

Analysis on the Multiscale Situations of Flood Disaster Involved in the Tropical Disturbance of 91W in 2026 for Early Warning

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Outlines

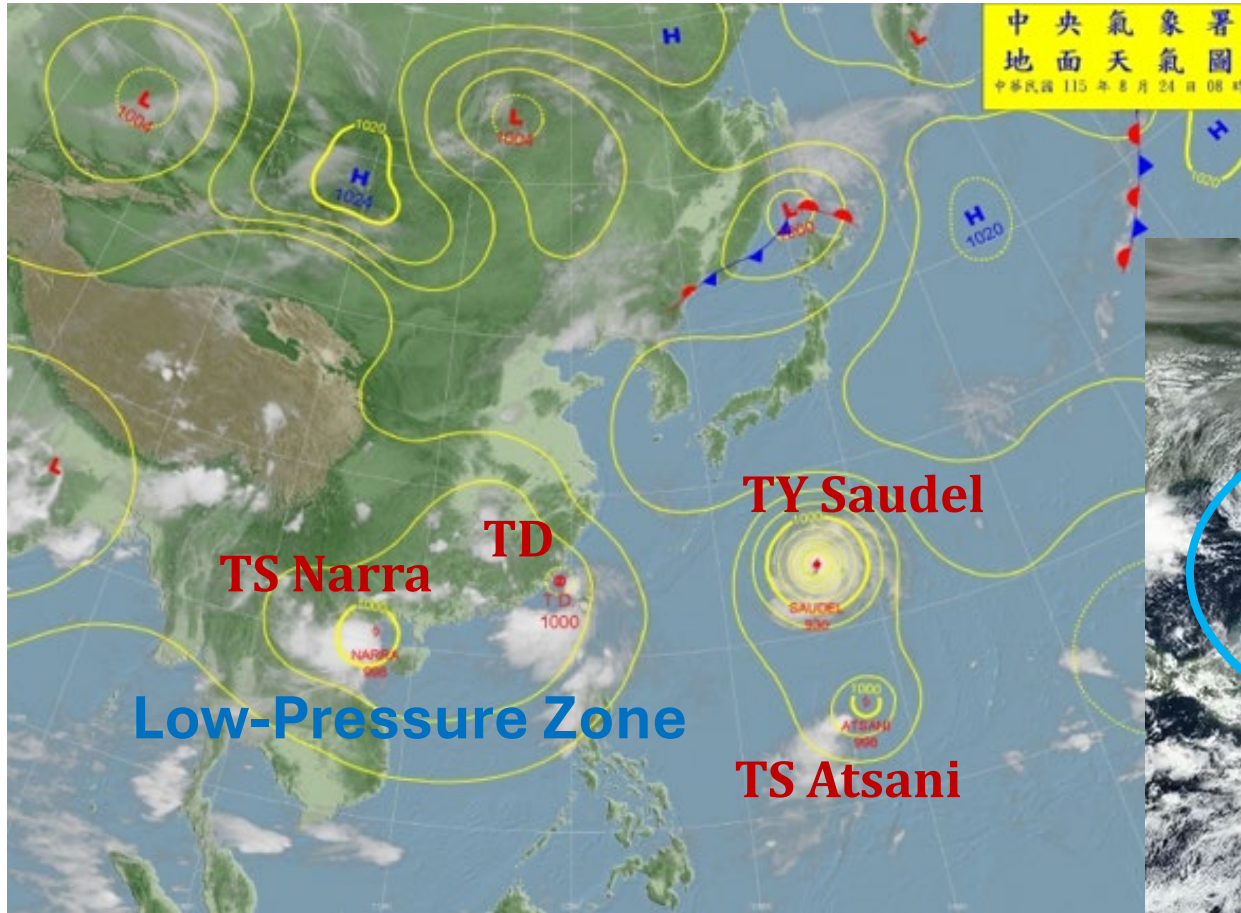
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 2. Flood Disasters Involved in TD81 in 1959 (tropical depression)
 - (1) Weather Situations
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1. Introduction

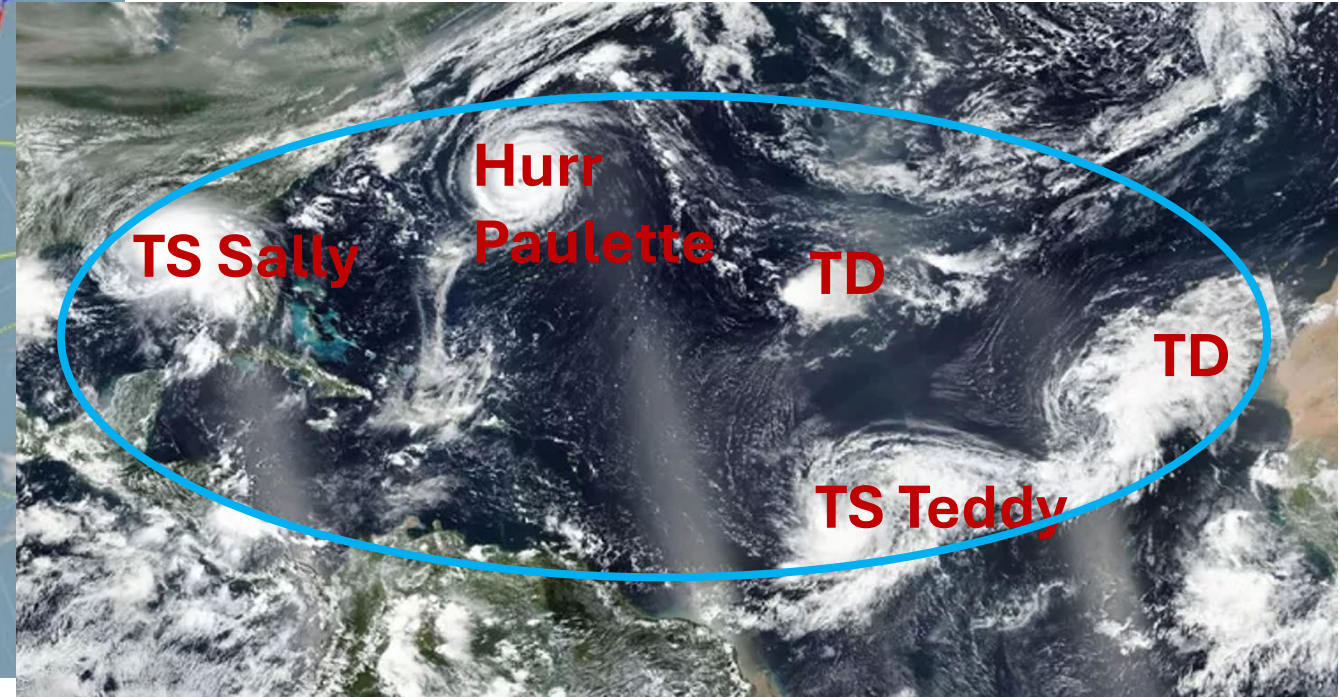
- Usually, the **monsoon trough** in summer is located at the intersection of SW trade wind and the easterly/northeasterly wind related to the Pacific high. Again, inside the **monsoon trough**, it's possibly favorable for the initiation of typhoon. Also, some of the low-pressure systems (called tropical depressions and tropical disturbances) initiated in the monsoon trough become typhoon, but some will influence Taiwan area directly.
- Dozens of TDs (max sustained sfc winds of **33 knots or less** in 10-min/1-min average) form each typhoon/hurricane season; the exact number varies depending on how active (or inactive) a season is.
- According to the National Oceanic and Atmospheric Administration, **tropical disturbance is an organized mass of tropical thunderstorms, with a slight cyclonic circulation, and winds less than 20 knots.**

¹Source: "Average Atlantic Hurricane Season To Reflect More Storms." National Oceanic And Atmospheric Administration, 2021.

²Source: Tiffany Means, 2021: What Is a Tropical Depression? Treehugger, May 13, 2021.



A low-pressure trough and 3 tropical storms have formed over the South China Sea and NW Pacific Ocean on **24 August 2026**. Adopted from CWA.



