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Improving Disaster Resilience Using "Real-Time Observation/Forecasting Systems for Torrential Rainfall" and "Shared Information Platform for Disaster Management (SIP4D)"

S. Shimizu[(1)], T. Maesaka[(1)], M. Hanashima[(1)], and Y. Usuda[(1)]
(1) National Research Institute for Earth Science and Disaster Resilience; e-mail: shimizus@bosai.go.jp

The number of flood events was 2935 and the about a half of million people lives lost due to flood in the world during 1993-2002 (EM-DAT: International disasters database, 2003) and the number will increase because extreme weather gets a boost from global climate change. In Japan, 1259 people was died by flood and landslide from 1999 to 2018 (ushiyama, 2020). National research Institute for Earth science and Disaster resilience (NIED) and many collaborators (including other national research institute, universities and private sectors) developed real-time observation/forecasting systems for torrential rainfall and "shared information platform for disaster management (SIP4D)" in the national project "Cross-ministerial Strategic Innovation Promotion Program (SIP)". The former is advisory system using potential forecast of severe rainfall based on environmental analysis 12 hours before disaster occurrence in order to prepare the citizen evacuation in a day time. The system also specifies the area where the citizen needs to evacuate due to torrential rainfall 2 hours before the disaster occurrence. The system uses cutting-edge observation networks for water vapor to improve the predictability. (1) aircraft observation over sea, (2) water vapor lidars (Raman lidar), (3) microwave radiometers and (4) new observation system using digital terrestrial broadcasting waves (DTB, Kawamura et al., 2017). These observation data were assimilated in real-time to produce appropriate initial condition to forecast heavy rainfall up to 2 hours every 10 minutes using high resolution (1 km) cloud-resolving storm simulator. The latter is the system to integrate all kinds information needed to support decision-making of local government (Usuda et al., 2017). In order to automate and link inter-organizational disaster response coordination as a system, the data registered in SIP4D is monitored, events to be dealt with are extracted from changes in the data and converted into messages. SIP4D can realize switching and expression tuning according to the viewpoint of decision supporters. The system provides information that contributes to proactive responses for flooding disaster, etc. by expressing/visualizing according to the unit/standard of decision support using rainfall forecasting information.

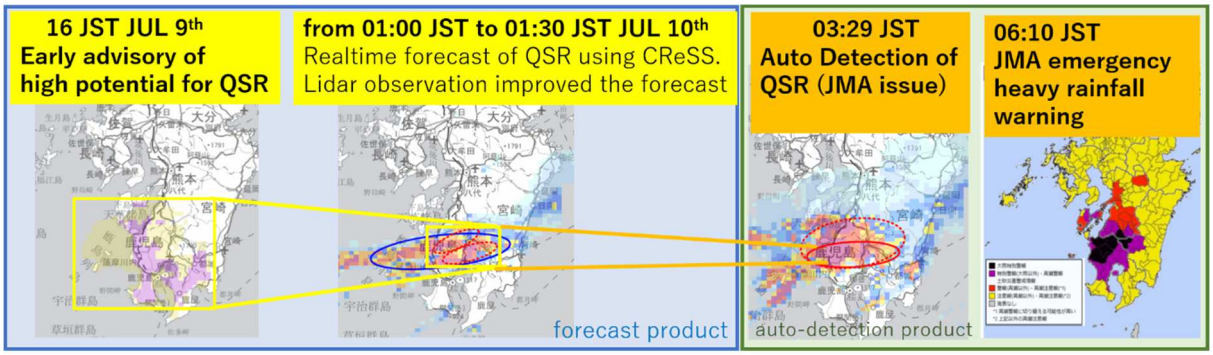

Figure 1. Localized heavy rainfall form Quasi-Stational Rainband(QSR) was observed at Kyushu region on Jul 10th 2021. We developed early advisory system of high potential for QSR (lead time is 12-hr, around the sunset time on Jul 9th) and short-range quantitative precipitation forecast system for QSR (lead time is 2 hr, around the midnight time on the Jul 10th).The two forecast systems successfully narrowed down the area where the citizen needs to evacuate from record-breaking severe rainfall observed in the morning on Jul 10th.

References

[1] Kawamura, S., et al. (2017), Water vapor estimation using digital terrestrial broadcasting waves, Radio Sci., 52, 367– 377, doi:10.1002/2016RS006191.

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