Development of three-dimensional dynamic object extraction and tracking method and its application to the analysis of localized heavy rain system

Manami Matsuoka[1], Tomoya Matsunaga[1], *Rie Honda[1], Ken T. Murata[2], Shinsuke Sato[2], Koji Sassa[1], Fumie Murata[1], Yoshiaki Nagaya[2], Kentaro Ukawa[3]

1.Department of Information Science, Kochi University, 2.National Institute of Information and Communications Technology, 3.Systems Engineering Consultants Co., LTD.

The development of the ground-based radar observation instrument such as phased-array meteorological radar has enabled the acquisition of the data on three-dimensional structure of the raincloud system. In particular, the phased-array is able to sample the data at the time interval as short as 30 Sec, and thus it helps to understand the whole process of development of localized heavy rainfall systems starting from precursor (the first echo) to the main rainfall event.
We extended a method of 2D dynamic object extraction and tracking for time-series images (e.g., Honda et al. 2002) to that of 3D objects, and applied it to the phased array meteorological radar data. As a result of modeling of the object points sampled from the data after the threading at the value of 30dBZ, we observed the first echoes of heavy rainfall events are extracted the independent components at each event, and extracted the development of clouds in complex shape as the increase of the number of components.
In addition, we considered the hierarchical data model that is composed of “snapshot object”, “real object”, “object family”, and currently constructing the interactive query and visualization system that will be utilized in exploring the collection of object information to find spatio-temporal patterns of clouds related to heavy rainfall.

Keywords: spatio-temporal, data mining, object extraction, meteorological radar, modeling

