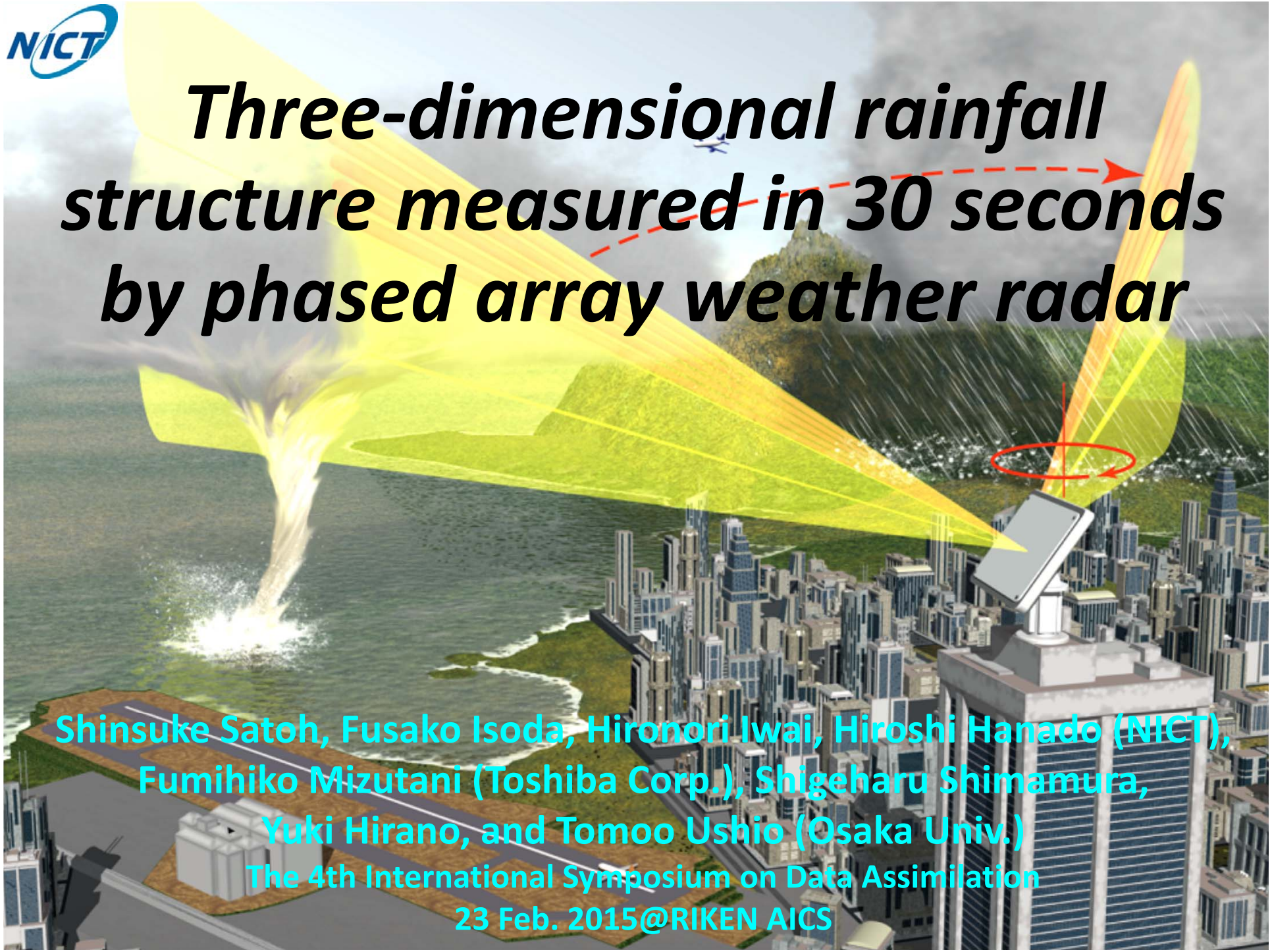


Three-dimensional rainfall structure measured in 30 seconds by phased array weather radar

Shinsuke Satoh, Fusako Isoda, Hironori Iwai, Hiroshi Hanado (NICT),
Fumihiko Mizutani (Toshiba Corp.), Shigeharu Shimamura,
Yuki Hirano, and Tomoo Ushio (Osaka Univ.)

The 4th International Symposium on Data Assimilation
23 Feb. 2015@RIKEN AICS

Introduction

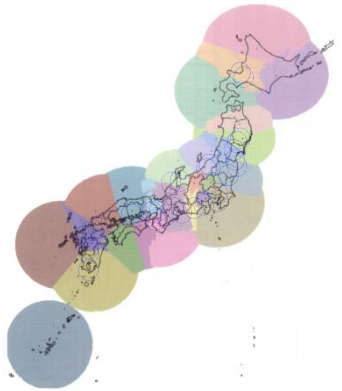
- We developed the X-band phased array weather radar (PAWR) to watch and predict severe weather disasters caused by localized heavy rainfalls or tornadoes. The PAWR measures 3-dimentional fine structure of rainfall with 100 m range resolution and about 100 elevation angles in 30 seconds was developed.

- The first PAWR was installed at Osaka University, Suita in 2012, and the second PAWR was install at NICT advanced ICT Research Institute, Kobe in 2014.

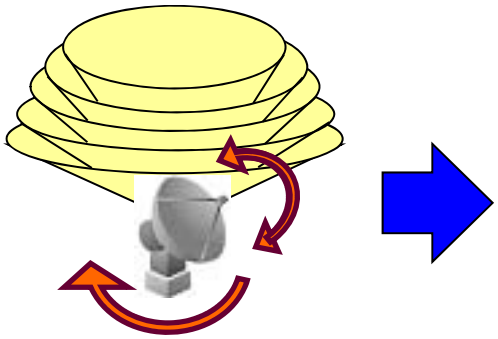
- 3D rainfall structure in 1) an isolated cumulonimbus, 2) a rain band in the Baiu season, and 3) developing convective cloud (dual-Doppler analysis).

Flash flood in Toga river
(28 July 2008)

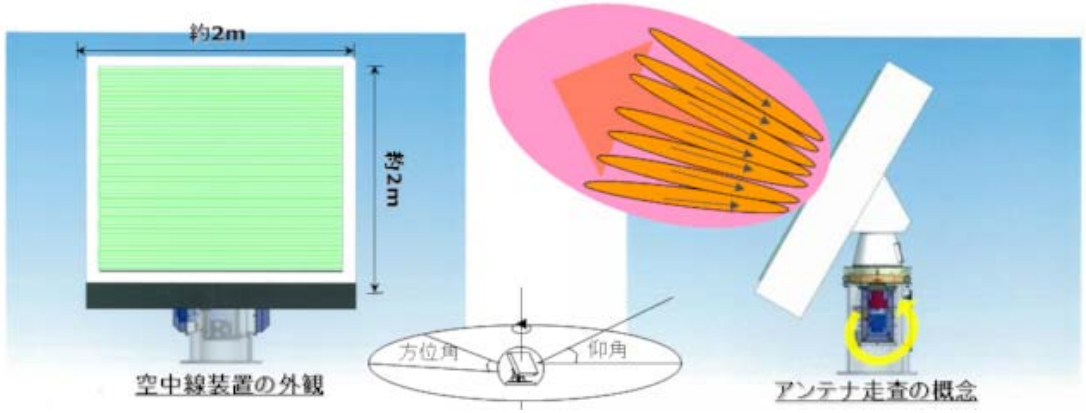
Tornado in Tsukuba
(6 May 2012)



MLIT operational C-band radar (colored area) and X-band MP radar（○）network.

