



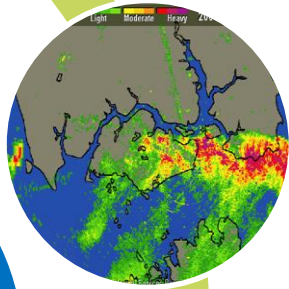
**METEOROLOGICAL
SERVICE
SINGAPORE**

Singapore Country Report

By Leona Lim
Meteorologist



Overview of Meteorological Service Singapore



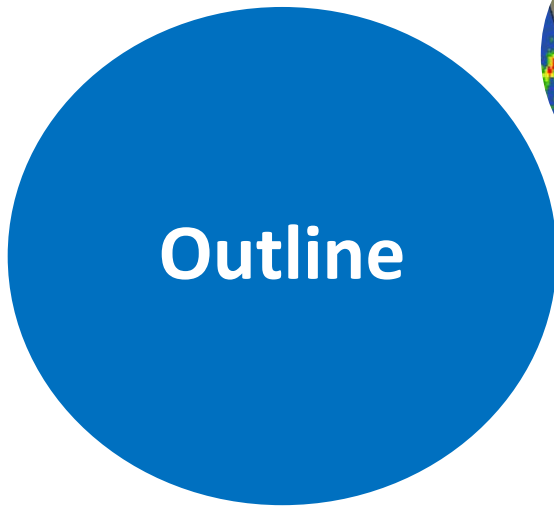
Weather and Climate of Singapore



Past Dry Weather Events

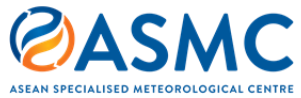


Cloud Seeding Efforts



Overview of Meteorological Service Singapore

Hosts the



Weather Services Department (WSD)

Meteorological Systems Department (MSD)

Centre for Climate Research Singapore (CCRS)

Risk & Resource Department (RRD)

OPERATIONS

RESEARCH & DEV'T

Our MISSION

MISSION

To observe and understand the weather and climate affecting Singapore and to provide services in support of national needs and international co-operation.

The key areas within the mission include:

- Collecting and maintaining of reliable long-term national weather records
- Providing reliable weather and climate services
- Conducting high quality research to advance understanding and prediction of the weather and climate of Singapore and the region
- Performing risk and impact assessment of natural environmental hazards

Key Weather Services

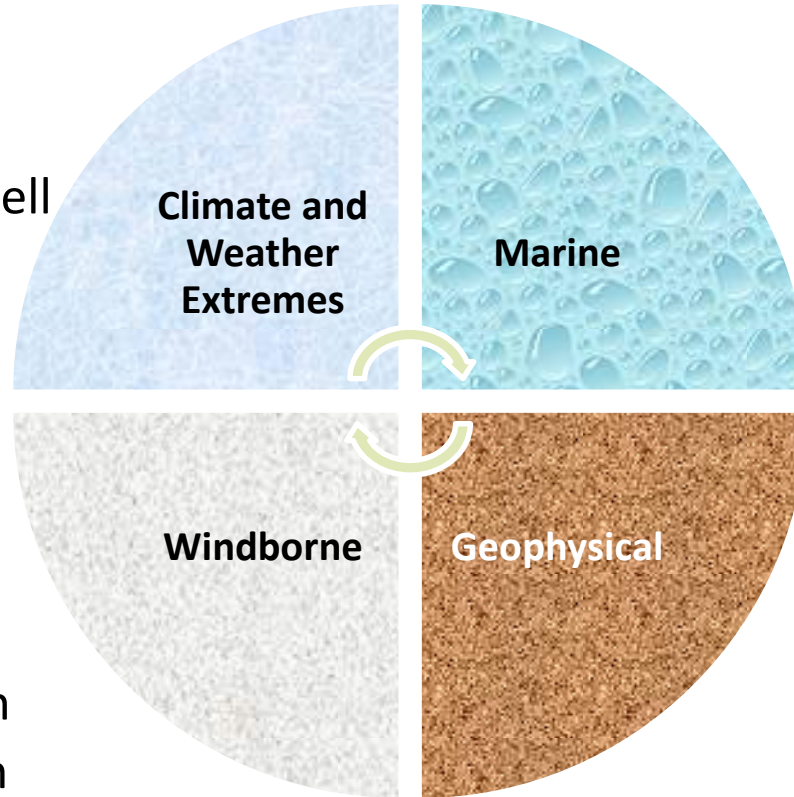
Our services serve a wide spectrum of users/customers and sectors who rely on **time-critical meteorological forecasts and information** to make important decisions in operations and planning

