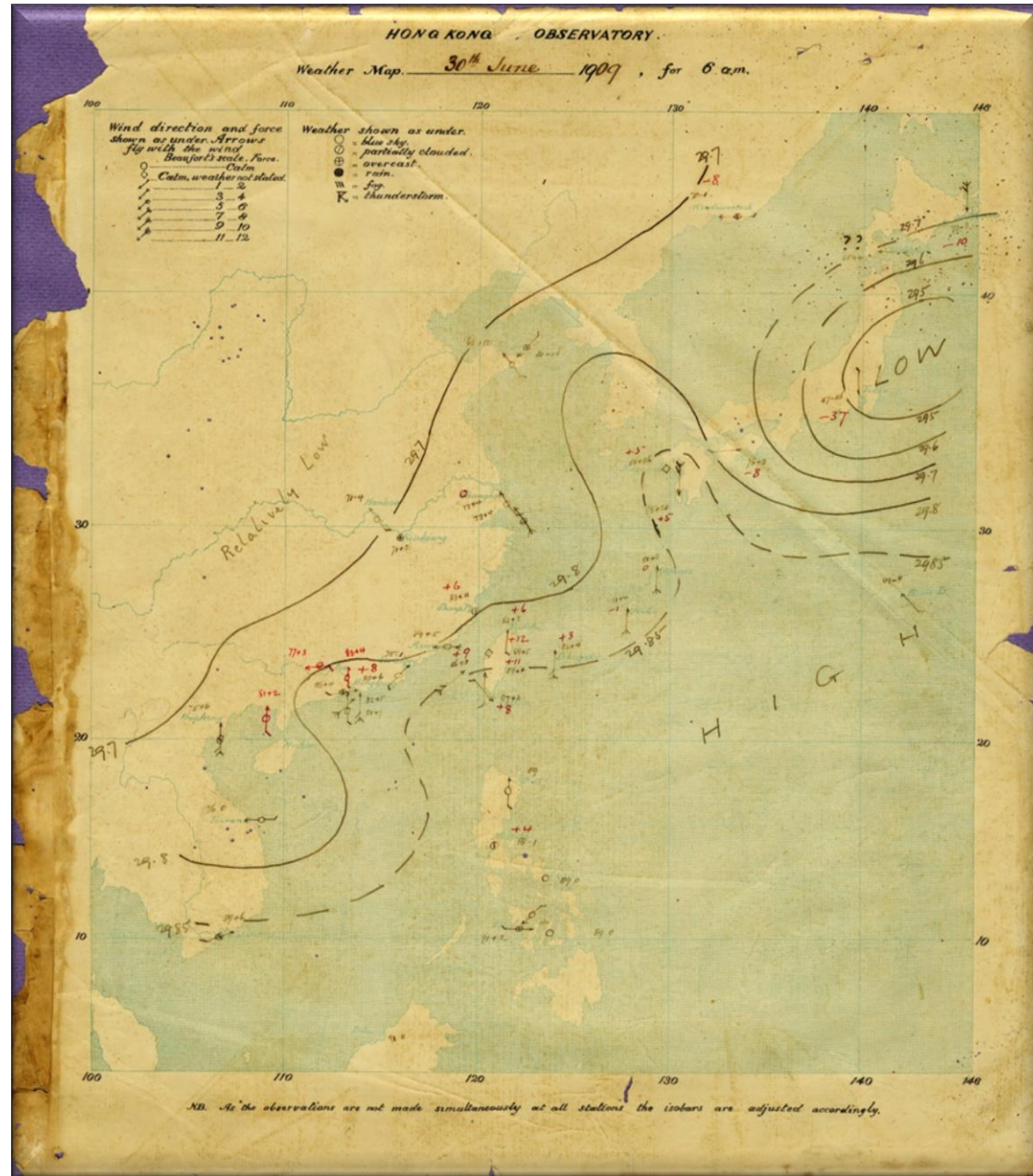


Era of big data and crowdsourcing

- Volume of data exploding
- Variety of data increasing
- Possibility of soliciting additional data from public through crowdsourcing
- Problem of information overflow
- Both challenge and opportunity in receiving, processing and using big and crowdsourced data
- Ride on new technologies to reap the full benefit of big data and crowdsourcing for DRR