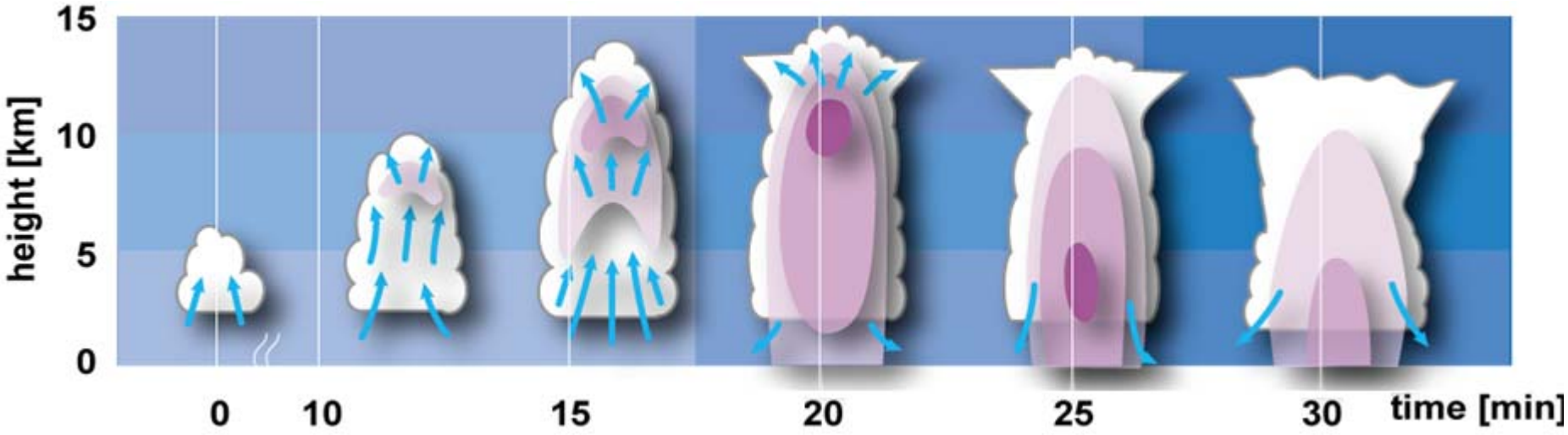


3-dim measurement using
a parabolic antenna
(15 EL angles in 5 min)

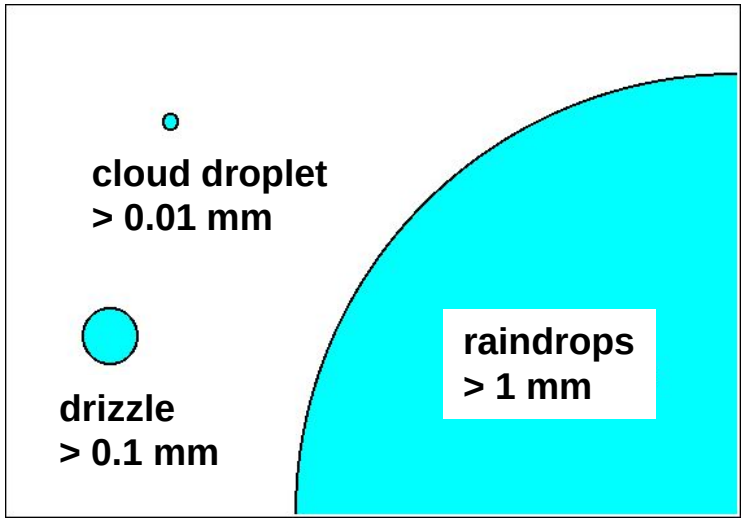


3-dim measurement using phased array radar
(110 EL angles in 30 sec)

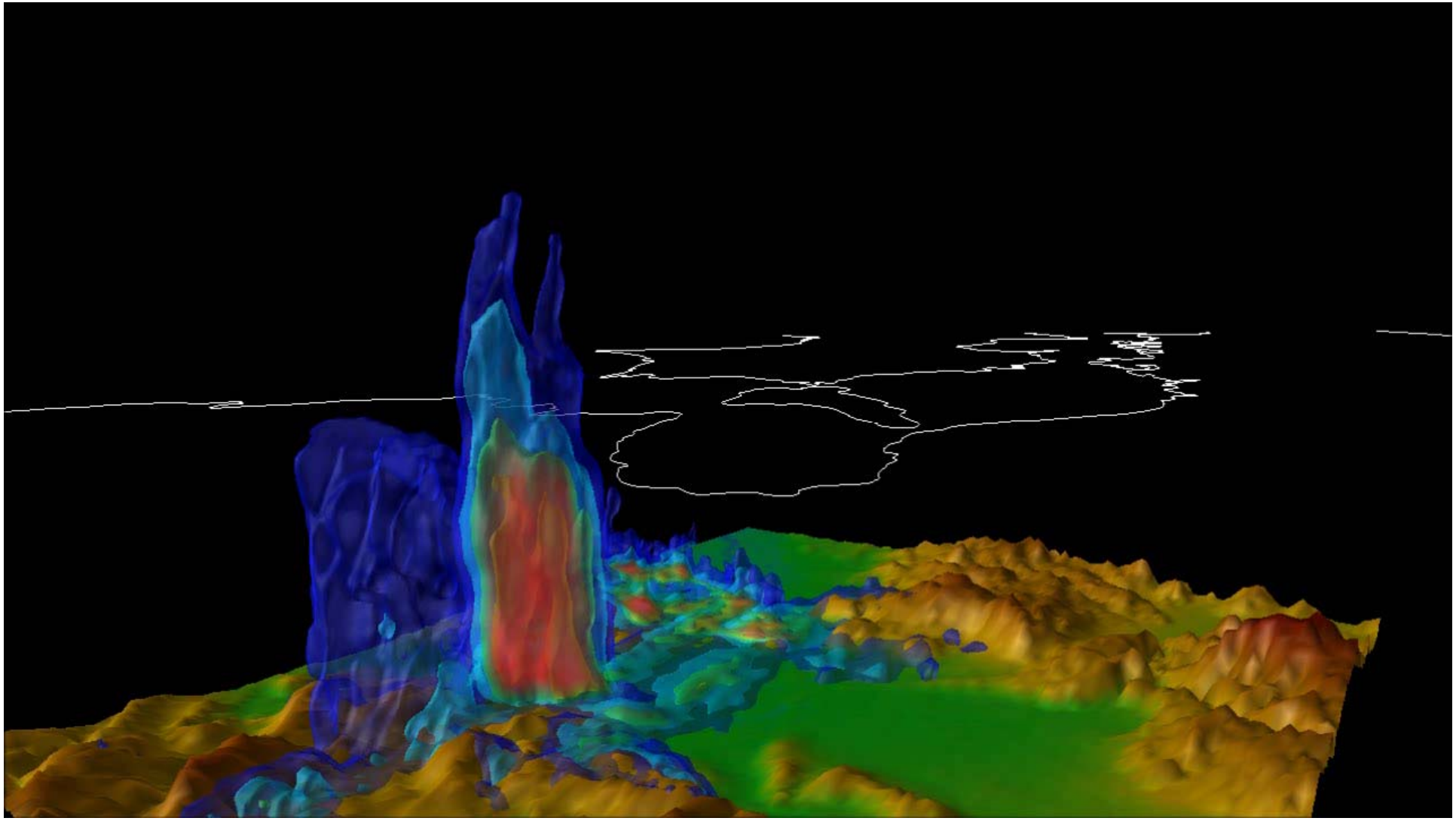
Precipitation development in a cumulonimbus