- **Weather Forecast and Warning Services**
- **Monitoring and Early Warning Of Multi-Hazards**
- **Climate Information Services**



Multi-Hazard Warnings/Advisories

- Lightning
- Wind gusts
- Heavy rainfall
- Prolonged dry spell
- Prolonged high temperatures



- Storm surge
- High waves

- Volcanic Ash
- Air pollution

- Earthquakes /
Tsunami
- Volcanic eruptions

Centre for Climate Research Singapore

MISSION

To advance scientific understanding of **tropical climate variability and change** and its associated weather systems **affecting Singapore and the wider Southeast Asia region**, so that the knowledge and expertise can **benefit decision makers and the community**.

Climate
Projections

Subseasonal
and Seasonal
Predictions

Numerical
Weather
Prediction

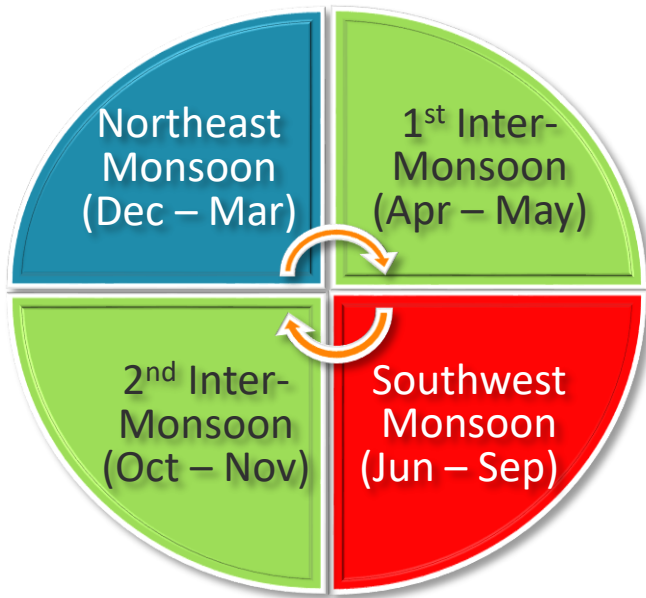
Applied
Modelling

Climatology &
Climate
Studies

Weather and Climate of Singapore

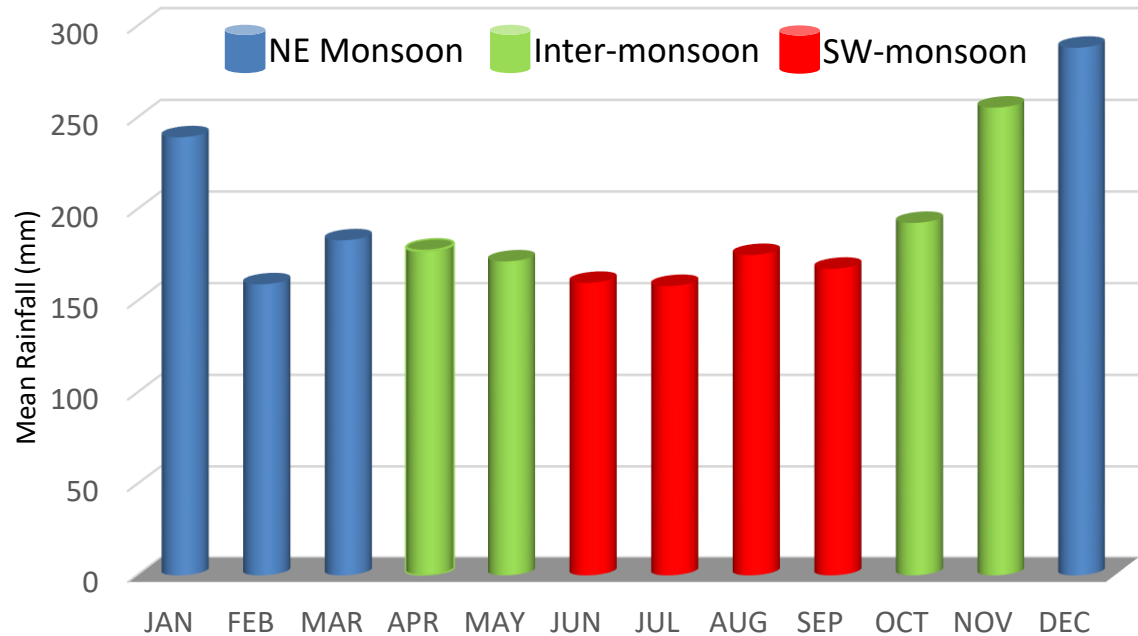


Climate of Singapore

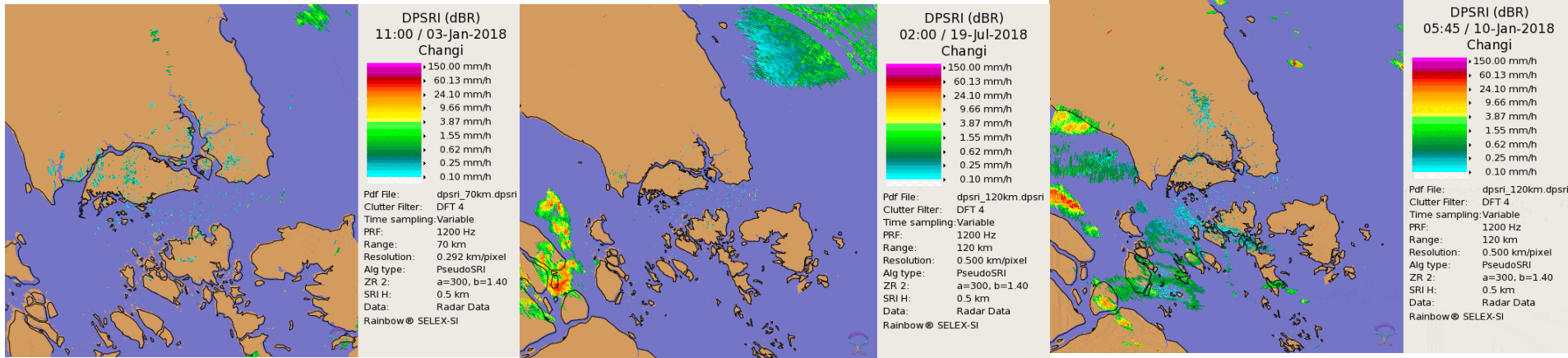


Weather throughout the year is dominated by monsoons

Rainfall Distribution



Main Weather Systems



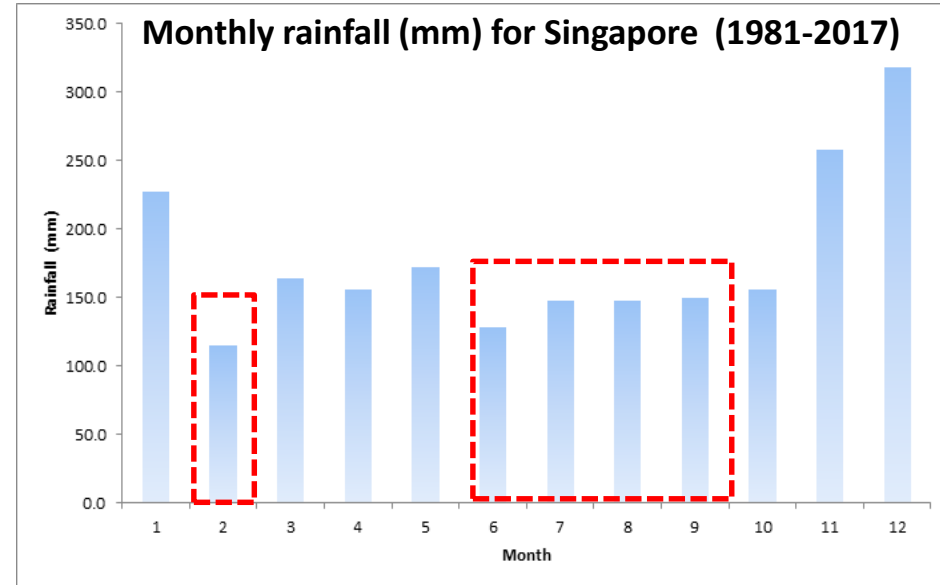
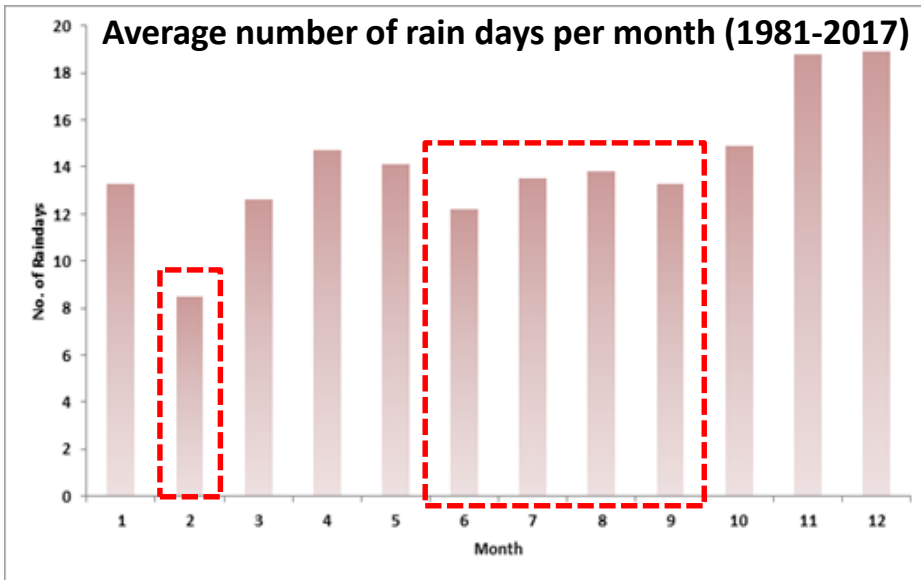
**Localized convective
thunderstorms**