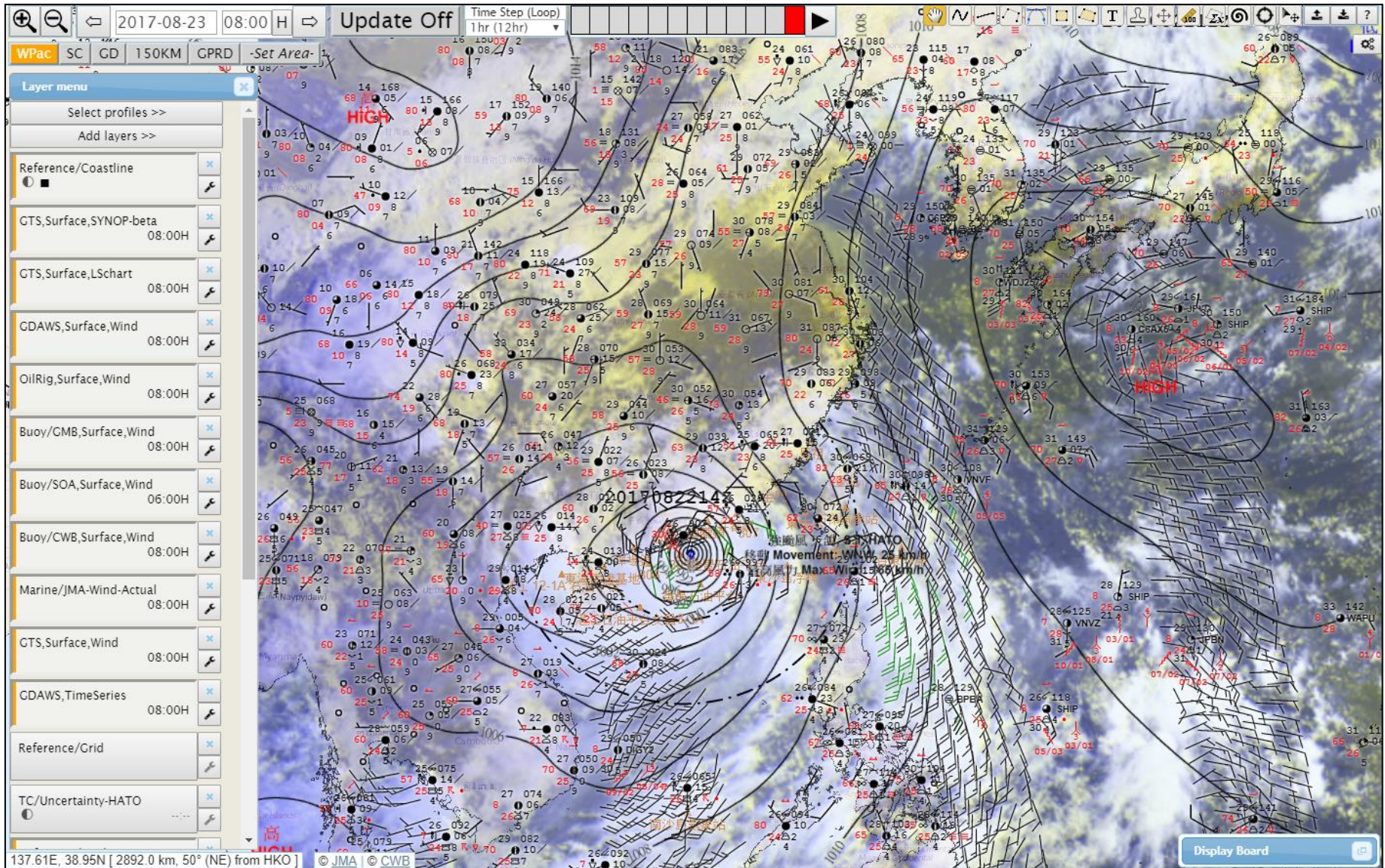
Meteorological Data - THEN

- The Hong Kong Observatory (HKO) making regular meteorological measurement for over 130 years since 1883
- Observations in early days confined mostly to coastal region