(1) growth of cloud droplets in cumulus updrafts
(2) increase of droplet size in upper levels
(3) large droplets detected by radar (first echo)
(4) raindrops falls to the ground at a rate of 4-5 km in 10 min.
(5) The life time of a cumulus cloud is 30-60 min.



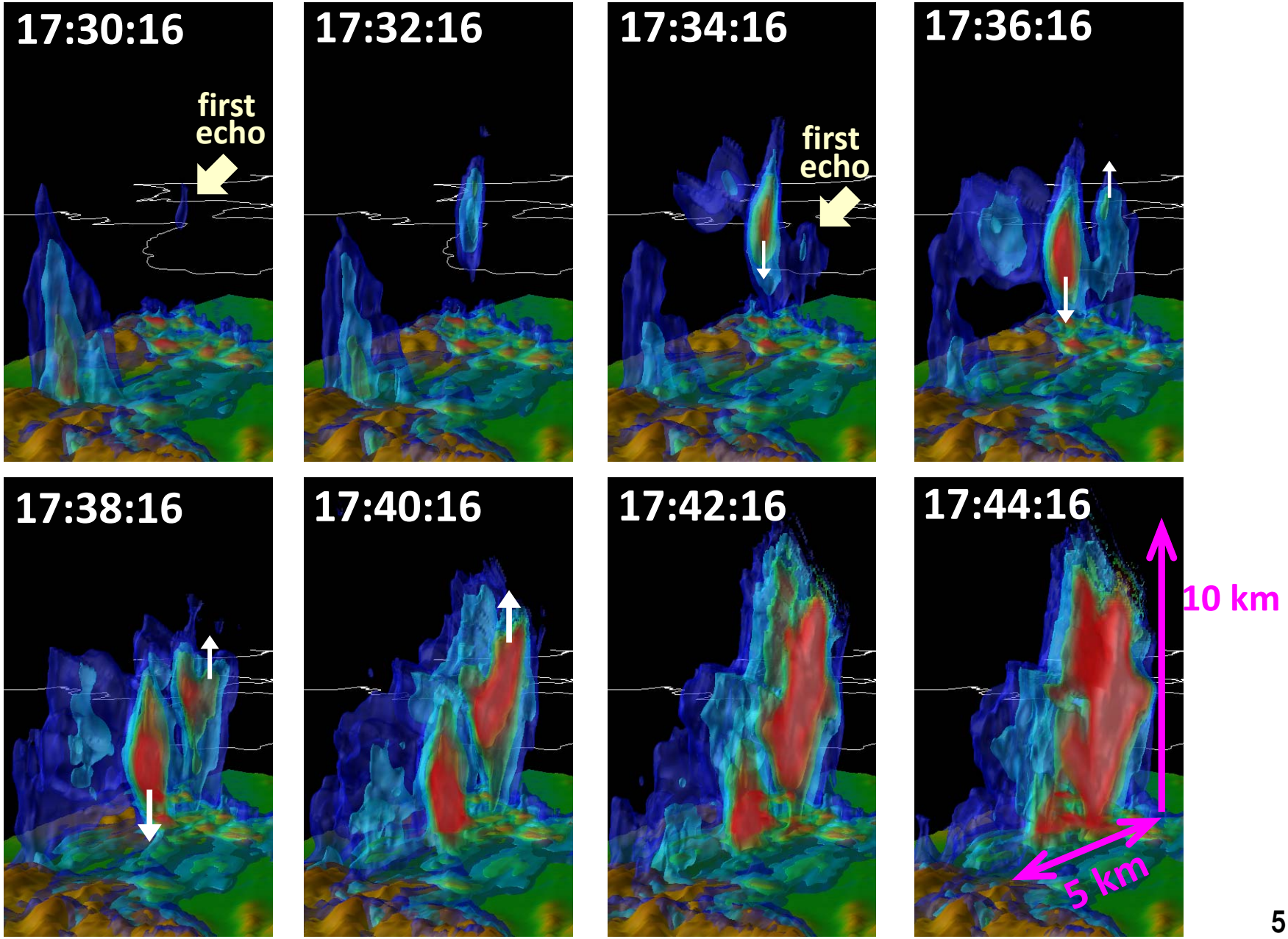
Localized heavy rainfall in a cumulonimbus



