



Flooding in Bifurcation

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Edo River to diverge from Tone River on the right side flows away through Tokyo downtown, and into Tokyo Bay. Tone River of main stream flows through the north region of Kanto into Chiba prefecture of rural area. Tone River originally flowed through present Edo River into Tokyo downtown. So when Tokyo (Edo era) became the political center of Japan 400 years ago, this place had been suffered from flood caused by augmenting downstream flowing of rainfall over watershed catchment area. Edo Government extended near independent small rivers and connected with Tone River and led away most of flood water transportation into Chiba prefecture to be a rural reason. The present route of the river has been determined in the mass during the 16th century. Created artificial Edo River experimentally divided into 40 percentage and artificial Tone River divided into 60 percentage of flood water transportation.

After that Japanese Government confirmed a safety against flood and confirmed to be a safety Tokyo by using SFM (storage function method) and SNFM (steady non-uniform flow method). Japanese Government estimated Plan High Water Discharge 17,500m³/s at upstream of the divergent point and Edo river flowing through 40 percentage (7,000m³/s) of 17,500m³/s which was same ratio as Edo era.

But SFM and SNFM could not explain dynamic flow phenomena. We surveyed how many channel storage amount were there in this river by using UFM (unsteady flow method). We reproduce real flowing shape and carried out more detail dynamic phenomena.

In this research, we had taken up diverse and various 11 floods from 1981. These floods were confirmed that Edo River to be bifurcated less than 40 percentages. Large flood are not always high ratio of diversion in to Edo River. It's almost smaller ratio rather than higher ratio. For example, peak discharge 11,117m³/s, Aug. 1982 flood was bifurcated into Edo river flowing through 20 percentage of 11,117m³/s. Small flood peak discharge 1,030m³/s, Aug. 1992 flood was diverted into Edo river flowing through 33 percentage of 1,030m³/s. The case of these phenomena was arisen from channel storage.

In right side of upstream, a lot of spur dike that Japanese Government constructed in 300 years ago invented storage effect.

Otherwise, channel storage effect delayed the reach of peak discharge from upstream to Edo River downstream. We realized that channel storage have a ability to make a safe river and save person's life from flood water.

We will show you each floods hydrograph at the EGU 2010. It is testified the channel storage that the difference between discharge of upstream and downstream during inverse phenomena which upstream is higher discharge than downstream. And more over, we will show you our UFM equation and current direction graph in design flood.