Satellite view of (from top right to bottom left) Tropical Storm Sally, Hurricane Paulette, Tropical Depression Renee (middle), Tropical Storm Teddy, and Tropical Depression 21 on **14 September 2020**.
NASA / Wikimedia Commons / Public Domain

Categorization of the Intensity of Typhoon

<https://www.cwa.gov.tw/V8/E/K/Encyclopedia/typhoon/#typhoon-10>

Typhoon intensity	Maximum wind speed near the typhoon's center			
	km / hour	m / sec	mile / hour (mph, knots)	Beaufort scale
Tropical storm	62 ~ 117	17.2 ~ 32.6	34 ~ 63	8 ~ 11
Typhoon (moderate intensity)	118 ~ 183	32.7 ~ 50.9	64 ~ 99	12 ~ 15
Typhoon (intense intensity)	above 184	above 51.0	above 100	above 16

Tropical Depression (TD) has the max sustained sfc winds of 33 knots or less in 10-min average.

Tropical Disturbance is an organized mass of tropical thunderstorms, with a slight cyclonic circulation, and winds less than 20 knots.

Information Dissemination on Social Media Threads

Some netizens on Threads social media networking expressed that comparing the best tracks of **TY BAVI (#2609) and **TY NOUL (#2612)**, it seemed that God advised these cyclones stay away from Taiwan and advance to China directly, one avoiding northern Taiwan, and the other one bypassing southern Taiwan.**

They emphasized that it wasn't a complete coincident, and it was a high-precision navigation.

網友在社群平台「Threads」表示，將巴威(BAVI, #2609)與紅霞(NOUL, #2612)兩個颱風的路徑放在一起比較，笑稱一個從台灣北方經過、一個繞行南側，彷彿事先約好一樣，都沒有直接侵襲台灣，而是一路朝中國前進，讓他笑稱「這已經不是巧合，簡直是颱風界的精準導航，連老天都知道該往哪裡走」。

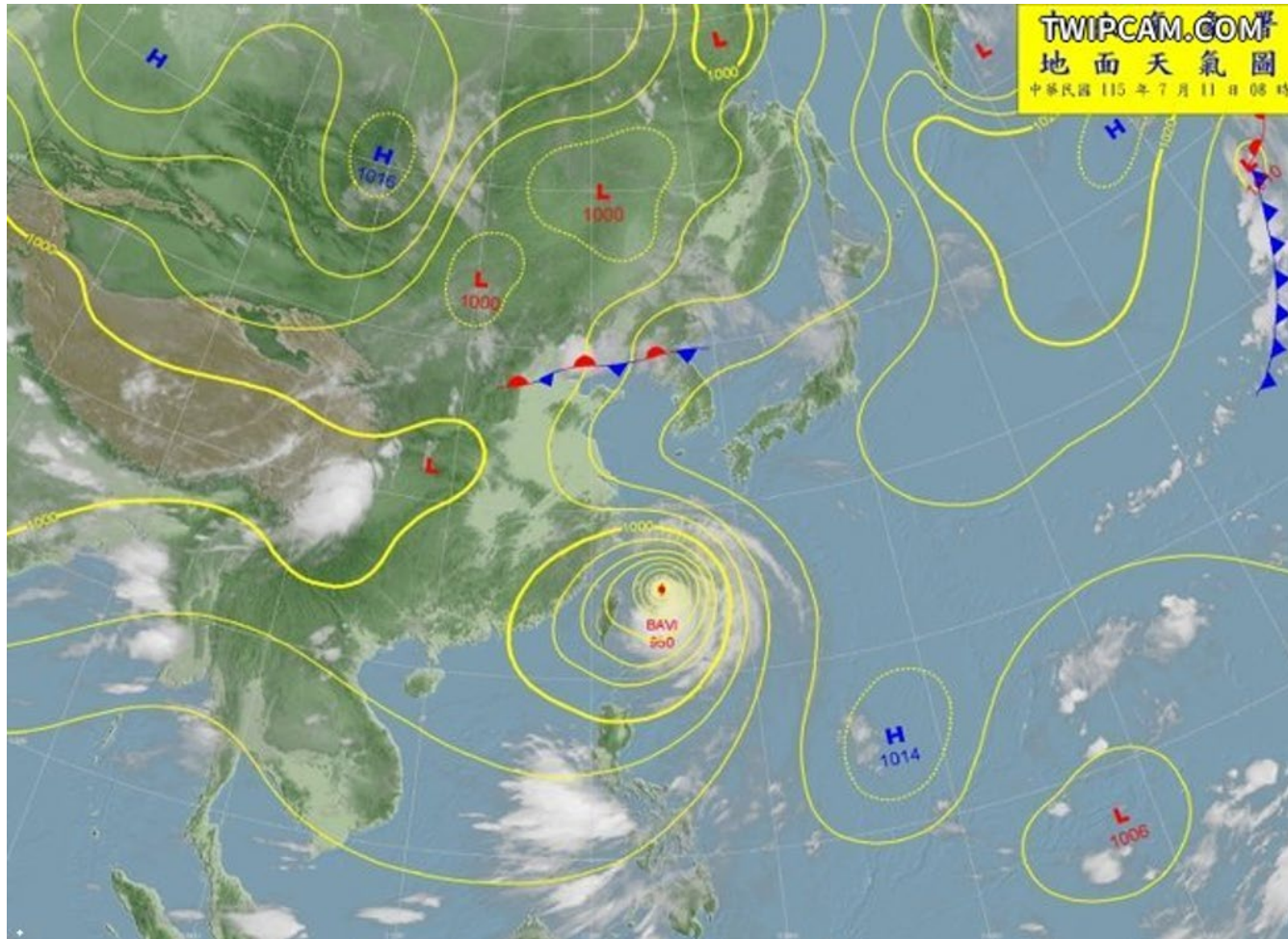
巴威、紅霞接力閃台！他笑稱「颱風界精準導航」神秘現象引熱議。2026-07-25 10:06 聯合新聞網

https://udn.com/news/story/7266/9650036?from=udn-referralnews_ch2artbottom

Severe Typhoon **Bavi (#2609)** went by the northern waters of Taiwan on 11 July, away from the north coast was about 210 km. JTWC estimated its max intensity as 155 kts (~287km/h) based on satellite analysis.

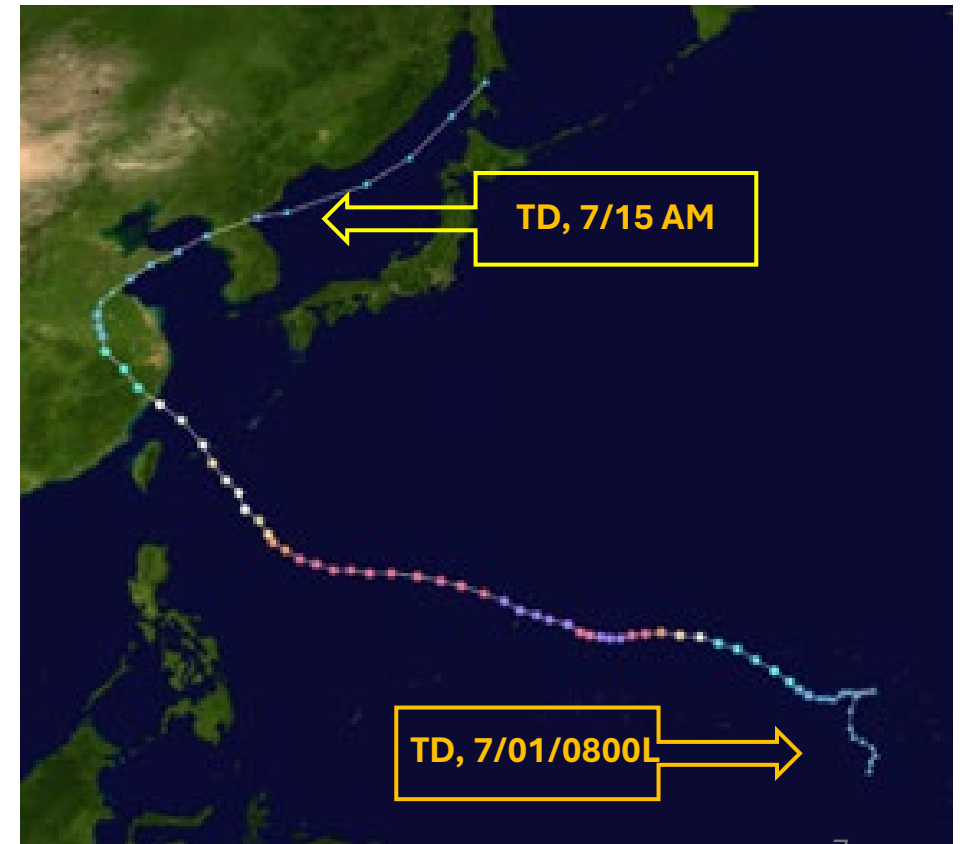
2026.07.11.0800L

Adopted from CWA



Best track of TY Bavi (#2609)

https://commons.wikimedia.org/wiki/File:Bavi_2026_path.png



1. Weather Situations

Severe Typhoon **Bavi (#2609)** was a tropical depression on 1 July 2026, and it became a super typhoon in the early hours of July 4 local time while tracking west over the warm ocean. Satellite observations indicated that sea surface temperatures were around 30 degrees Celsius in the region. JTWC estimated its initial intensity as 155 kts (~287km/h) based on satellite analysis.

