



Analysis of flood disaster characteristics by using GIS: a case study at the Kujukuri Plain in Chiba Prefecture, Japan

Yuka Ito (1), Huali Chen (1), Marie Sawamukai (2), and Tomochika Tokunaga (1)

(1) Graduate School of Frontier Sciences, The University of Tokyo, Kashiwa, Japan, (2) Vision Tech Inc, Tsukuba, Japan

Subsidence has occurred at many areas in Japan. The Kujukuri Plain, Chiba Prefecture, Japan, is one of the heavy subsidence areas caused by ground deformation from paleo-earthquakes, plate tectonics and human-induced subsidence by groundwater use. The maximum value of accumulated subsidence is 106.8 cm at the Mobara City during the period from 1969 to 2011. The impact of land subsidence on surface environment has been concerned; one of its effects may include the increase of the risk of flood. In the Kujukuri area, flood disaster has occurred repeatedly in the past. In this study, we analyzed and compared the flood disaster of different period that occurred at 1 July 1970, 8 to 11 October 2004, and 16 October 2013 by using GIS to understand the temporal change of the flood characteristics of the region. Three periods were selected because 1970 is after huge land modification, 2004 is prior to the 2011 off the Pacific coast of Tohoku Earthquake, and 2013 is after the earthquake of 2011. Data used are 1-meter resolution airborne laser scanning data, Landsat-data, and precipitation data. Local topographic depressions were represented from the difference between the raster images that filled the sinks from original raster image using 1-m DEM. Slope angles along the road were calculated by using road data of digital map 2500 (Geospatial information authority of Japan: GSI) and 1-m DEM. Land use maps were produced by Landsat-1 MSS (26 November 1972) and Landsat-5 TM (1 April 2004 and 5 April 2011) and aerial photograph. Impervious ratio distribution map was made by defining the impervious area where covered by asphalt such as roads and buildings. The results showed that the distribution of depressions was mostly unchanged from 1970 to 2004, however, changed slightly in 2013. This change could be affected by ground deformation after earthquake or small human activities such as surface improvement. Flood disaster area is recognized in the depth of depression of more than 20cm with the road gradient of ca. 1 % or less at Mobara City. In some areas, flooding is also occurred in the depressions of ca. 5 to 10 cm. Land use change, impervious area, and other data will be analyzed and compared with flood record map to investigate flood-prone area.