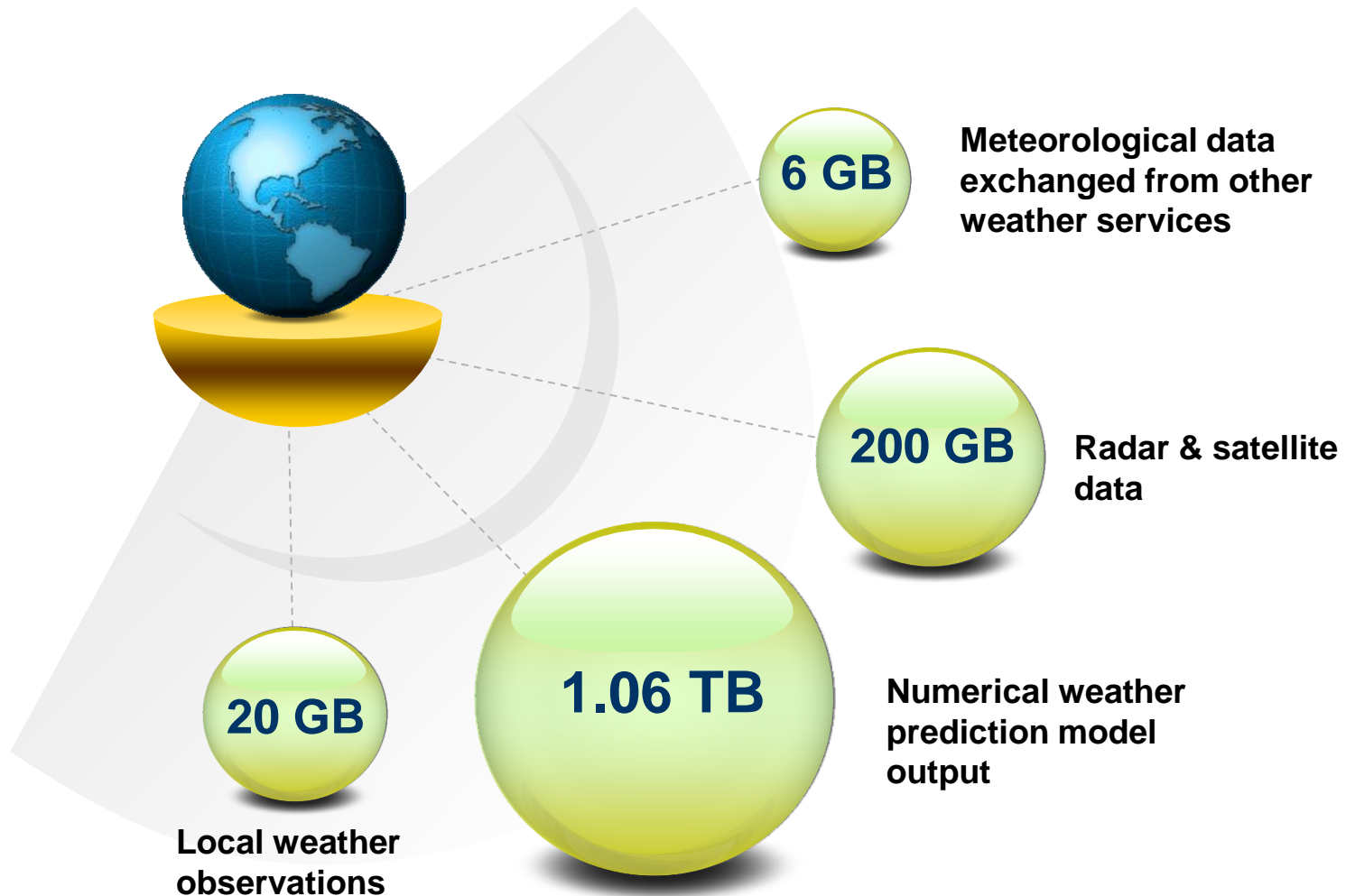


Weather map in 1909 →

Meteorological Data - NOW



BIG DATA at Hong Kong Observatory



- Daily total ~ **1,300,000,000,000 bytes** (1.3 TB)

Key Challenges

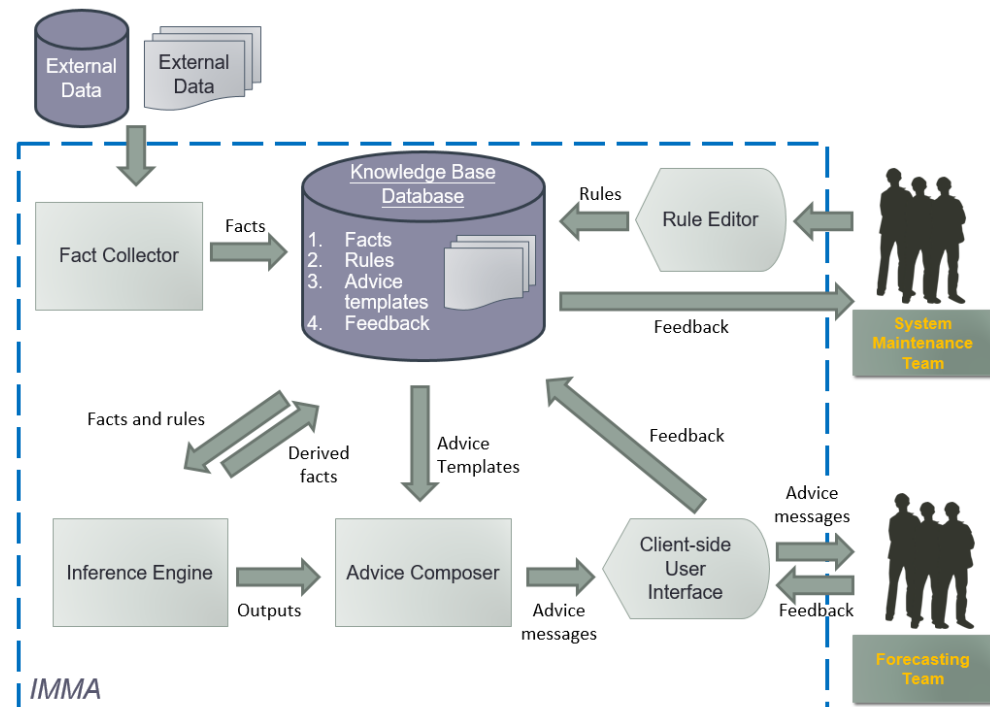


- Enormous **growth** of meteorological big data
 - Forecasters overwhelmed by the sea of weather data
- Emergence of **crowdsourced** weather data
 - Weather observations shared by public
 - Unstructured format with varying quality
- Emergence of **social media**
 - Spread of photos, videos, views & rumours (!)
- Weather information becoming a **commodity**
 - Free weather observations/forecasts from websites, smartphones, TV
 - People not only asking for what the weather will be like but what it will do to them (impact)