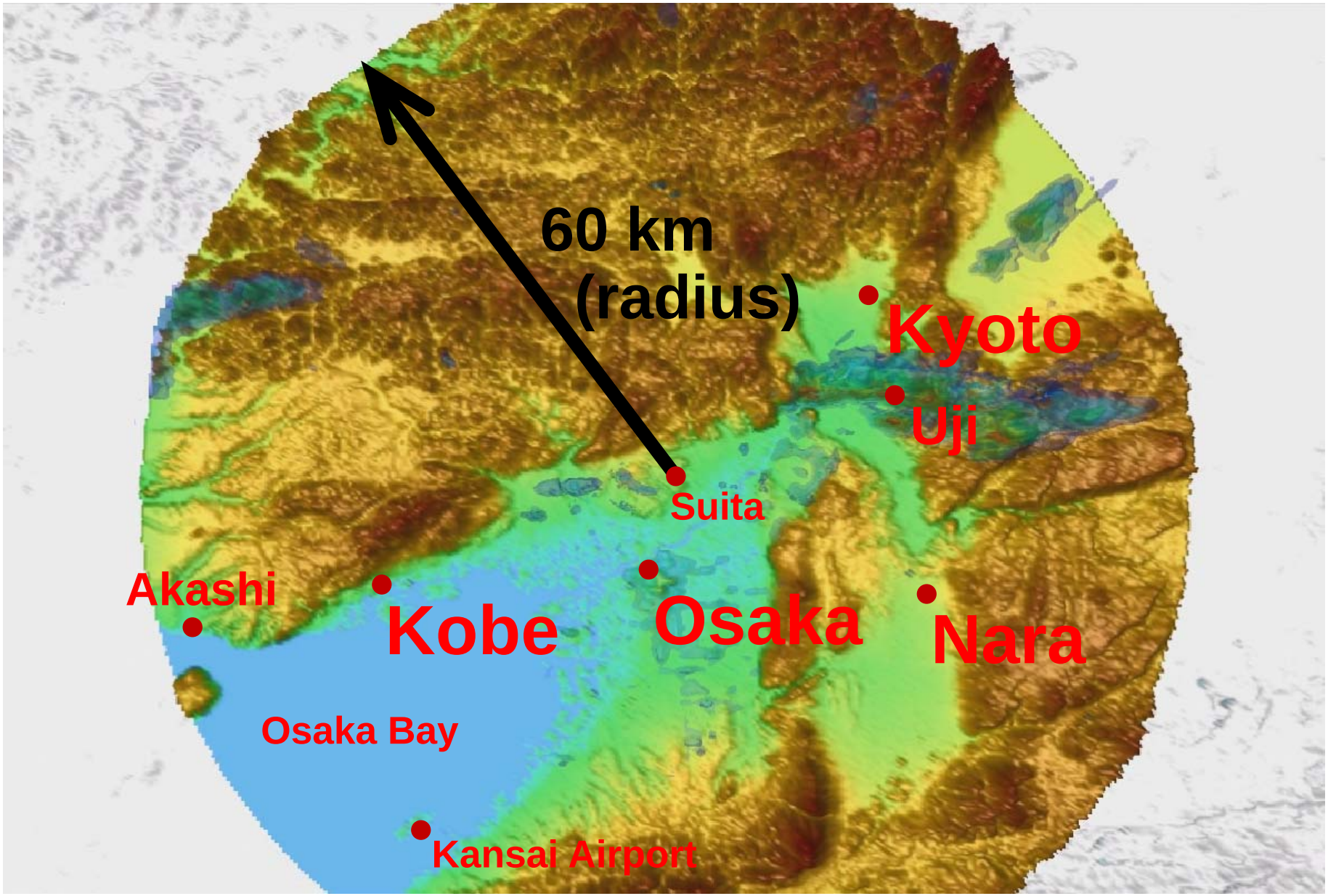
Three-dimensional distribution of precipitation over Kyo-tanabe city observed by PAWR from 17:20:16 to 18:10:46, July 26, 2012. View from the North-East, 100m grid size, and 30 seconds time interval.

Precip. development in an isolated cumulonimbus

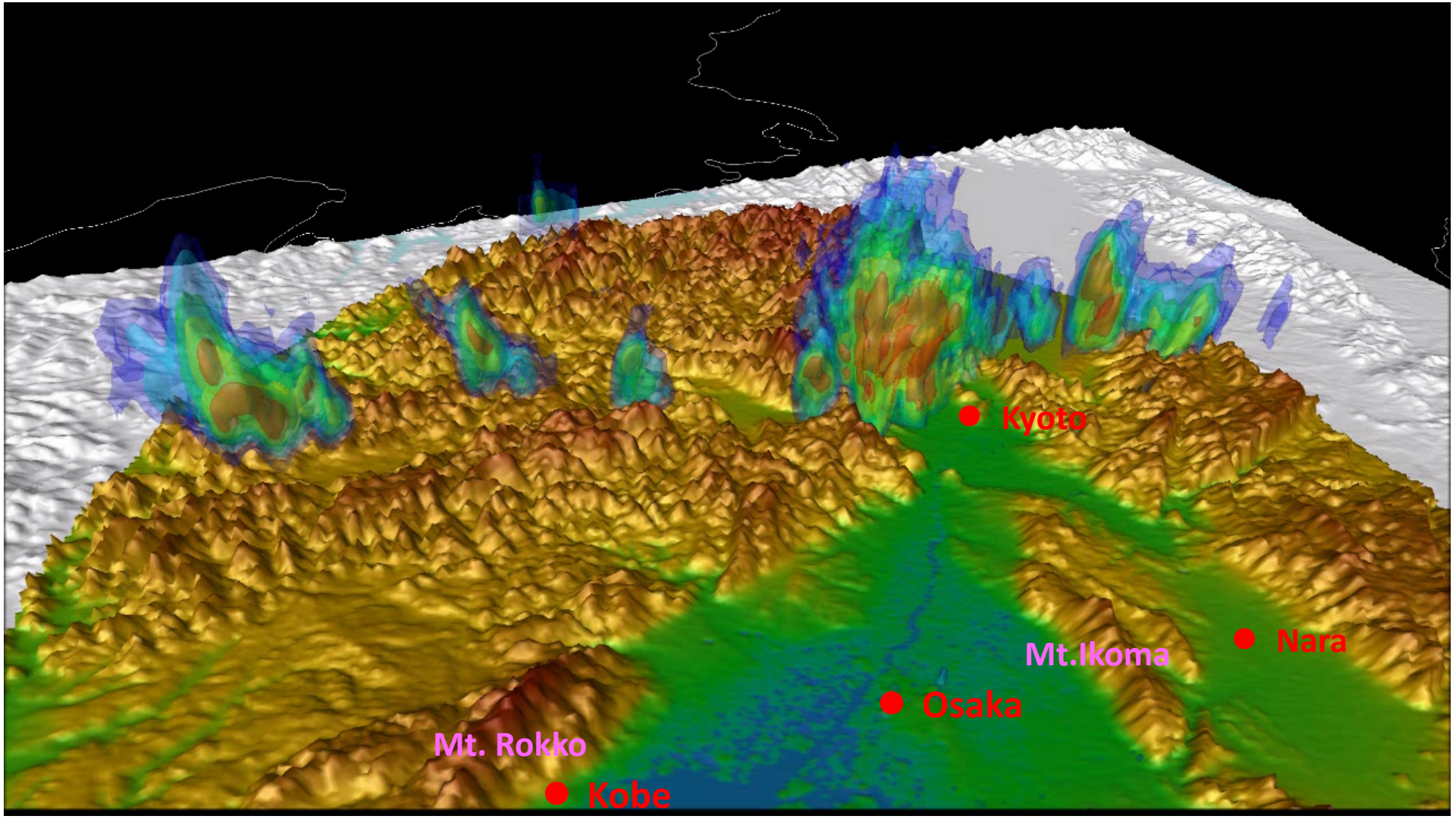
(July 26, 2012)