Meteorologist Jeff Masters said El Niño-year typhoons may form farther east, giving them more time over warm water to intensify before curving toward Asia, Masters explained, “resulting in a greater chance of reaching Category 5 intensity.” Bavi made landfall in Zhejiang浙江 twice on July 11 and July 12. Finally, it passed through Pyongyang on 15 July and became a tropical depression again.

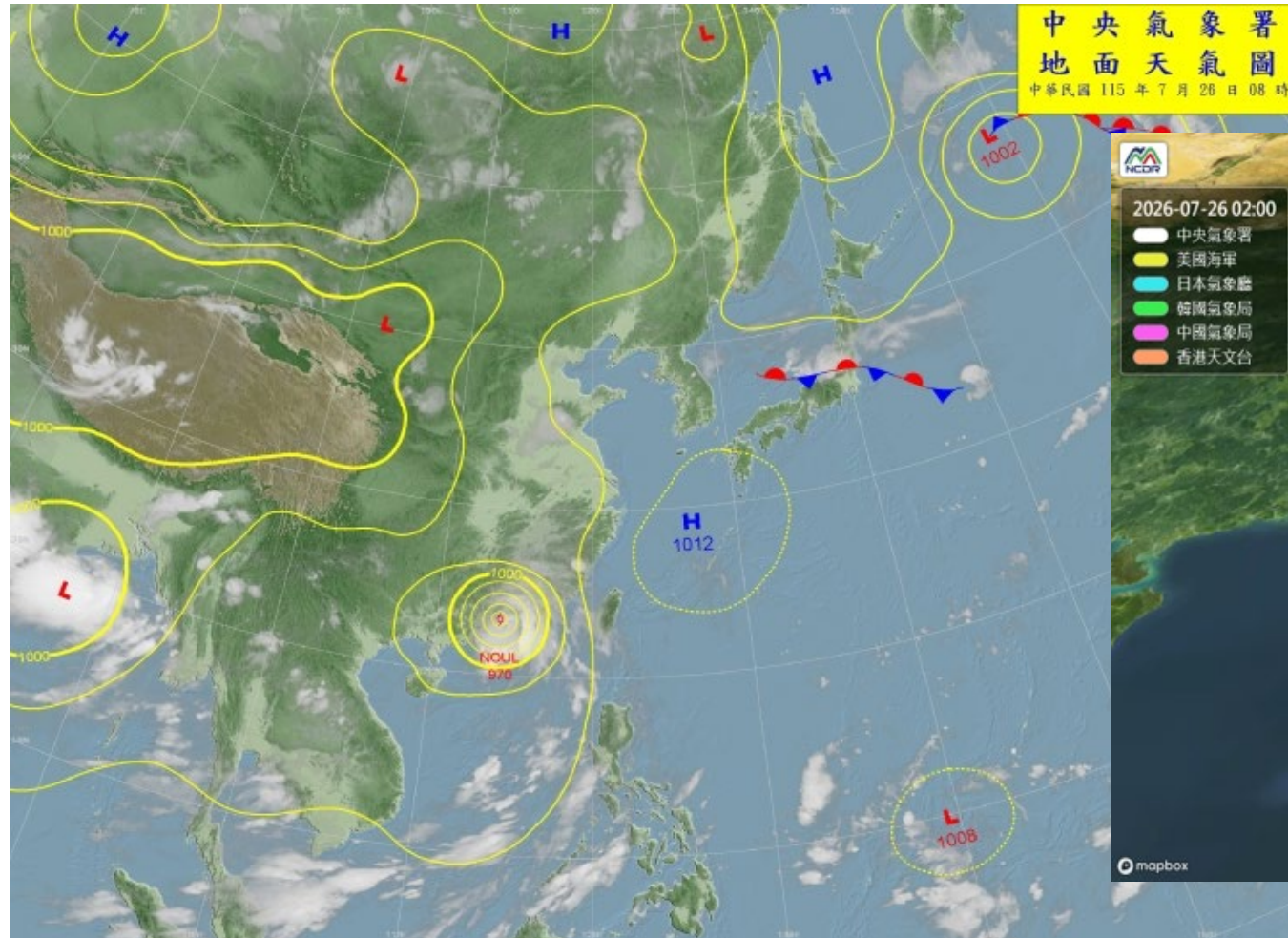
2. Primary Hazards

Bavi went by the northern waters of Taiwan on 11 July, and the shortest distance away from the north coast was about 210 km. During its passage, the max accumulated precipitation of **770.5mm** was in Miaoli苗栗, the **14-grade gust wind** was observed at Orchid Island綠島, and **wave height of 9.3m** was measured at Chenggong成功, Taitung. **Debris flow and landslide disasters** occurred in Taoyuan, Hsinchu and Miaoli areas. Also, **foehn wind** with 37.6°C was reported at Fugang. ⁸

Tropical Storm **NOUL紅霞 (#2612)** passed by the Bashi Channel on July 24, 2026, and stepped up to moderate typhoon. It made landfall in Huizhou惠州, Guangdong at 0350L on 26 July 2026, and its intensity was weakening gradually.

2026.07.26.0800L

Adopted from CWA



Best track of TY Noul (#2612)

Adopted from NCDR Watch.



1. Weather Situations

Tropical Storm **Noul紅霞 (#2612)** passed by the Bashi Channel on July 24, 2026, and stepped up to moderate typhoon on July 25. It made landfall in Huizhou惠州, Guangdong at 0350L on 26 July. The radius of 34-knot winds was about 120km, and its outer circulation could influence the Hengchun Peninsula, the central and southern mountainous regions and offshore islands.

2. Primary Hazards

The heavy rain and roaring winds accompanying with typhoon circulation occurred in the southeastern Taiwan on 25 July 2026, resulting in the **max daily precipitation over 200mm** and **3-day accumulated precipitation 436.5mm at Taimali太麻里**, and water leaking into the Tze-Chiang carriage自強號車廂 occasionally. Also, **a landslide and rockfall** appeared at the 370km mark of Provincial Highway 9 in Taitung. And wave height of 3.6m was measured off the southeast coast of Taiwan. During its passage, **the ferry services bet. Kinmen and Xiamen** on 25 July had been suspended due to severe wx triggered by typhoon circulation, causing **insufficient passenger capacity of flights** in the Taiwan-Kinmen flight route on 26 July.

2. Flood Disasters Involved in TD81 in 1959

(1) Weather Situations:

Heavy Rainfall & Severe Flood Case on August 7 Flood

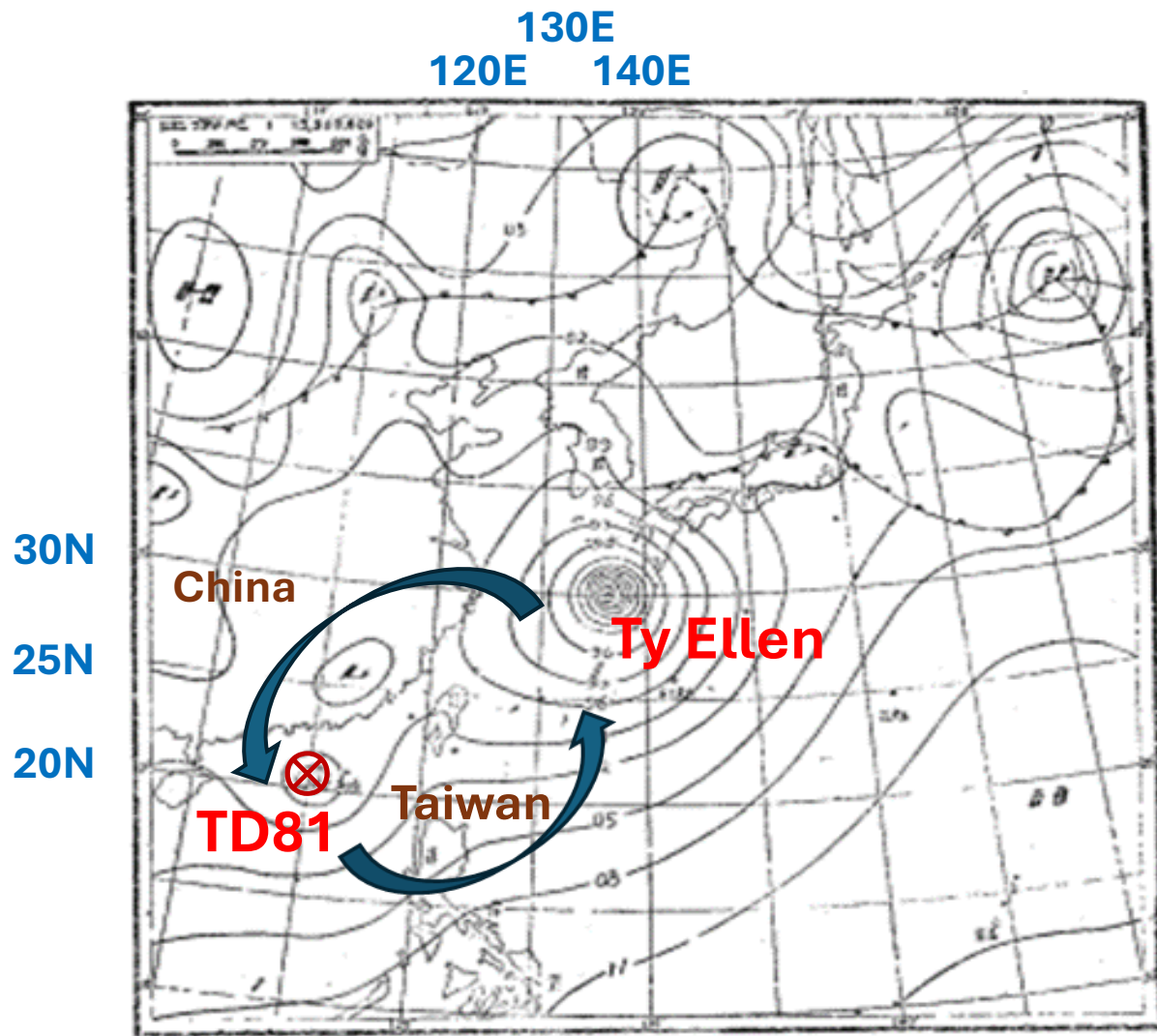
● At **2000L on 6 August 1959**, **TD81** was formed near the Dongsha Island 東沙島 and gradually propagated north-easterly. Later, it moved to the west coast of Taiwan due to the **Fujiwara effect** initiated by Typhoon Ellen **in slowly moving speed between 9 ~11 m/s**, and at **1700L on 7 August**, it made a landfall at **Budai 布袋**, Chiayi, inducing severe southwesterly flows which caused torrential rains in south and central Taiwan and created constructive flooding. It gradually weakened and eventually dissipated **in the afternoon of 8 August 1959, staying on land in Taiwan for 23hrs.**

● Three hot spots for 2-days (7 & 8 August) accumulated rainfall shown in the isohyet map:

