

A short-term rainfall prediction method using whether radar for typhoon related rainfall

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The translation method as a short-term rainfall prediction method is widely used in Japan and in some other countries. The method assumes that the temporal variation of horizontal rainfall distribution can be described by the two-dimensional translation equation. Also the method can easily identify the translation vector and growth-decay rate in the equation using method of least squares by assuming that two-dimensional distributions of the vector and the rate can be expressed as linear equations in terms of location. Furthermore, rainfall prediction can be done by following backward the characteristic curve of simultaneous equations which are equivalent to the translation equation with liner fields of translation vector and the rate.

However, the two-dimensional distribution of the vector as the linear field (hereafter vector filed) is not enough to well describe the movement of rainfall distribution when the target area is whole Japanese archipelago and whole typhoon system is included in the target area. Therefore, in this paper, the translation vector filed is re-defined as composition of “rotation around the typhoon’s eye”, “movement of typhoon’s eye itself” and the “liner field”. Also, a method of identifying parameters in the vector filed is proposed. Here, the vector field as the rotation around typhoon is assumed to be described by Rankine’s combined vortex which is composed by forced vortex (rigid body rotation) inside a specified distance from the eye and free vortex outside the distance. Because the vector filed is not linear in terms of location in this definition, prediction can not be done by following backward the characteristic curve of the simultaneous equations, numerical integration of finite difference equation of the translation equation with liner fields of translation vector is used.

The proposed method well improves accuracy of prediction until lead time of three ours. Even accuracy of one hour ahead prediction is improved.