Observation range of the PAWR in Suita



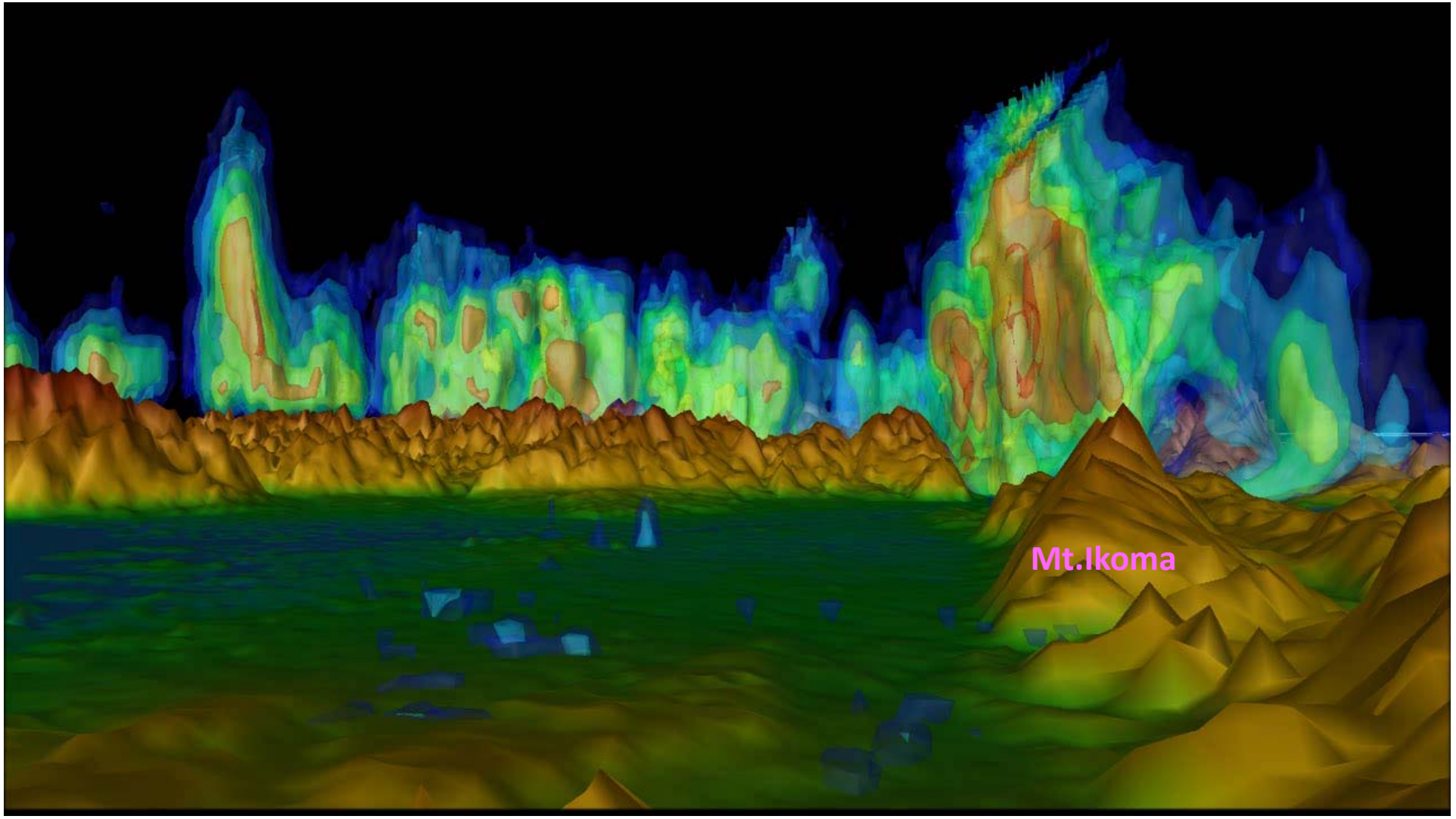
Rain band in the Baiu season (14:00-16:20, July 13, 2013)



3D rain distribution observed by PAWR from 14:00 to 16:20, July 13, 2013. Look-down view from upper Osaka-bay, 250m grid size, and 30 seconds time interval.

(10 fps → 300 times speed)

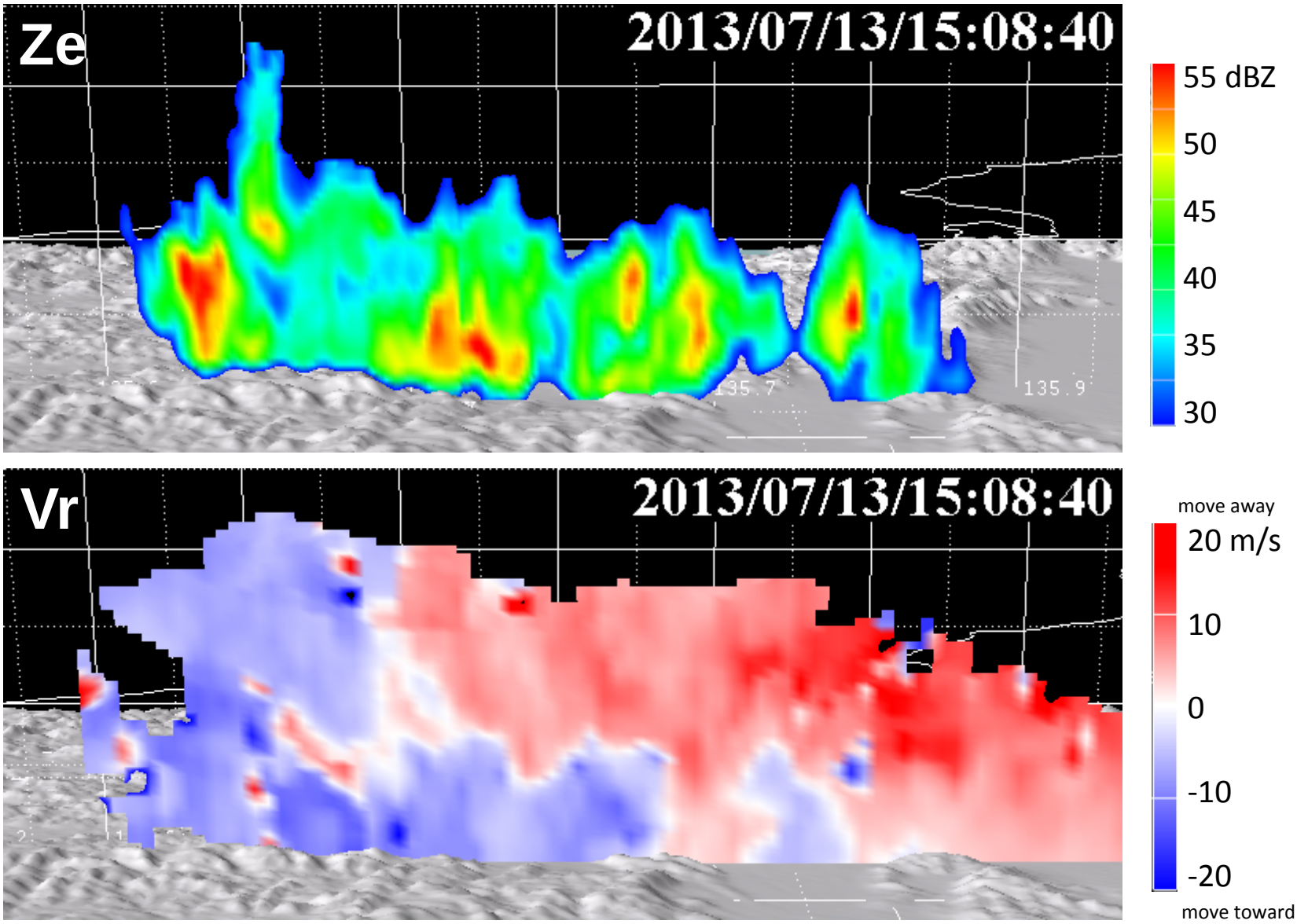
Another view of Rain band (15:20-16:20, July 13, 2013)



3D rain distribution from 15:20 to 16:20, July 13, 2013. Look-up view from the Osaka plain, double scale of topography height.