Turning Challenges into Opportunities
- Big Data Applications in HKO

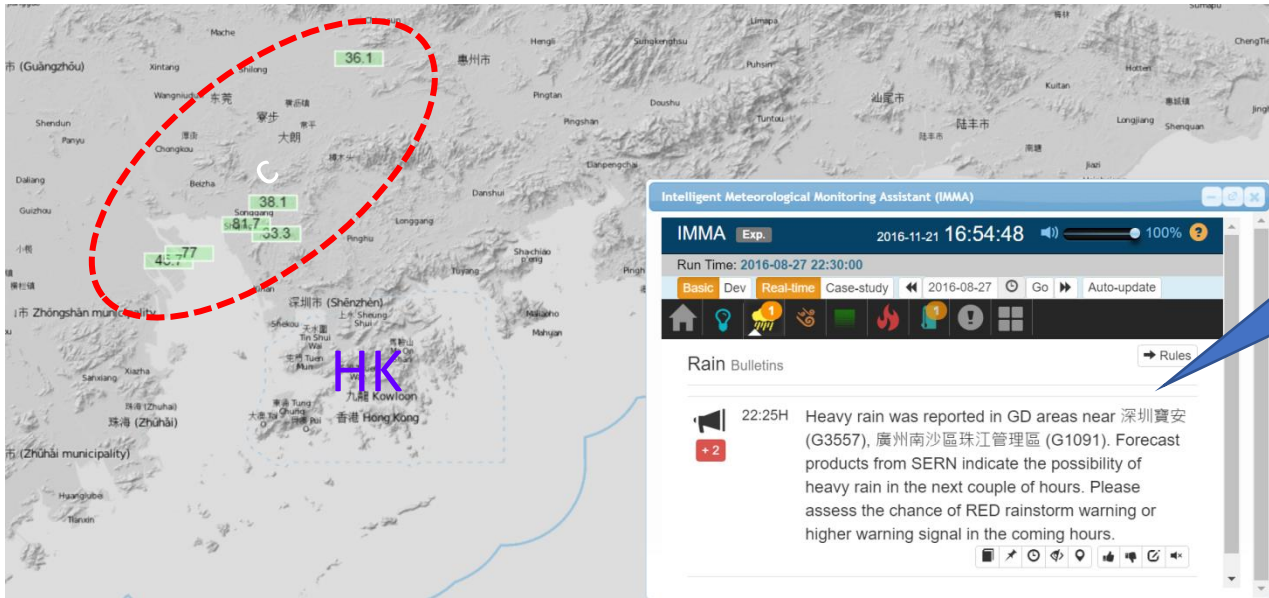
Weather Monitoring using Expert System

- **Intelligent Meteorological Monitoring Assistant (IMMA)** to support weather analysis and monitoring
- Automatic processing : turning weather **data into intelligence** for forecaster

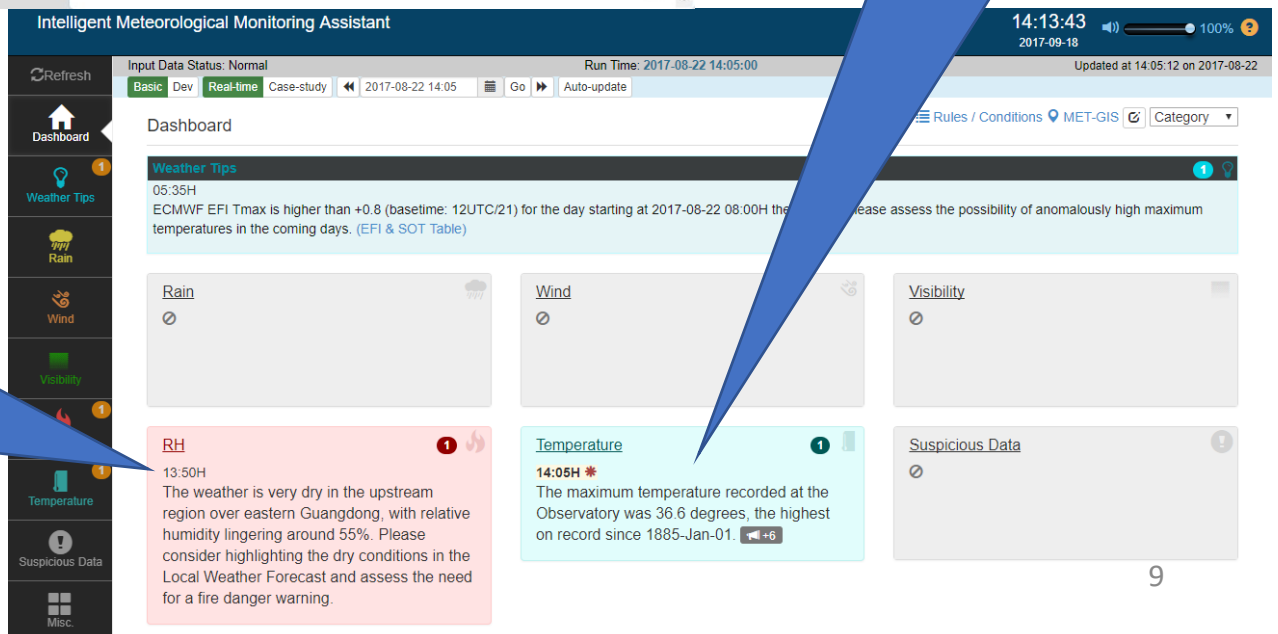


Sample Advice from IMMA

“Heavy rain reported in Guangdong, rainfall nowcast system also suggested possible heavy rain shortly. Please consider the need for a RED Rainstorm Warning”



“Historical record of maximum temperature at HKO just broken”



“Relative humidity dropped to a rather low level in upstream region, please consider the need for a Fire Danger Warning”

