A study on global analysis of abnormal rainfall through various spatio-temporal scales and basin characteristics

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In recent years, disasters induced by abnormal　extreme　rainfall have been reported around the world, and it has come out the necessity of estimating these disasters objectively. The purpose of this presentation is to show how global analysis should be done by proposing new indexes of the abnormal rainfall event. Furthermore, as a part of realization of the proposal, this research defines an index using data from rain gauges around the world, and performs global analysis of abnormal rainfall with this index

First, a strategy of investigating spatio-temporal distribution of occurrence of abnormal rainfall will be presented. Even if we simply say "abnormal rainfall", we can think of various aspects of it. Here, we concentrate on the abnormality depending duration of rainfall. In a view point of flooding, this aspect is very important because floods can be categorized into the flush floods, the short-rain floods and the long-rain floods. Answer to "Which type of flood becomes serious for specified target point?" depends on the location of the target point, raging from location along mainstream of huge river basin to location along tributary with small river basin. Taking these as a background, we can understand that it is important to investigate combined global distributions of occurrence of abnormality of rainfall with various time durations. Although, of course, combination of abnormality of events with large (for floods) and small (for draught) amount of rainfall also is very important, however, application below is limited within the events with large amount of rainfall.

Second, we will show a definition of an index of abnormality which can be commonly used through various time duration of rainfall. Here, we define it as exceeding probability of each realized rainfall after identifying the probability density function of annually maximum one day, three days, seven days and fifteen days rainfall.

The identification was done with respect to each available rain gauge station in the world. Total number of the stations is more than thirty thousand.

As one of the results, we verified that the longer the duration is, the higher the spatial correlation of distribution of the index is. Also, feature of spatio-temporal distribution of the index for one-day duration is different than that of longer time duration. Regarding the time series of about hundred-years, it us found that area percentage of rare events of which exceeding probability is less than 0.02 or 0.01 rapidly increases in only recent decade, respectively. This feature is common in all time durations. Furthermore, this index was also applied into a few flooding events in the world such as flood in Mississippi river basin in 1993. As a result, it was verified this index works well for each regional extreme event.

The index of abnormality defined above only takes into consideration rainfall events through a little of characteristic of river basin. In order to develop the index into more human related one, concept of the social coping should be taken into consideration. In this sense, we are very interesting in discussions through the workshop. Also, descriptions above have been concentrated on events related to floods, a similar idea on draughts will partly be shown.