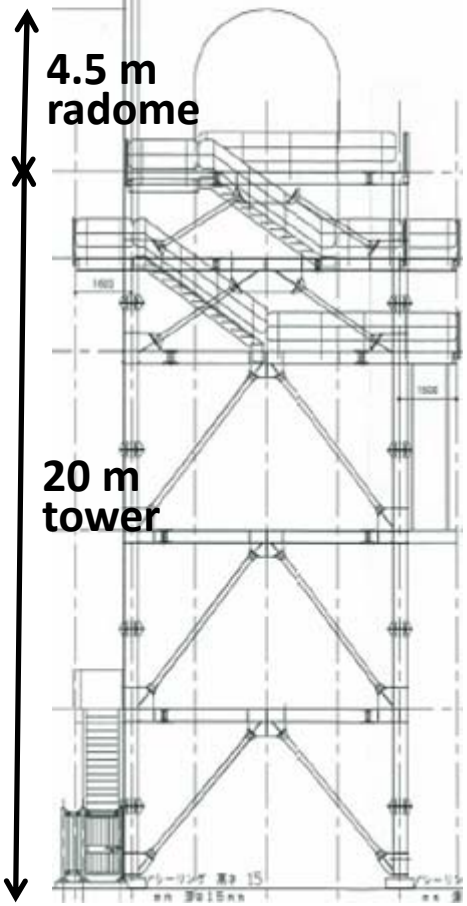
(10 fps → 300 times speed)

Reflectivity and Doppler vel. in a vertical slice



PANDA: Phased Array weather radar and Doppler Lidar Network fusion DAta system

@NICT advanced ICT Research Institute (Iwaoka-cho, Kobe)
@ NICT Okinawa Electromagnetic Technology Center (Onna-son)



