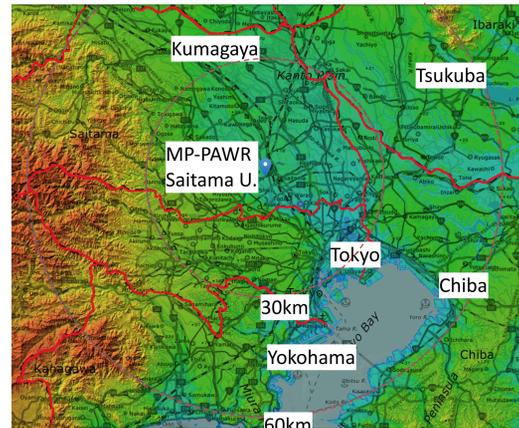
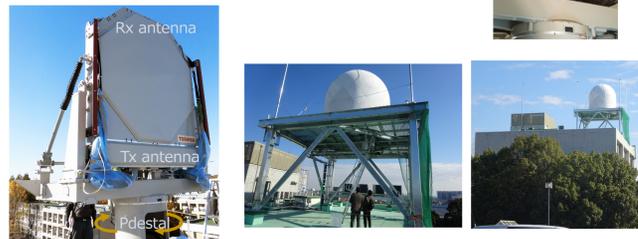


# DPR validation using multi-parameter phased array weather radar (MP-PAWR)

Nobuhiro Takahashi (Nagoya U.), Hiroshi Hanado (NICT), Katsuhiro Nakagawa (NICT) and Masahiko Osada (Saitama U.)

## MP-PAWR

- ❑ X-band dual-polarization weather radar
- ❑ Basically same concept with PAWR
- ❑ Electrical scan for elevation
  - Very fast RHI scan (in 0.1 sec.)
- ❑ Azimuth data are obtained by rotating antenna
  - one rotation in 30 second (2 rpm)
- ❑ Parameters
  - Z, ZDR, Velocity,  $\phi$ DP,  $\rho$ hv

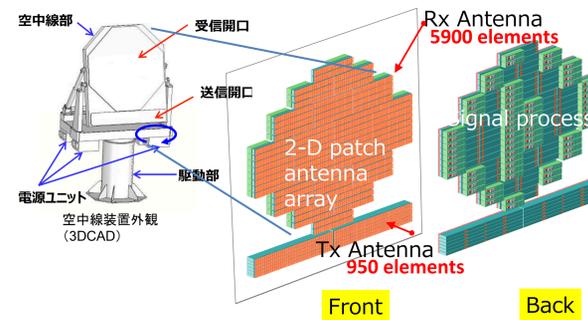


This map is a reproduction published by Geospatial Information Authority of Japan with some modifications

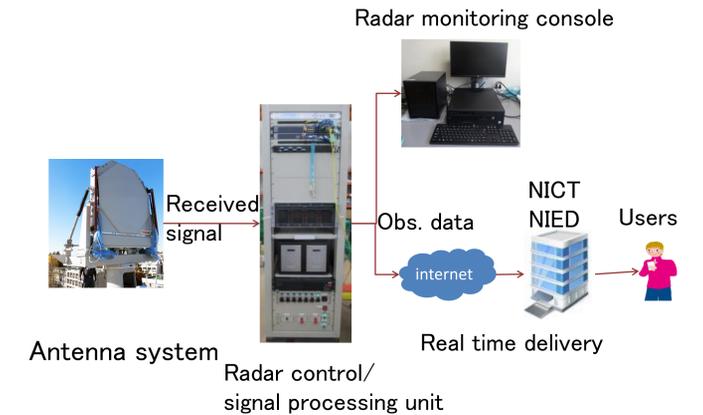
## MP-PAWSR system

### Antenna

- ❑ Two-dimensional patch antenna array is used as one-dimensional phased array system
- ❑ Bistatic radar (separate Tx antenna and Rx antenna)



