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Understanding of Large-Scale Flood Processes with a Rainfall - Runoff Inundation Model and Time-Space Accounting Scheme.

Understanding large-scale flood processes is essential for flood risk management as well as PUB science. Regardless of the practical and scientific importance, the fundamental hydrologic processes of large-scale flooding have not been well understood. For example, we cannot answer even a simple question: Which period and location of rainfall dominantly caused prolonged inundation during the 2011 Thailand Flood?

To answer this type of questions, we conducted analysis by using a recently developed Rainfall-Runoff-Inundation (RRI) model and Time-Space Accounting Scheme (T-SAS). The RRI model simulates rainfall-runoff and flood inundation processes simultaneously at the river-basin scale, and T-SAS incorporated to the RRI model evaluates the sources of water that contributes to river discharges and inundations by tracking numerical tracers containing the information of water sources and path ways.

The application of the RRI model with T-SAS to the 2011 Thailand Flood revealed that the downstream river discharges mainly originated from precipitated water from six months before to the flood peak. Furthermore, the downstream inundation was largely caused by precipitated water over the large flood plain in addition to overflow from the main Chao Phraya River.

As the introduction of the RRI model application to the Thailand Flood, we also present real-time flood prediction that was made before the peak of the flooding as an emergency response-type simulation utilizing satellite-based information. Comparison between the real-time prediction in an ungauged-basin setting and post-flood simulation with more local information enabled us to discuss how far we could predict the large-scale flooding and how much we could improve the prediction with more local information for better estimation of river discharges and flood inundations.