PANDA sensor fusion system

Doppler lidar

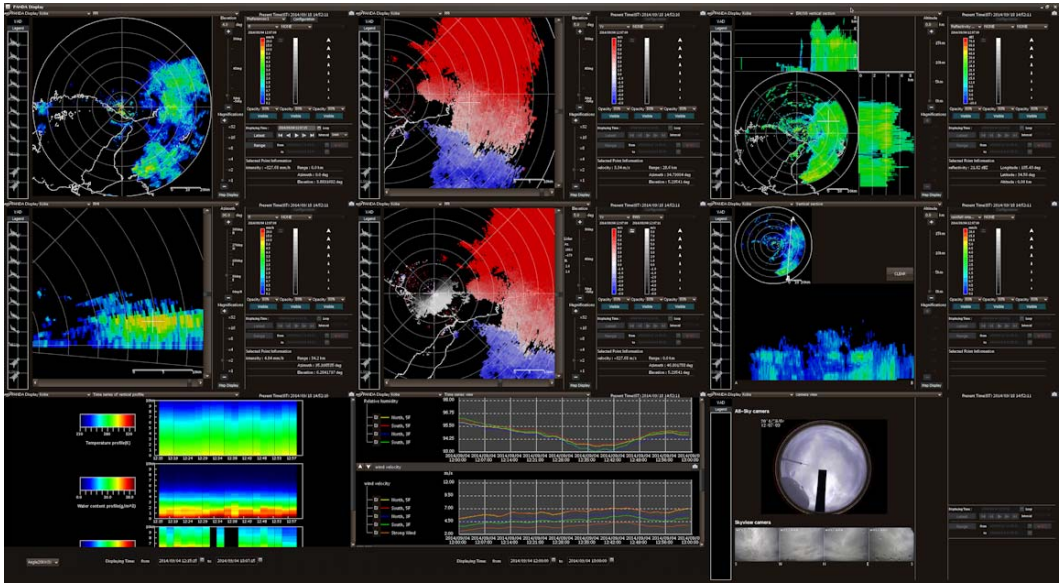
Microwave radiometer

Sky radiometer

Ultrasonic wind sensor
Thermo-hygrometer

Cloud watch-ing camera

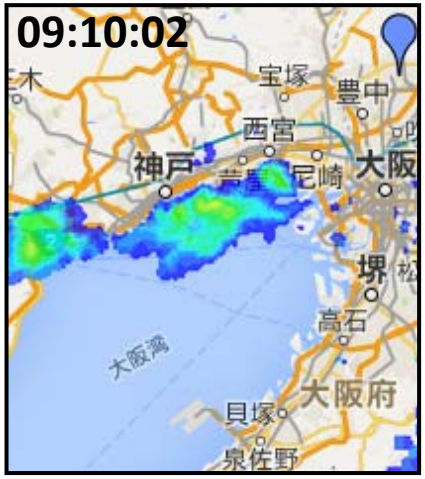
All-sky camera

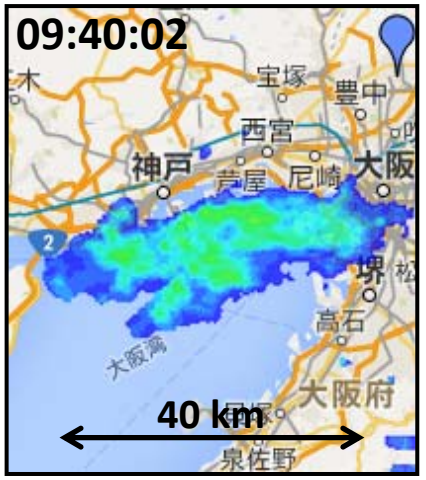


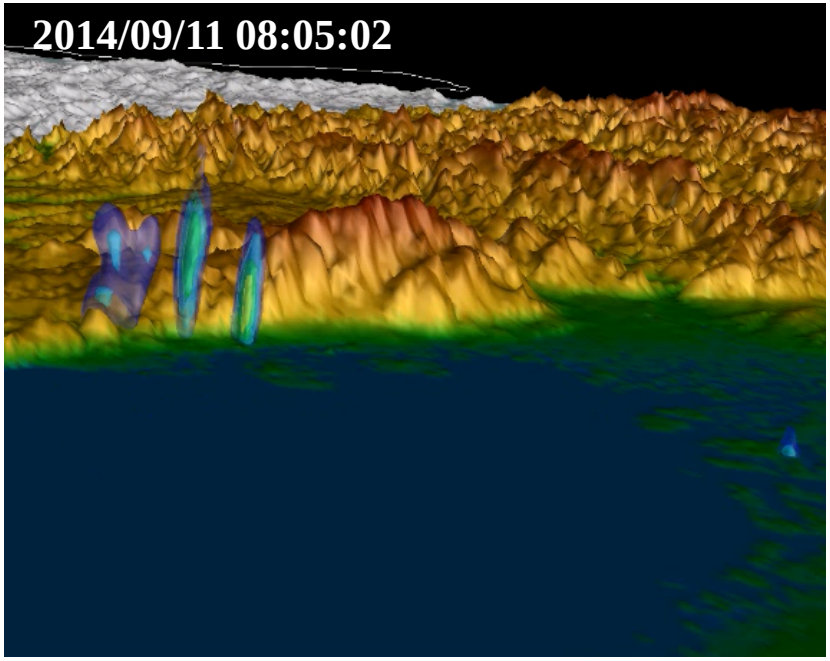
← Sensor fusion data visualized on a large screen (4K-REGZA) @NICT Koganei

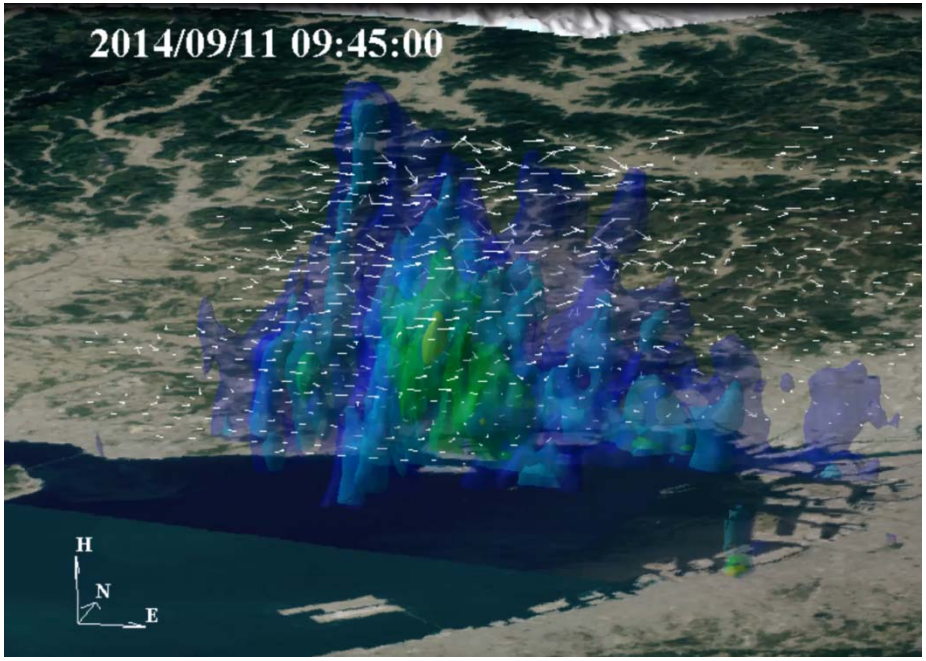
Observation range of Kobe & Suita PAWR

Developing convective cloud (18:00-10:00, Sep 11, 2014)