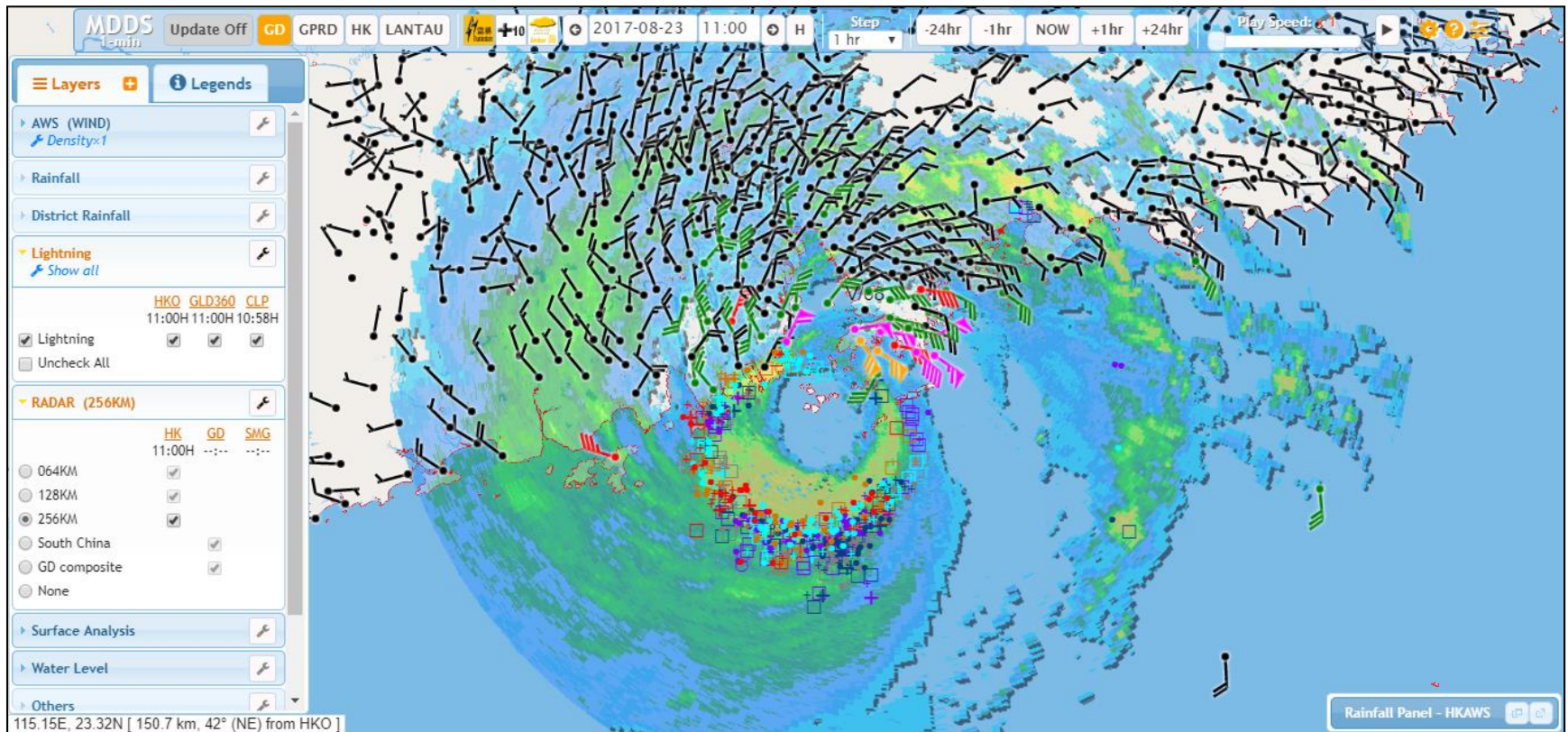
Major Capabilities of IMMA

- Provide alert of **severe weather** in neighbouring areas
- Detect **record-breaking** events in Hong Kong
- Provide alert of **emerging weather conditions** that may be inconsistent with forecast / warnings in effect (e.g. high winds from cyclones but no tropical cyclone warning signal)
- Enhance situational awareness

- Performance of IMMA
 - **530,000+** data points processed every minute
 - **7-8 seconds** to perform cycle run once every 5 minutes
 - 300+ conditions in support of **~250** production rules for advice generation