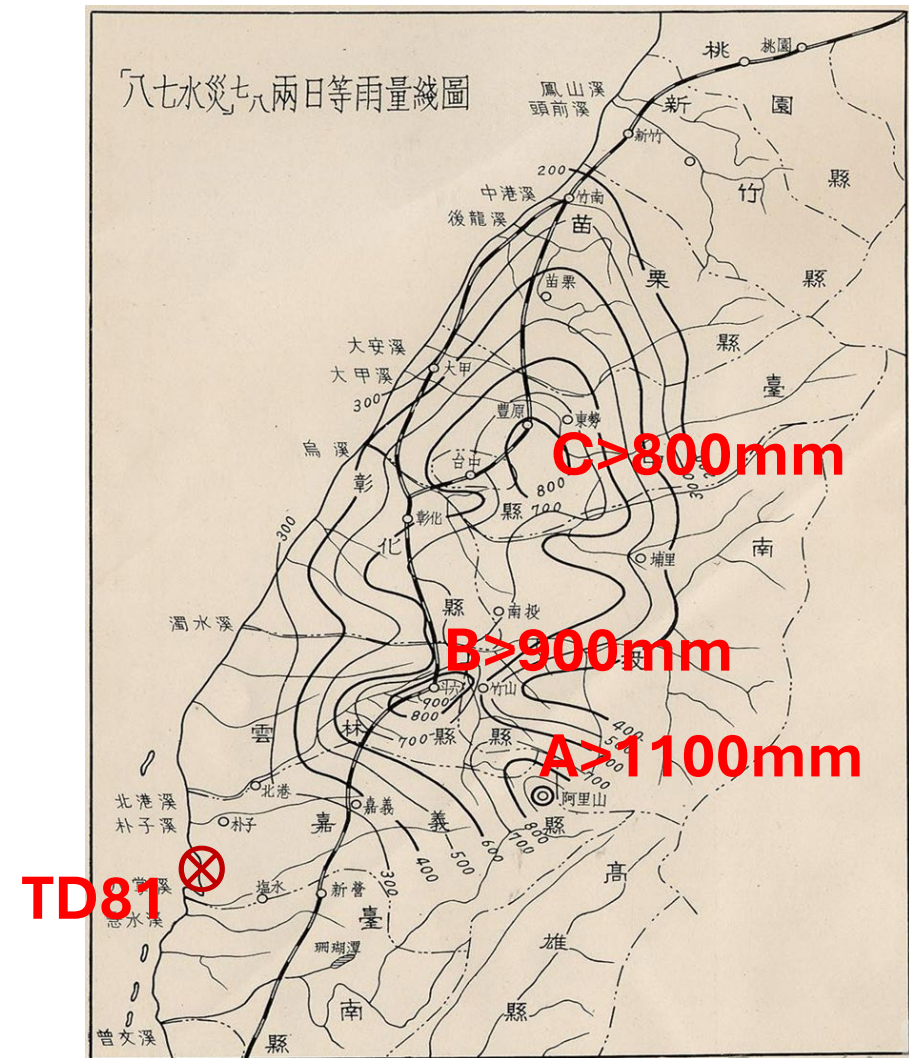
Spot A. Alishan Area(阿里山) > 1100mm/2d

Spot B. Douliu Area(斗六) > 900mm/2d

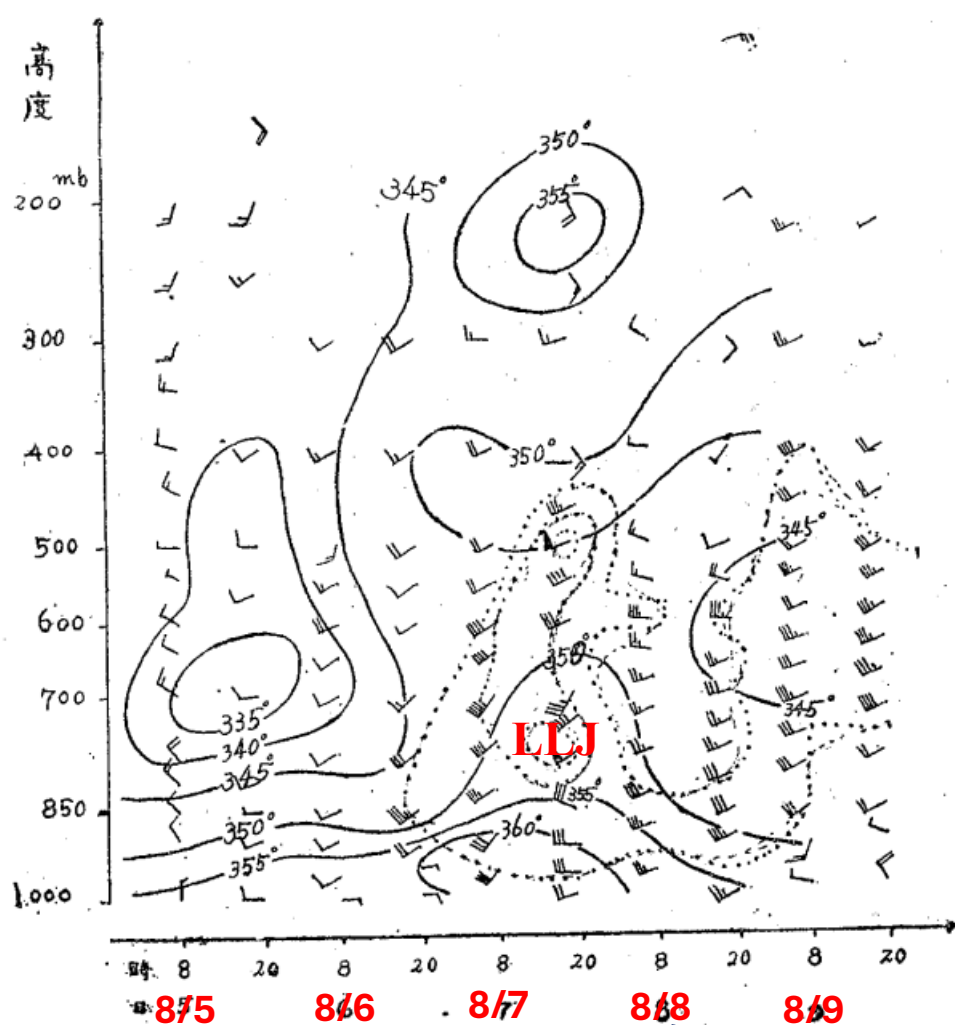
Spot C. Xinshe Area(新社) > 800mm/2d



The surface wx map at 0800L on 6 August 1959. TD81 in speed of 9 ~11 m/s moved to the west coast of Taiwan due to the Fujiwara effect initiated by Typhoon Ellen. (Source : CWA, 1988)



The Isohyet map on 7 & 8 August 1959 when TD81 made a landfall at Budai布袋, Chiayi in Taiwan. (Source: Taiwan Provincial Government's Revised Report on the August 7 Flood, 1959.)

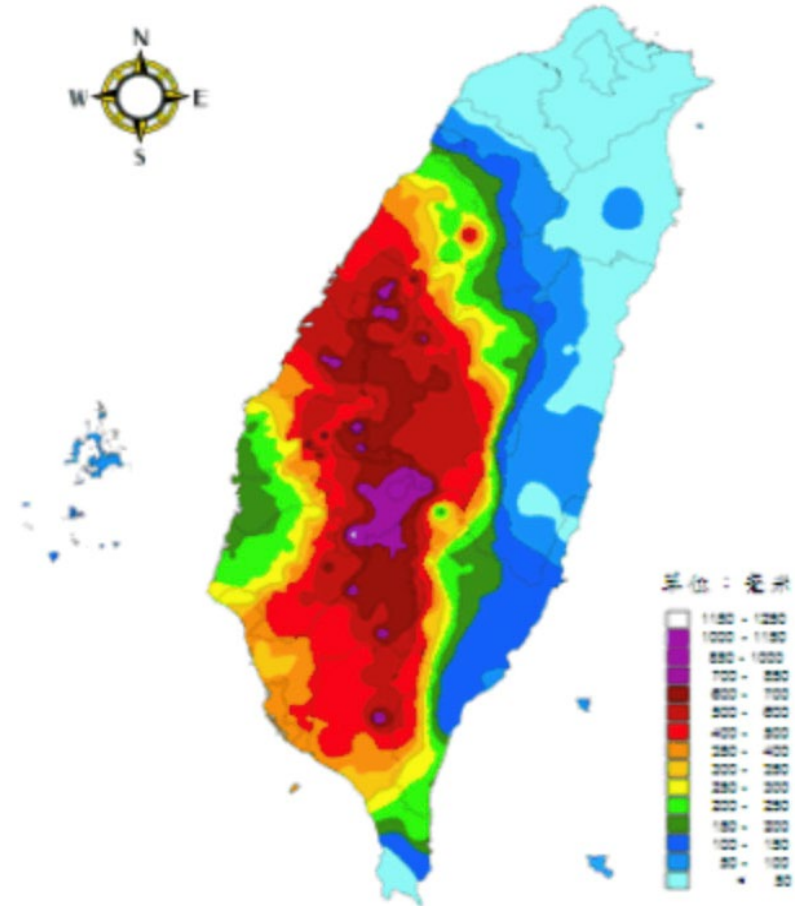


Vertical sounding profile of Donggang東港 station from Aug. 5 to 9, 1959, indicating the atm was unstable with warm core in the lower and severe LLJ of 50kts in the middle, deeply triggered by the disturbance of TD. (台灣省氣象所，1960.06.)

Experts concluded that the factors that created such a massive disaster were connected to the continuously torrential downpours, and the insufficient communication networks at that time in 1959. The 30y-averaged annual precipitation in Taiwan is ~2500 mm.

八七水災總雨量圖

民國48年8月7日至8月9日



Max. accumulated rainfall for 3 days reached ~1100mm. 1959.08.07.~09.

(2) Primary Hazards

a. **Flash flooding, landslides, and rapidly rising streams** occurred along the western coast and inland of Taiwan, including **13 counties and cities** while heavy rain bands persisted over the same locations. Especially, the Dadu River **大肚溪 (or Wu River 烏溪) basin** and its upstream rivers swelled, and brought southward flooding simultaneously due to heavy rain falls **at night of 7 August 1959**. The standing water could reach 3 m in depth, and the duration of heavy flooding situation lasted more than 24 hours.

b. The exactly damaged area covered 1,365 km², the number of disaster victims had soared to 300 thousands, the completely collapsed buildings reached 27,466 houses, the half-collapsed 18,303 ones. Moreover, there **were 667 death, 408 missing, and 942 injured**. Transportation and communication were disrupted almost completely in flooded areas, as well as the area of damaged farmland surpassed 0.13 million hectares.

The total loss reached 3.7 billions, equivalent to approximately 12% of the national income of the year 1958.

維基百科_八七水災 <https://zh.wikipedia.org/wiki/>

(3) Possible Causes

● TD81 had a quite short lifecycle for approximate 3 days (6 August ~ 8 August 1959) with the lowest center pressure of 990 hPa. However, the perfect combination of **effectively triggering of southwestern flows due to the Fujiwara effect initiated by Typhoon Ellen, slowly lingering over land in moving speed between 9 ~11 m/s for more than 23hrs (1700L on 7 August ~1400L on 8 August), and blocking effect of the Central Mountain Range** caused torrential rains in south and central Taiwan following with severe destructive floods and mudslides in Taiwan's history.

External forcing by Fujiwara effect & slow propagation!



A steam locomotive (model T169) was tilted by the devastating flood at Changhua train station.

<https://www.archives.gov.tw/ALohas/ALohasColumn.aspx?c=1961>



The railway track across the Dadu River was destroyed. (大肚溪，又名烏溪)

<https://www.archives.gov.tw/ALohas/ALohasColumn.aspx?c=1961>

Tropical Depression 81 in 1959

Formation Date 1959年8月6日

Dissipation Date 1959年8月8日

Min Sfc Pressure 990 hPa

Property Loss NTD 3.7 Billions

Casualties 667 Dead, 942 Injured, 408 Missing

<https://zh.wikipedia.org/zh-tw/%E5%85%AB%E4%B8%83%E6%B0%B4%E7%81%BD>

3. Flood Disasters Involved in 91W in 2026

(1) Weather Situations:

Heavy Rainfall & Severe Flood Case on 05 June 2026 (91W)

● The heavy rainfall event on **05 June 2026** due to the influence of **tropical disturbance 91W** (JMA: TD09) brought severe flash floods with landslides, damage of roads, houses and crops in southwestern areas of Taiwan.

● The objective of this research is to realize the large-scale dynamic conditions, and furthermore, the physical mechanisms from the mesoscale point of views to find out the approximate approaches for disaster prevention and early warning.

91W made landfall at Donggang東港 in the morning (0830TST) of 05 June 2026, and left Taiwan's east coast in the evening, lingering over Taiwan about 12 hrs.

