type(III) show a landfall as TS grade, by comparison.
- The intensity of a typhoon landfall on North Korea is variable depending on the development of NPH.
- The damage by the wind of Papiroon and heavy rainfall with Rusu landing on North Korea was analyzed.

V. Acknowledgement

This work was supported by the R&D Project of the Korea Meteorological Administration “Development and application of technology for weather forecast” (grant no.: NIMR-2012-B-1).