Integrated Data Display

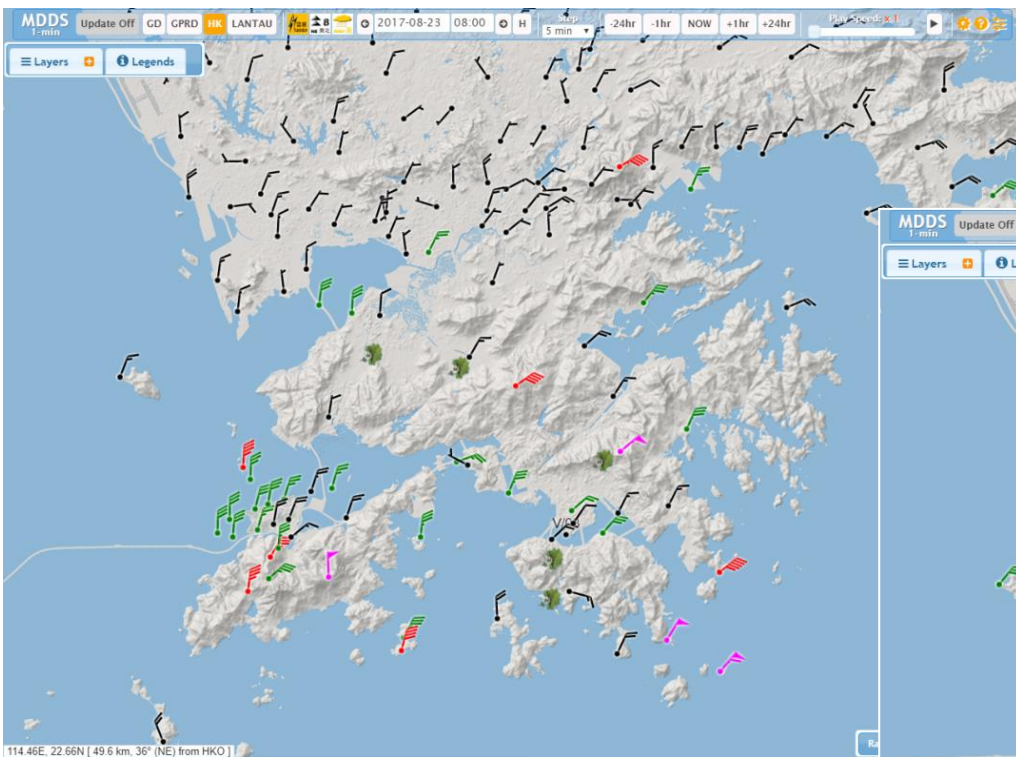
- Challenges: Multi-hazard impacts, including those associated with high winds, storm surge, rainstorm, landslide, flooding and thunderstorm.
- Opportunities: Monitoring and analysis with Big Data (weather, geophysical, traffic, damage assessment report and etc.)



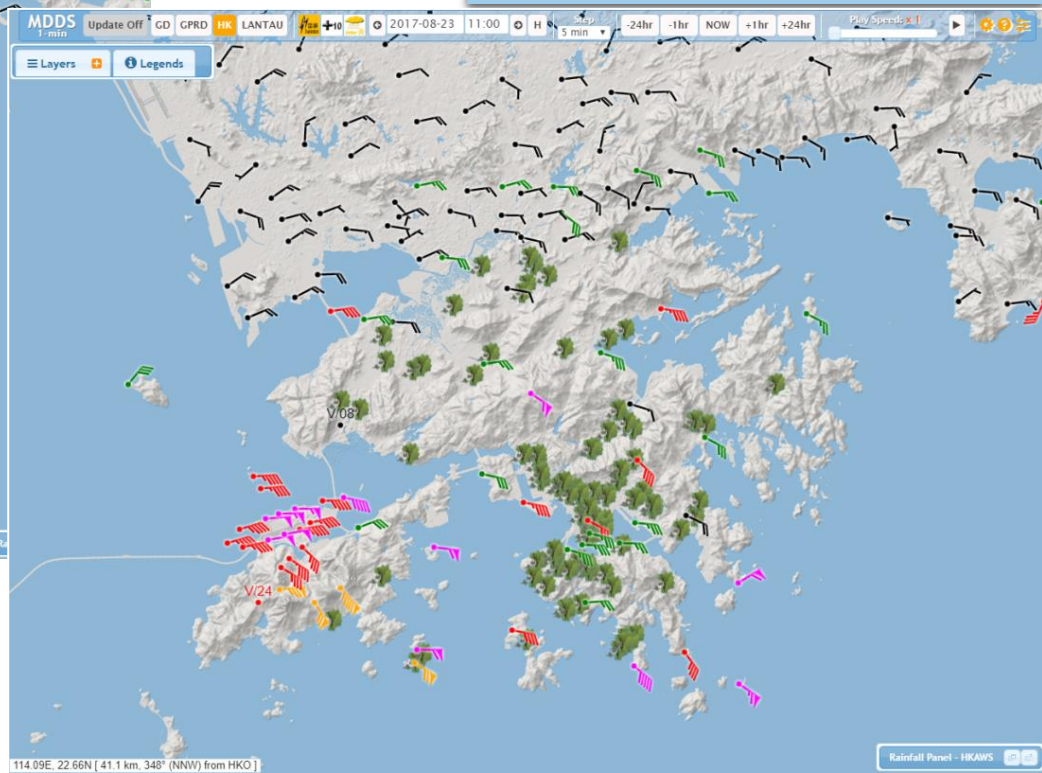
High winds and lightning associated with Hato

Hato brought damaging winds to Hong Kong

- 2017-08-23 integrated display of winds, topography and fallen trees () can clearly depict the combined effects of wind force & direction, and sheltering.