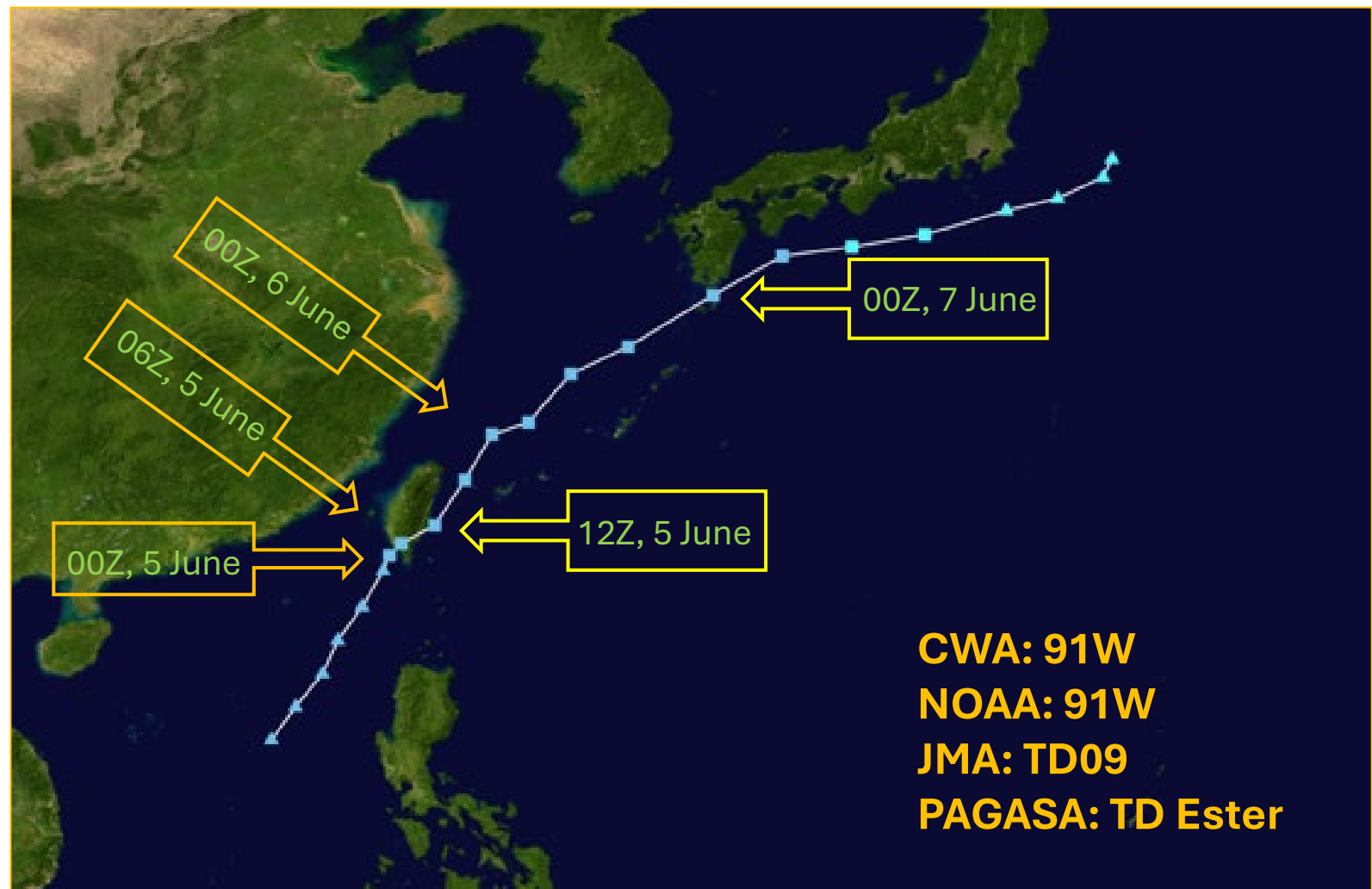
3. Flood Disasters Involved in 91W in 2026

(1) Weather Situations:

Heavy Rainfall & Severe Flood Case on 05 June 2026 (91W)

- Tropical Disturbance 91W (JMA: TD09) with moving speed of 25 km/h in NE direction made landfall at **Donggang東港**, Pingtung **at 0830TST on 05 June 2026**, and left Taiwan's east coast that night, **lingering over Taiwan about 12 hrs.** The heavy rainfall events due to the influence of 91W storm brought damage of roads, houses and crops and traffic accidents with low visibility in the southern Taiwan.
- The objective of this research is to realize the large-scale dynamic conditions, and furthermore, the physical mechanisms from the mesoscale point of views to find out the approximate approaches for disaster prevention and early warning.

91W landing time:
0830TST, 05 June 2026
91W leaving time:
2000TST, 05 June 2026
91W moving speed:
25km/h (~6.9m/s)
in NE direction
Slow propagation!



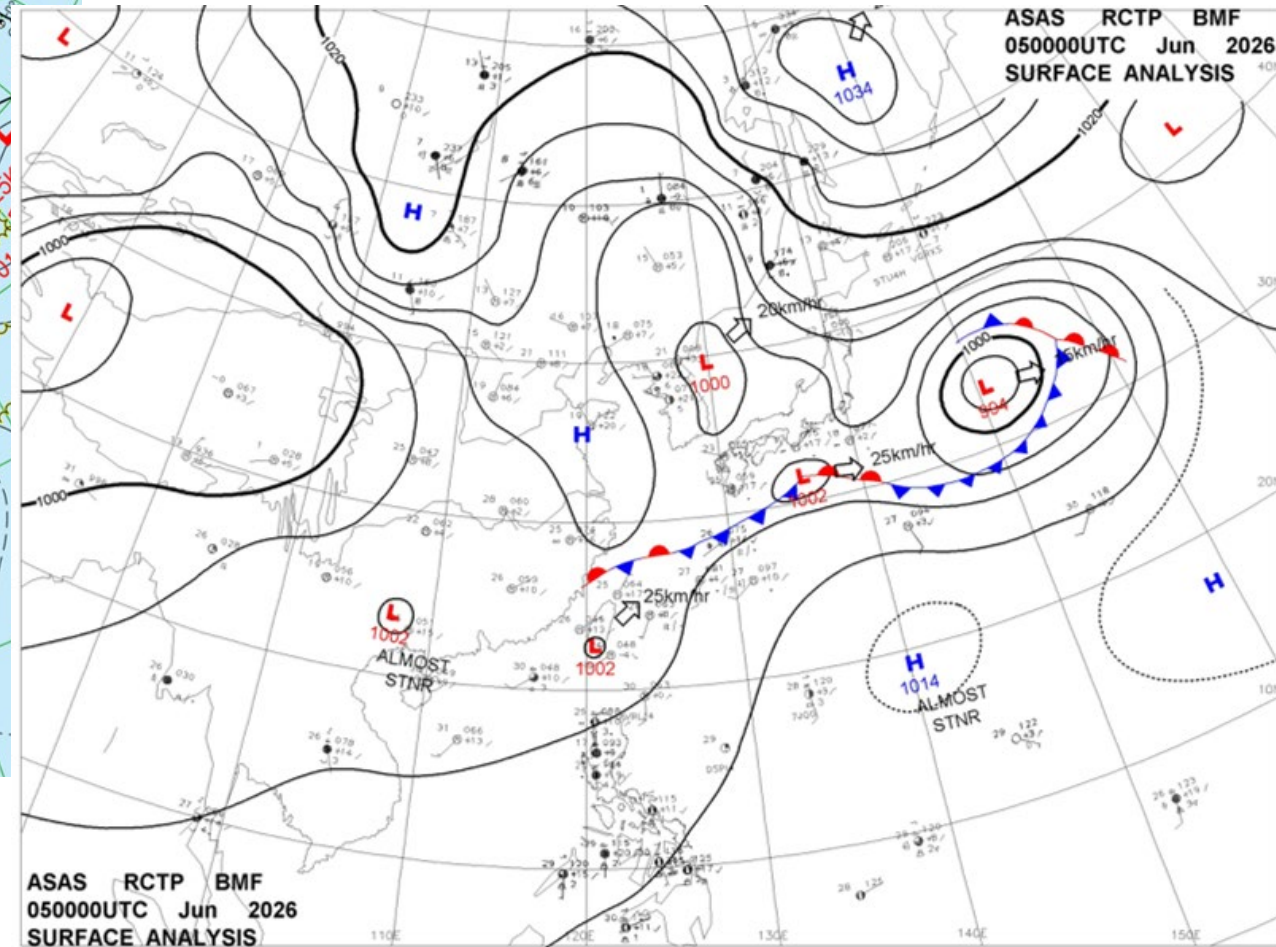
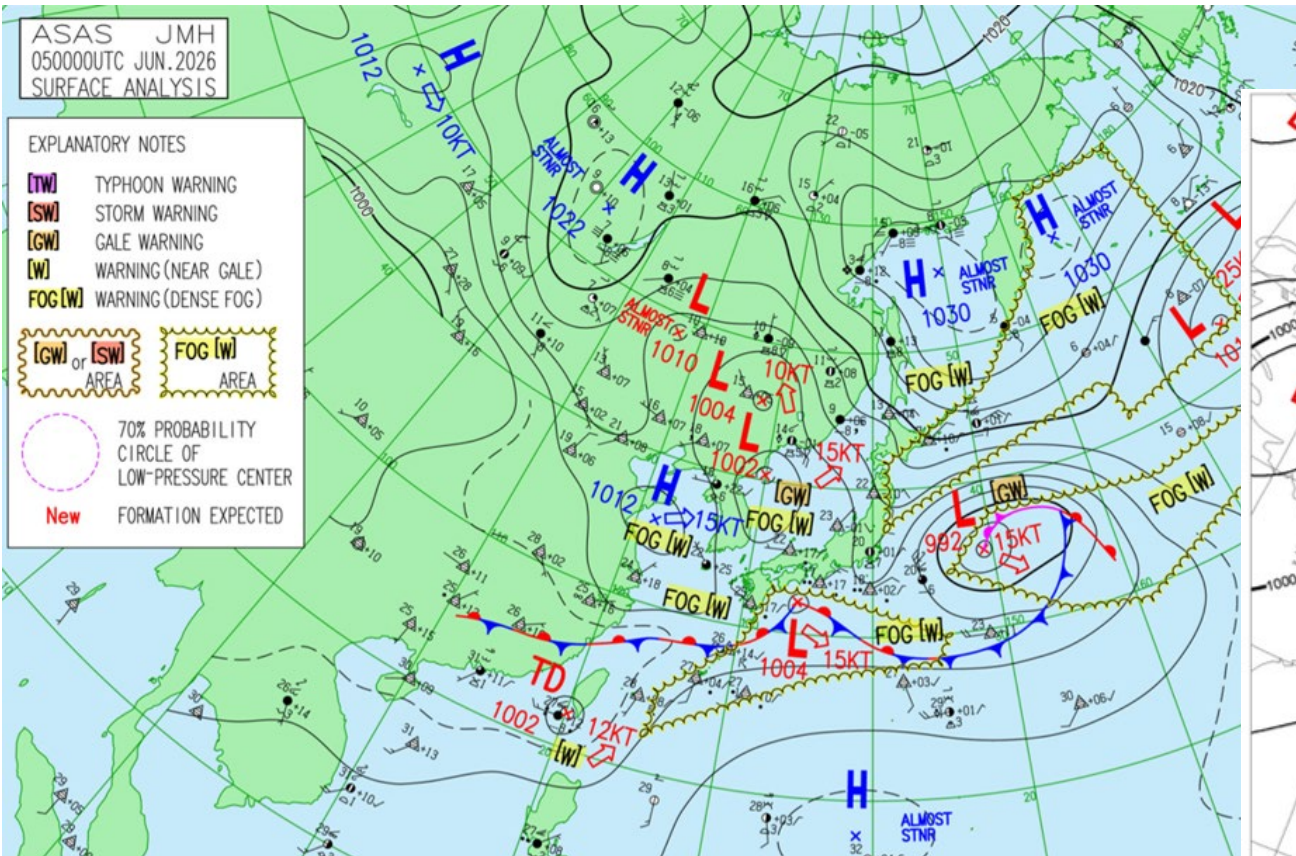
Track map of Tropical Depression Ester of the 2026 Pacific typhoon season. The points show the location of the storm at 6-hour intervals. The color represents the storm's maximum sustained wind speeds, and the shape of the data points represent the nature of the storm.