**"Sumatra"
squalls**

**Monsoon
surges**

- Convective-scale thunderstorms characterized by rapid development, short-life span and localized in extent
- Challenging to give precise forecasts of onset, location and intensity

Drier Periods in Singapore

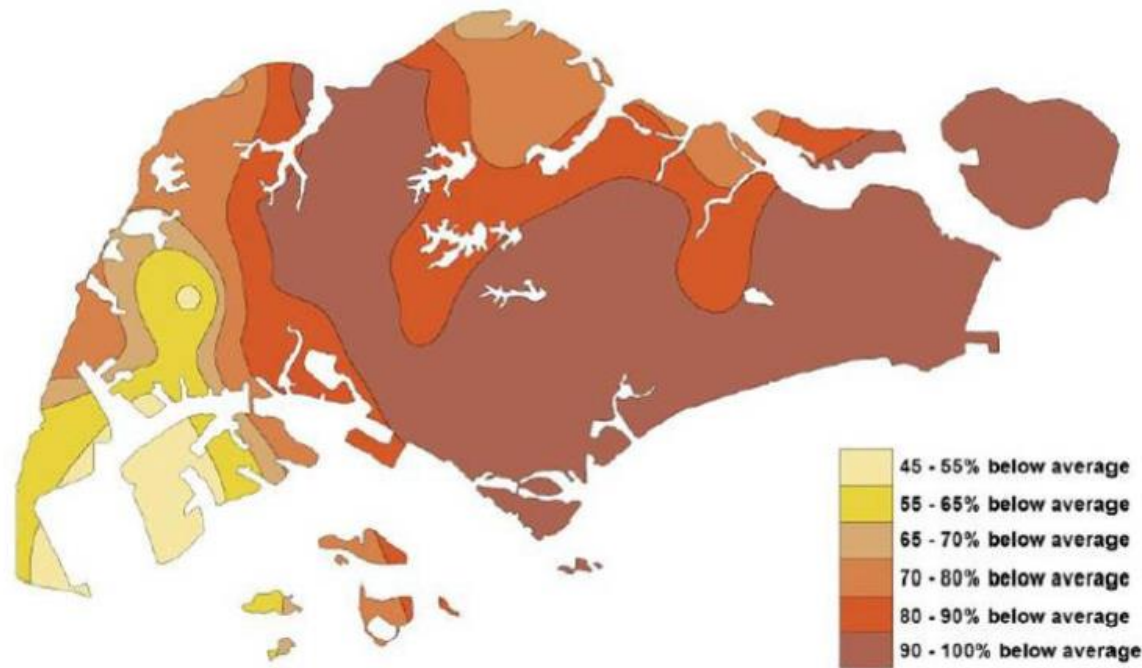


- High average annual rainfall of 2165.9mm
- Short dry spells do occur but prolonged dry periods are quite rare