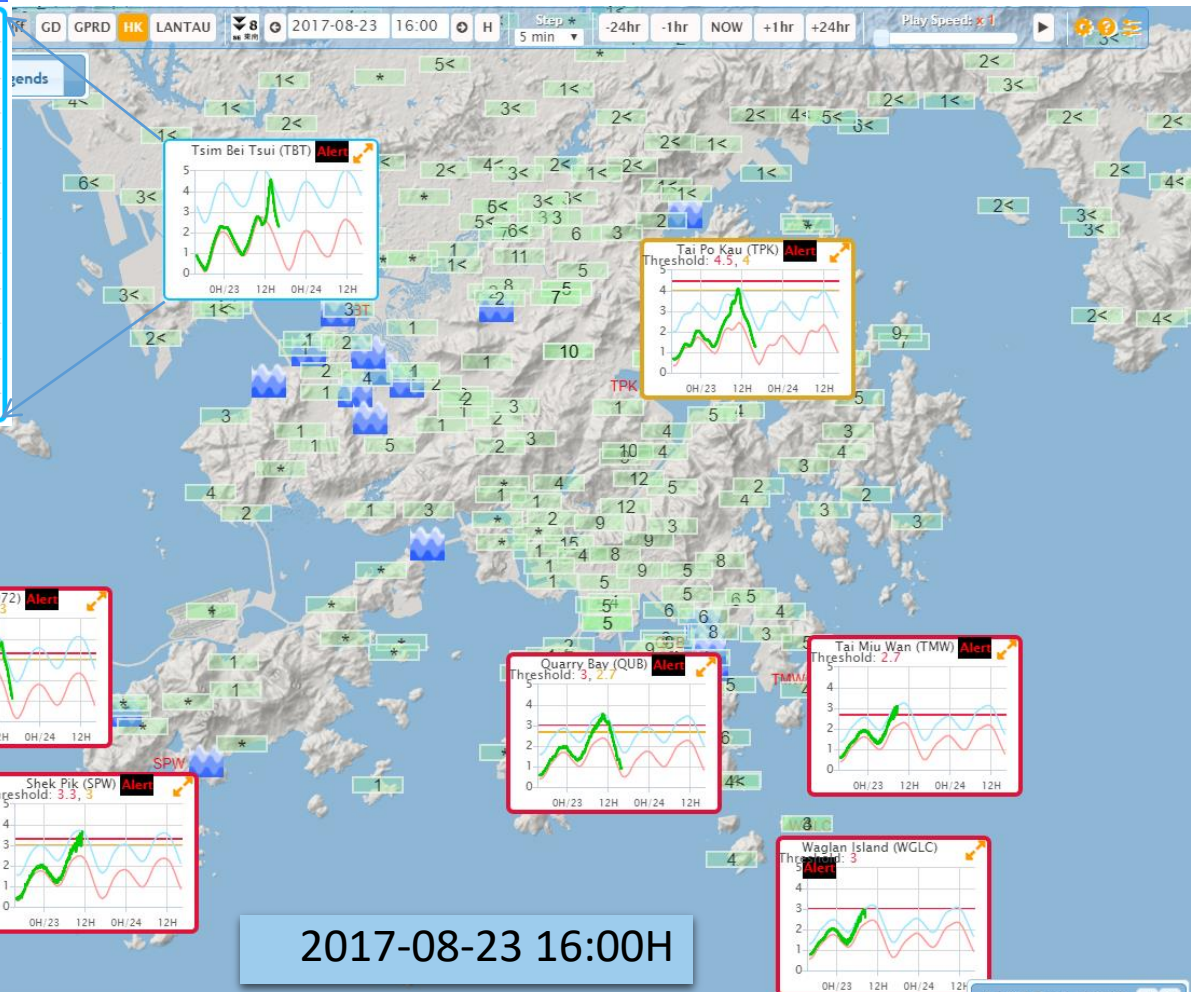
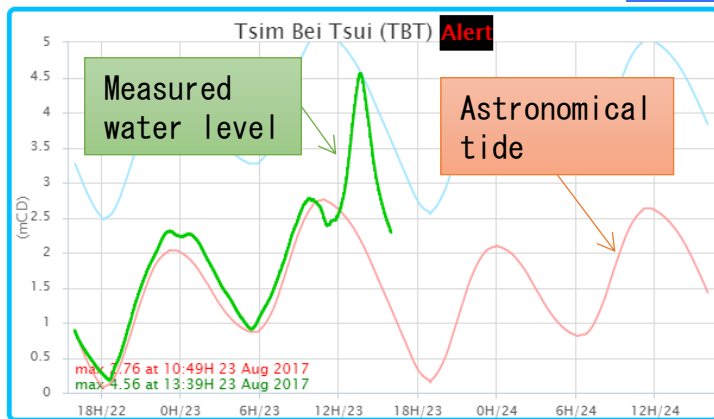
Up to 11H :
101 reports of fallen trees



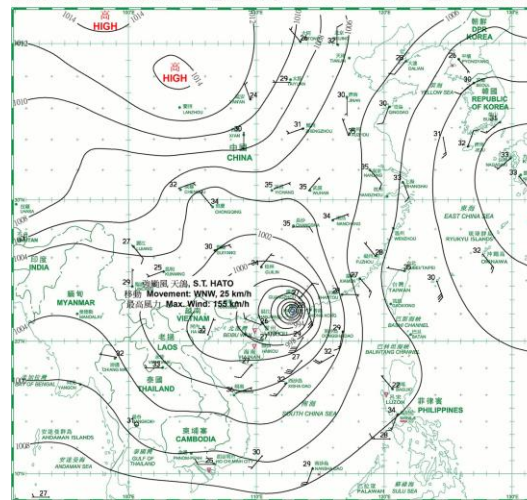
Up to 08H :
5 reports of fallen trees

Storm Surge induced by Hato

- The storm surge brought by Hato raised the water level in Hong Kong generally by about one to two metres. Coinciding with the high water of the astronomical tide, the aggregated effect resulted in unusually high water level and serious flooding () in many low-lying areas of Hong Kong.