Created by Oreostar-fait

https://commons.wikimedia.org/wiki/File:Ester_2026_path.png

CWA: tropical disturbance 91W.
JMA: tropical depression (TD09).

2026.06.05.0800TST (0900JST)
CWA Surface Weather Chart



2026.06.05.0800TST (0900JST)
JMA Surface Weather Chart

91W moving speed: 25km/h (~6.9m/s) in NE direction, weakly steering by the low-pressure system.

115.06.05.0830TST Tropical Disturbance 91W made landfall at Donggang東港...



鄭明典

1小時 · 6

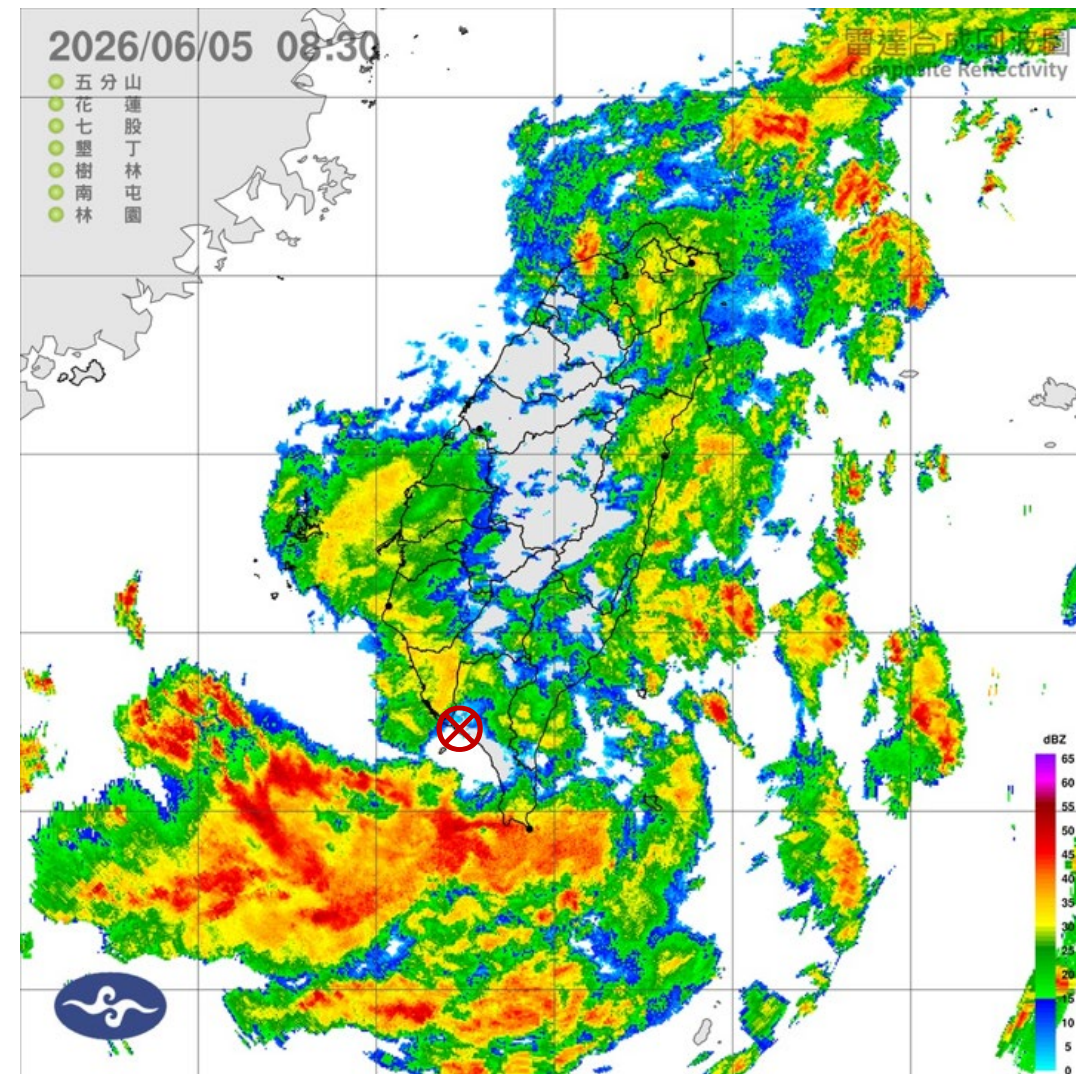
微弱低壓環流！

傳說中的低氣壓系統太弱了，比對雷達回波動態和風場，東港附近的還留有可能是低壓環流中心！當然，微弱低壓系統受地形影響，有可能出現很多小環流中心。這種比對只是想看看數值模式掌握的程度如何，很粗略的評估~ 顯示較少