Prolonged Dry Weather Events in Singapore

- 2 Dry spells from 13 January to 15 March 2014 – longest dry spell* in Singapore since 1929
 - 26 days and 27 days respectively
- Our climate station recorded 0.2mm rainfall total in February 2014

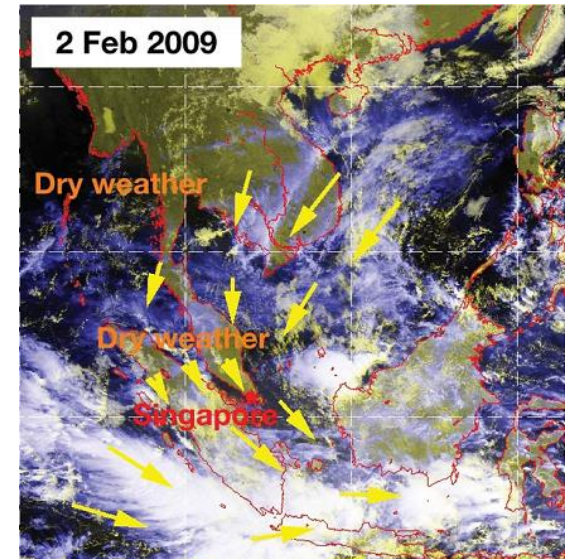
RAINFALL DISTRIBUTION 1 - 28 FEBRUARY 2014



*Dry spell – at least 15 consecutive days with daily rainfall total < 1mm averaged over rainfall stations

Prolonged Dry Weather Events in Singapore

- Other prolonged dry spell events in the last 30 years occurred during
 - the dry phase of the Northeast Monsoon season
 - 16 days in 2009
 - 21 days in 2004
 - the SW Monsoon season (Jun – Sep)
 - drier period of the year in Singapore
 - 3 Dry spell periods not exceeding 15 days



Dry weather conditions persisted over Singapore for several weeks in early 2009

Cloud Seeding Efforts

The background features several overlapping, curved, 3D-style shapes. A prominent yellow shape is in the upper right, with a light green shape overlapping it from above and a light blue shape overlapping it from below. The overall aesthetic is clean and modern.

Cloud Seeding Efforts in Singapore

- Dry weather conditions in 1963
 - Expertise from Australia were sought to conduct cloud seeding
 - Seeding using silver iodide performed over a period of 7 days in July 1963

Newspaper article of the cloud seeding effort in Singapore conducted in 1963

- Results
 - Rain followed on most occasions with only fraction of rain over catchment areas
 - Results were not conclusive

But until late this evening, officials – and even Mr. Smith himself – could not tell whether the downpour was the result of “Operation Rainmaking.” We don’t know whether it was caused by seeding. No one can differentiate between artificial and natural rain.

The rainmaker's riddle
Was downpour
caused by
cloud-seeding?

SINGAPORE, Friday.
AUSTRALIAN rainmaker Mr. E.J. Smith got into the specially-equipped Dakota and took off early this morning, when he spotted clouds which looked suitable for seeding.

Two clouds moving in the direction of the catchment areas between Johore and Tengah were injected with sodium and silver iodide between 6.55 a.m. and 7.10 a.m.

Shortly after rain fell.

But until late this evening, officials—and even Mr. Smith himself—could not tell whether the downpour was the result of “Operation Rainmaking.”

Mr. Smith said: “We don’t know whether it was caused by seeding. No-one can differentiate between artificial and natural rain.”

The Public Utilities Board announced: “Rain fell from the cloud that was seeded, but owing to poor visibility it was not possible to see where the rain fell or how heavy it was.”

More bids

Today's attempt followed four weeks of hopeful waiting and four postponed take-offs since Mr. Smith, a rain-making specialist, came to Singapore.

The principal research officer of the Commonwealth Scientific Industrial Research Organisation in Australia, Mr. Smith is here under the Colombo Plan to advise the Public Utilities Board.

Mr. Smith will make further attempts at cloud-seeding tomorrow morning.

No rain fell in Tebrau yesterday. Negligible rain fell in Singapore at MacRitchie.

Our Interests

- Latest rain enhancement techniques
- Weather modification as a possible relief measure
- Rain suppression techniques





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SERVICE
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