日期/Date: 23.08.2017 香港時間/HK Time: 14:00 香港天文台 H



114.46E, 22.60N [43.6 km, 41° (NE) from HKO]

Crowdsourced Weather Data

- Community Weather Information Network (Co-WIN)
- Established in 2007 to collect crowdsourced weather data in collaboration with local universities
- Schools & community groups operate AWSs at own premises to make observations on temperature, humidity, wind, pressure, rainfall, solar radiation, etc.
- Data uploaded in real-time to Co-WIN website
- 160+ member organizations



Crowdsourced Weather Data

- Effort further expanded to engage general public in 2011 via the **Community Weather Observing Scheme (CWOS)**
- Allow sharing of weather observations, photos, videos made conveniently using smartphones
- **90,000+** contributions collected so far

Community Weather Observing Scheme (CWOS) facebook

Community Weather Observing Scheme (CWOS) 社區天氣觀測計劃

其他人張貼了 767 張照片 查看全部

相簿 顯示全部

 <p>動態時報相片 3338張相片</p>	 <p>手機上傳 530張相片</p>	 <p>31/10/2016 第二批獲得國際雲圖(ICA)專家挑選人... 135張相片</p>	 <p>未命名的相簿 114張相片</p>
---	--	---	--

COMMUNITY WEATHER OBSERVING SCHEME
社區天氣觀測計劃

Home Map View Weather Observations Upload Weather Tips iCWeatherOS About Us Links

Henry Wong

iCWeatherOS
Install iCWeatherOS and create your stylish personal weather reports now!

Weather Tips

Featured Photos

Newly Uploaded Photos (Advanced Users)

<http://co-win.org/index.php/en/>

**Embracing the Big Data Era
- Projects in the Pipeline**

Presence on Social Media

- Widespread of **rumour via social media** on timing of tropical cyclone signals during Super Typhoon Haima in Oct 2016
- Comments/Shares/Facebook reaction emojis close to **170,000**

謠言止於智者

星期四, 2016年10月20日

[流動版]

謠言止於智者

很多時候當有熱帶氣旋將會影響香港，及有機會帶來較大威脅的時候，在網上討論區或手機社交平台便會傳出一些關於風球，尤其是八號或更高信號的消息，當中言之鑿鑿，甚至列出仔細的時間，有些更訛稱是天文台特別為一些行業所作的預測。我想和大家說清楚，天文台並沒有為任何行業或界別作出這般詳細的風球時間評估，這類信息純屬虛構。

謠言止於智者，請大家不要相信或散播這些謠言。當分享信息時，請先確認來源是否真的可靠。有關所有最新風暴消息，請密切留意天文台的公佈。

李立信

- HKO responded by issuing a blog on its website to quickly **stop further spreading of the rumour on tropical cyclone**
- Plan to inaugurate official **Facebook & Instagram** for better public communication & crisis management
- Active analysis of social media messages and sentiment to be pursued

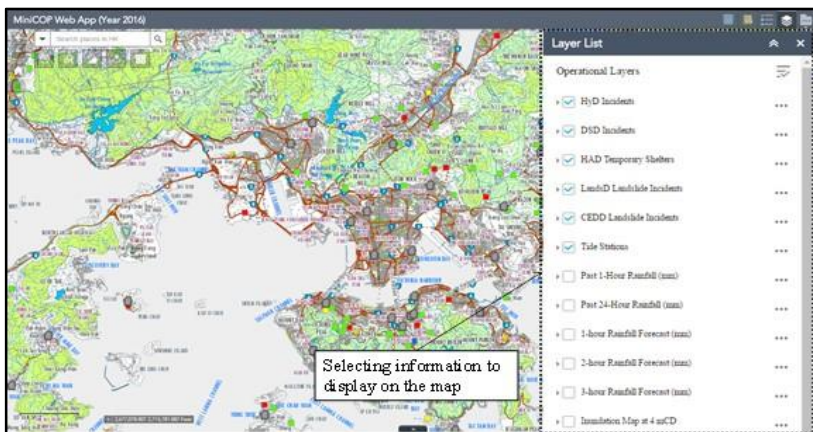
COMMON OPERATIONAL PICTURE (COP)

The Civil Engineering and Development Department (CEDD), a department of the Hong Kong Government, is developing a 'Common Operational Picture (COP)' which

- provides a new **map-based** common IT platform with Geographic Information System (GIS) functions for sharing real-time **emergency and impact information** such as landslides, flooding and major road incidents handled by various departments; and
- incorporates related information such as weather information and status of temporary shelters to provide a comprehensive platform for **emergency responses**.

Benefits of Using COP

- enhancing the **common situational awareness** of the **emergency managers** in relevant bureaux and departments and facilitate them to make effective, consistent and timely decisions and mobilize resources.
- facilitating **emergency information sharing** and support mechanism for dealing with multiple hazards.
- strengthening coordination and enhancing the planning and responsiveness to emergency situations in a holistic manner.
- enabling frontline staff and emergency managers to view the **emergency information anytime and anywhere** via desktop workstation and mobile devices.



Concluding Remarks

- Emergence of Big Data presents both **challenges** and **opportunities** to HKO.
- Innovative use of Big Data, including both meteorological and non-meteorological data, offers **huge potential** in enhancing weather services and “Emergency Preparedness and Response” of government departments, stakeholders and the general public.
- Future efforts in developing **impact-based** weather forecasts will increasingly rely on Big Data technologies.



(Photo courtesy : DSD and CEDD)



HONG KONG OBSERVATORY

Thank you