Typhoon change for 100 years and development of typhoon-hazard map

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In recent years, for example Typhoon 21 in 2018 (hereafter T1821), T1915, and T1919, an intense typhoon has approached to Japan Islands and has caused serious damage to various parts of Japan. Even the advancement of science and technology and the typhoon-course can be accurately predicted, typhoons are still a threat phenomenon. In this presentation, we introduce recent research on typhoon climate change and the latest typhoon disaster prevention.

Because typhoon-track data by the Japan Meteorological Agency (JMA) is only about 70 years after 1951, there are not enough observational data for research on typhoon-related climate change. However, there were many typhoons before 1950, such as Muroto Typhoon in 1934 and Makurazaki Typhoon in 1945, which caused devastating damages that exceeded 1,000 people. Therefore, this study focused on only typhoons that made landfall in Japan and detected typhoon data from 1900 to 2014 using original definitions and ground observation data. As a result of the number and intensity of typhoon that made landfall during the 115 years, (1) there was no tendency to increase or decrease, and (2) the proportion of intense typhoon that made landfall increased since the 1990s. In addition, it is clear that the annual number of typhoons that make landfall in June and July is high in El Nino years, and the proportion of intense typhoons in El Nino years is high in August and September.

According to the typhoon statistics for 115 years from the above study, there are no typhoons that make landfall on the Pacific side of the Tohoku region, except T1610. Although T1610 that made landfall in Iwate Prefecture was not very strong, but more than 20 people were killed. When a typhoon hits an area where disaster prevention was low, it became clear that even a weak intensity could cause serious damage. As long as you live in Japan, you should change your idea that a typhoon will come anywhere and anytime. Typhoon-hazard maps that indicate the area of high risk of typhoon-strong winds and heavy rainfalls enhanced by terrain effects may be useful for disaster prevention and mitigation, but they do not exist in the world.

This study investigates how the distribution of typhoon-related wind speeds and rainfall are enhanced by the topographical effects of their surrounding areas over the Japan Islands with the goal of creating typhoon-hazard maps. To produce typhoon ensemble simulations, this study utilized the terrain shift operation method. The typhoon-hazard maps created using the results of the typhoon ensemble simulations of about 1500 typhoons show the distributions of average wind speed and rainfall when the typhoon center enters in the circle with a radius of 300 km at each point. For example, the hazard maps can be seen that the average wind speeds that occurred at each point associated with approaching typhoons were high in the southern areas of the Japanese Islands and weak in the northern areas. These typhoon-hazard maps were possible to determine the regions where typhoon-related strong wind risks are high over the Japanese islands, thereby providing important disaster prevention information.

Keywords: Typhoon, Landfall in Japan islands , Typhoon-hazard maps