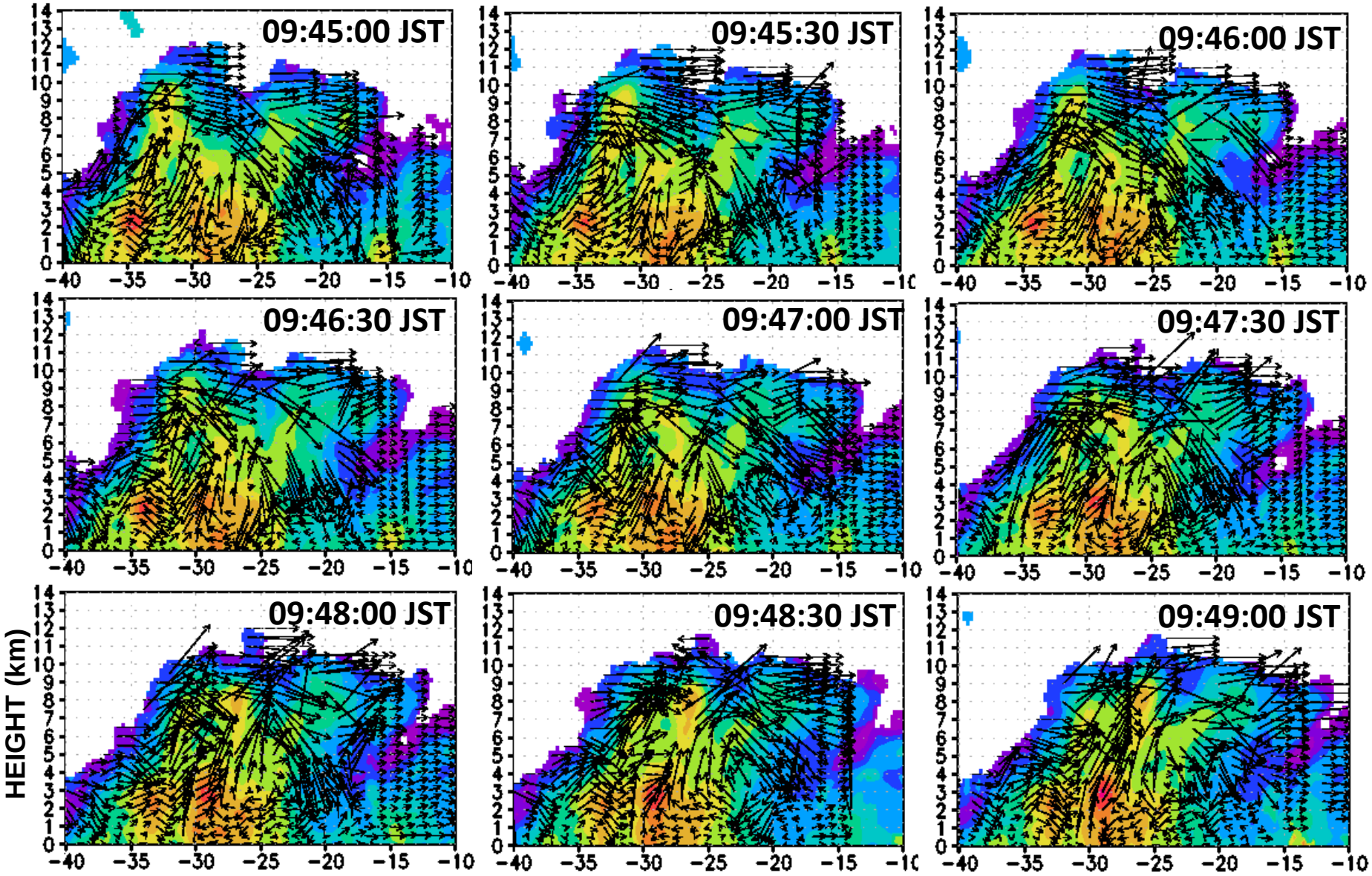




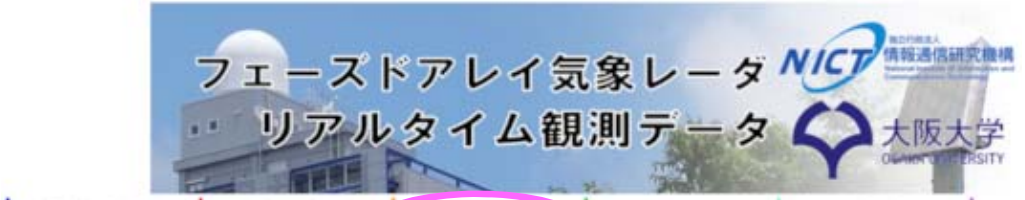




30 seconds dual-Doppler analysis (Sep 11, 2014)



PAWR Web Page（http://pawr.nict.go.jp/）



最新のデータ | 直近のデータ | 過去のデータ | PAWRについて | トピックス

雨の情報 | 雨と風の情報

最新の降雨分布

大阪大学吹田キャンパスに設置されたフェーズドアレイ気象レーダの観測をもとに、雨量情報(高度2kmのレーダ反射強度)の30秒ごとのリアルタイムクイックルックを表示しています。図は30秒ごとに自動更新されます。

ALT(km) 2.0

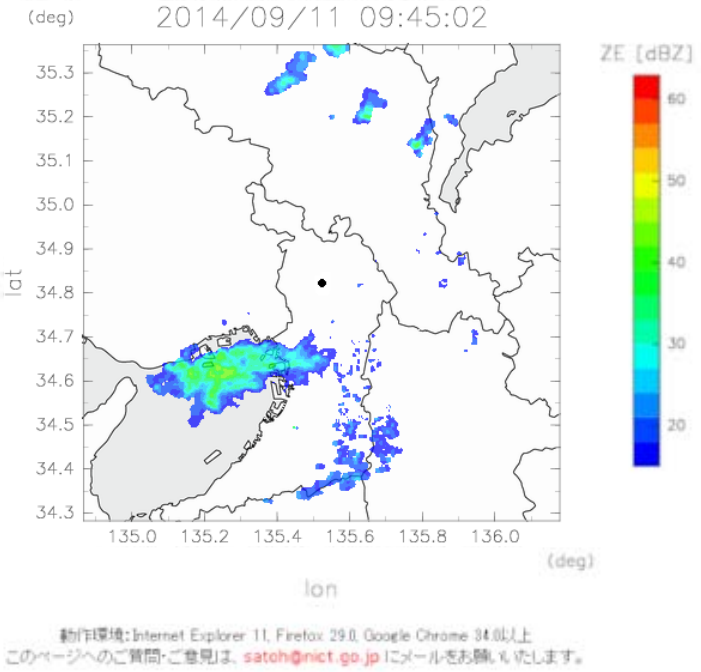
日付を指定

2013 年 5月

日	月	火	水	木	金	土
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

降雨量から指定

2014 年 03 月 表示

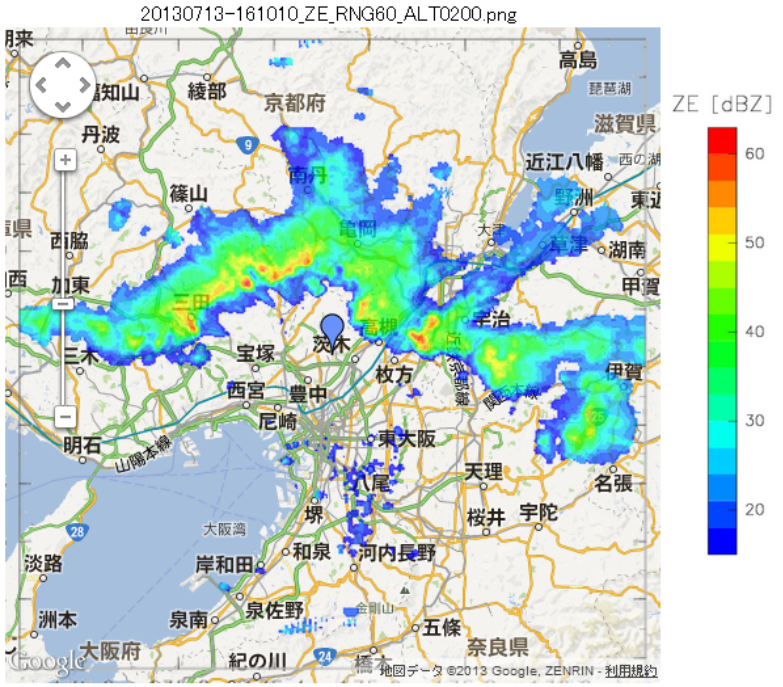


動作環境:Internet Explorer 11, Firefox 29.0, Google Chrome 34.0以上
このページへのご質問・ご意見は、satoh@nict.go.jp にメールをお願いいたします。

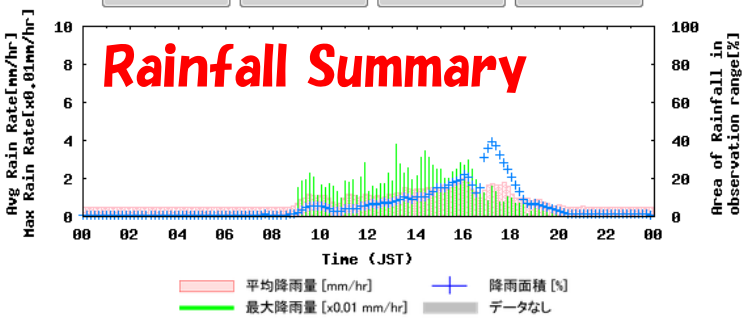
Retrieve archived past data

2013/07/13 16:10:10

Google maps display



-10 | prev | next | +10



降雨サマリー(グラフ)をクリックすると、その時刻の降雨分布を表示します。

Real time display（within 1 min of obs）

Summary and future work

- **The phased array weather radar (PAWR) measures 3-dim rainfall structure with high spatial-temporal resolution (100 m, 100 EL angles, 30 seconds).**
- **Three rainfall events observed by PAWR were introduced using 3D visualization images.**
  1) An isolated cumulonimbus (July 26, 2012)
  2) Rain band in the Baiu season (July 13, 2013)
  3) Developing convective cloud (Sep 11, 2014)
- **For the study of radar data assimilation:**
  1) data quality control (to cancel noise/clutter data, to estimate error variance in the observation)
  2) effective preprocessing (dual-Doppler analysis?)
  3) real-time data distribution