### Data processing system

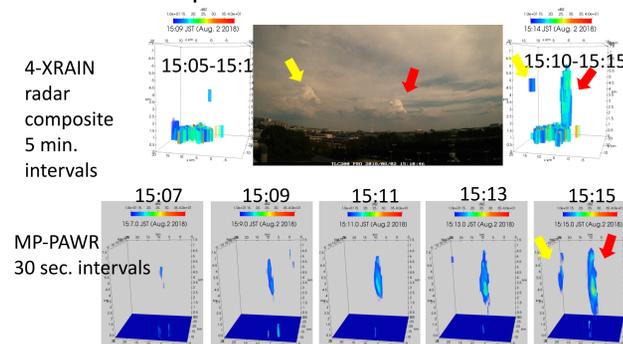


## Advantages of MP-PAWR for DPR validation

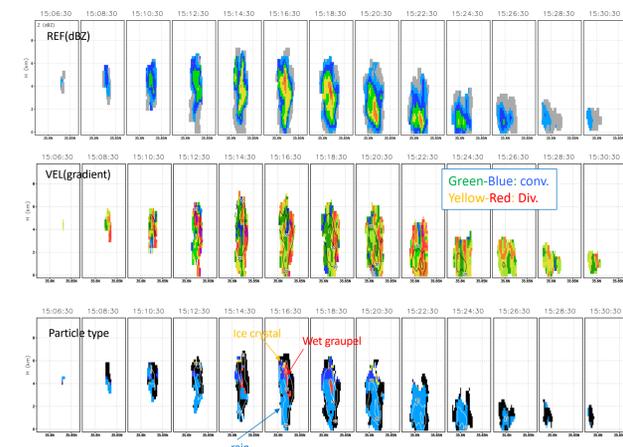
- ❑ Very short time difference (< 30 sec.) with DPR observation
- ❑ Available for various cloud physical products
  - Accurate rain rate by using KDP
  - Precipitation type classification
- ❑ Kinematic information can be obtained by (dual) Doppler analysis
  - Two more PAWRs around Tokyo metropolitan area
  - 5 operational X-band multiparameter radars in this area
- Vertical pointing information every 30 sec.
- Easy to compare with visual observations

## Examples of MP-PAWR observation

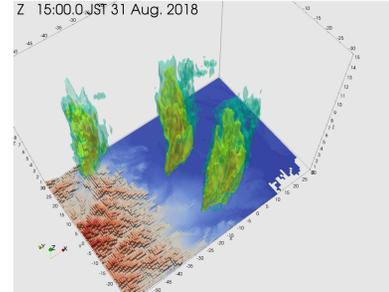
### Comparison of 3-D structure with composite 4 XRAIN radars.



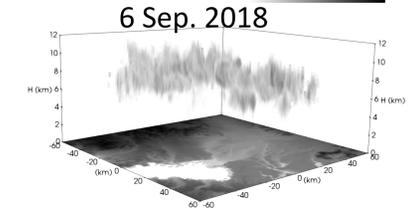
### Isolated convective cloud on 2 Aug. 2018



### 31 Aug. 2018

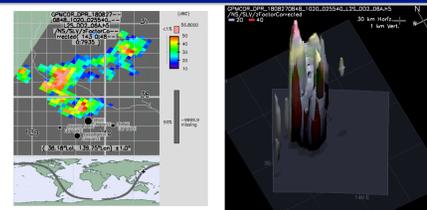


### 14:30 JST Sep. 6, 2018

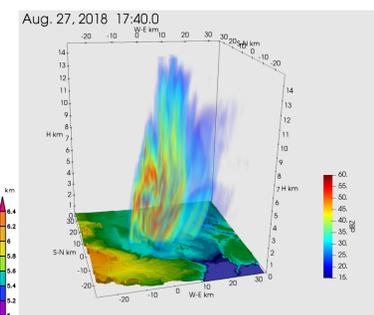


## GPM overpass case on 27 Aug. 2018

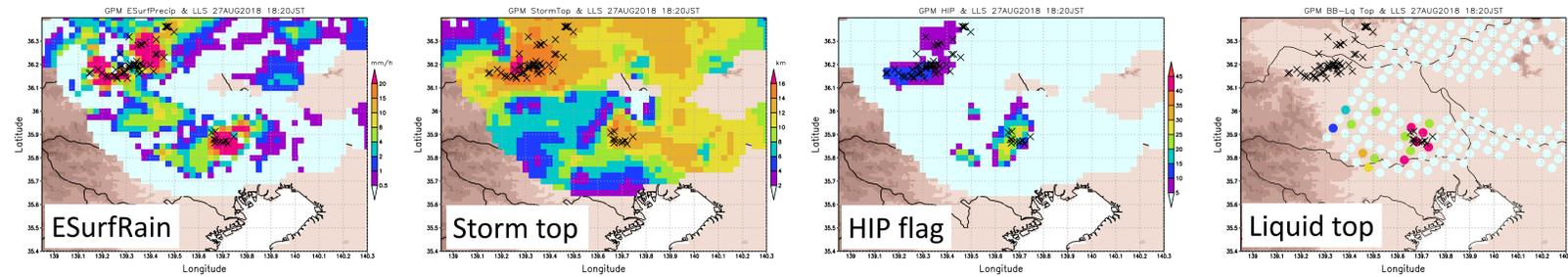
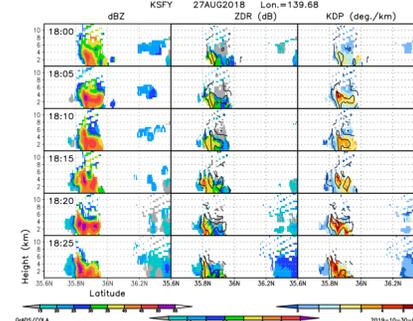
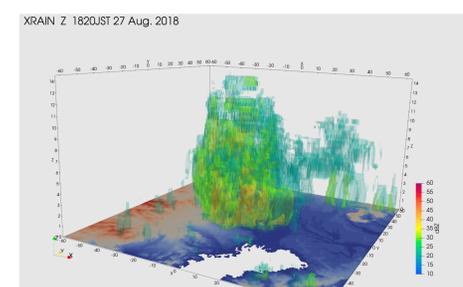
- ❑ MP-PAWR data were not available during the overpass because of power shut down, but one hour before and after were available.
- ❑ Multiple conventional radar data are used.



### MP-PAWR (40 minutes before the passage)



### Analysis by using conventional dual-pol. Radar (4 XRAIN radars)



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