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Location-Based Rainfall Nowcasting Service for Public

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The Hong Kong Observatory has developed the "Short-range Warning of Intense Rainstorms in Localized Systems (SWIRLS)", a radar-based rainfall nowcasting system originally to support forecasters in rainstorm warning and severe weather forecasting such as hail, lightning and strong wind gusts in Hong Kong. The system has since been extended to provide rainfall nowcast service direct for the public in recent years. Following the launch of "Rainfall Nowcast for the Pearl River Delta Region" service provided via a Geographical Information System (GIS) platform in 2008, a location-based rainfall nowcast service served through "MyObservatory", a smartphone app for iOS and Android developed by the Observatory, debuted in September 2012. The new service takes advantage of the capability of smartphones to detect own locations and utilizes the quantitative precipitation forecast (QPF) from SWIRLS to provide location-based rainfall nowcast to the public.

The conversion of radar reflectivity data (at 2 or 3 km above ground) to rainfall in SWIRLS is based on the Z-R relationship ($Z=aR^b$) with dynamical calibration of the coefficients a and b determined using real-time rain gauge data. Adopting the "Multi-scale Optical-flow by Variational Analysis (MOVA)" scheme to track the movement of radar echoes and Semi-Lagrangian Advection (SLA) scheme to extrapolate their movement, the system is capable of producing QPF for the next six hours in a grid of 480 x 480 that covers a domain of 256 km x 256 km once every 6 minutes. Referencing the closest point in a resampled 2-km grid over the territory of Hong Kong, a prediction as to whether there will be rainfall exceeding 0.5 mm in every 30 minute intervals for the next two hours at users' own or designated locations are made available to the users in both textual and graphical format. For those users who have opted to receive notifications, a message would pop up on the user's phone whenever rain is predicted in the next two hours in a user-configurable manner.

Verification indicates that the service achieves a detection rate of 76% and a false alarm rate of 26% in the first 30 minute forecast. The skill decreases as the forecast range extends, with the detection rate lowered to 40% and false alarm rate increased to 63% for the two hour forecast. A number of factors affect the accuracy of the forecast, notably the anomalous propagation, the sensitivity and vertical coverage of the radar, as well as the growth and decay of the rain echoes.

The service has been gaining popularity rapidly since launch, and has already registered over 12,000 users who have opted for notifications. The successful launch of the location-based rainfall nowcast service in Hong Kong and favourable verification results reveal the high practicality of such services.