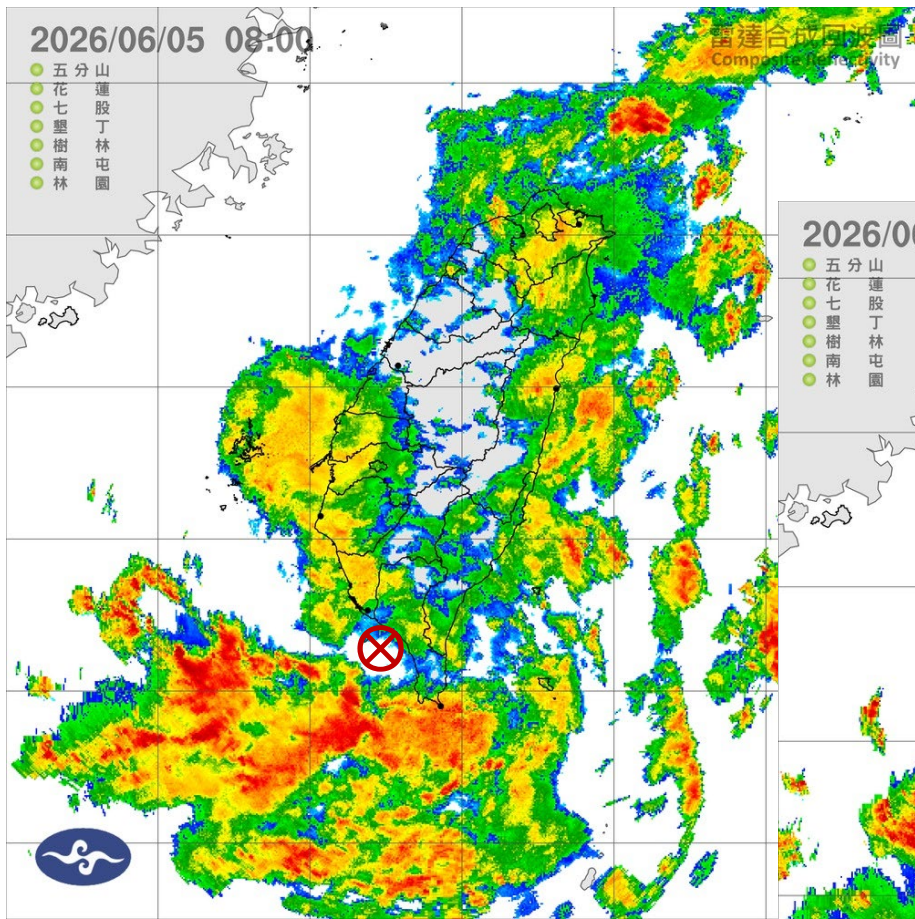


2026.06.05.0830L
CWA Sfc Observations Chart

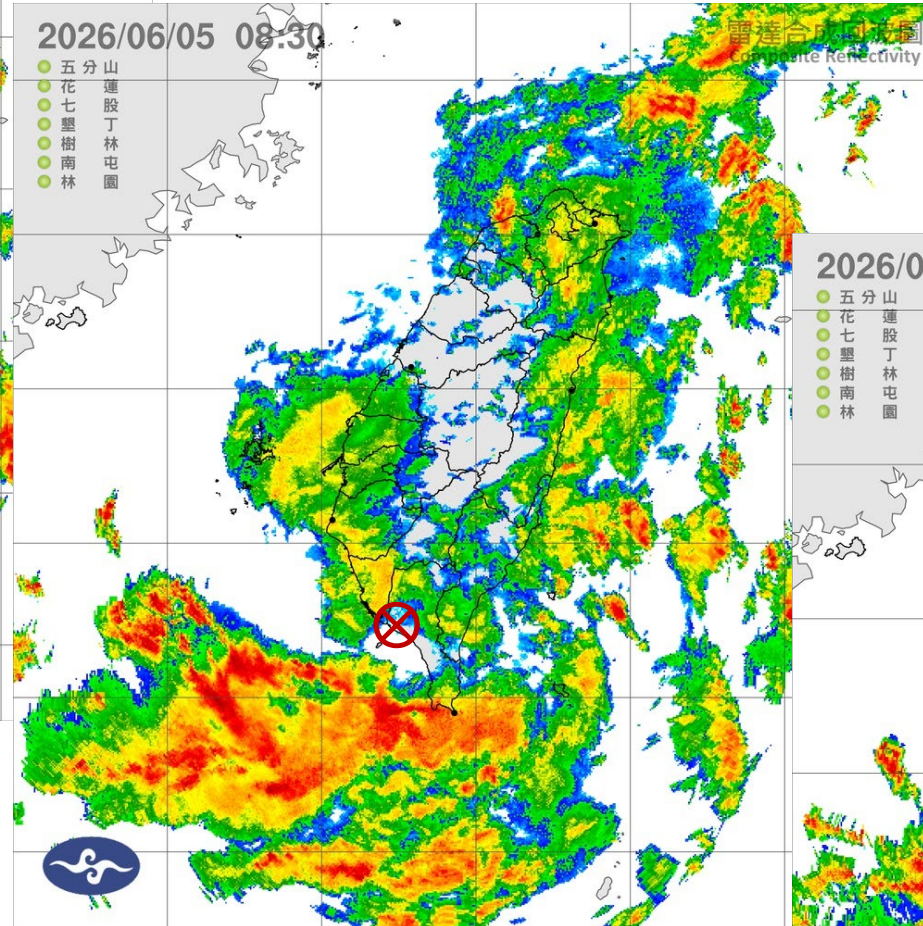
<https://qpeplus.cwa.gov.tw/pub/?tab=emap>



2026.06.05.0830TST
Radar Composite Ref.



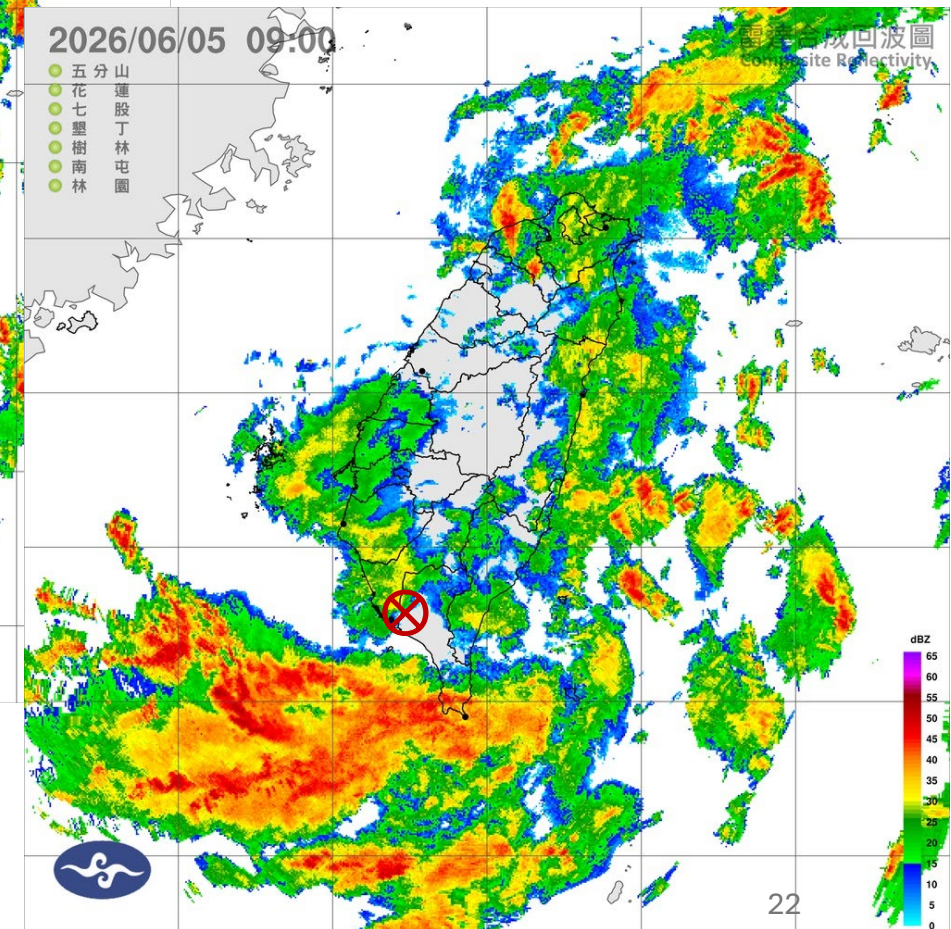
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Radar Composite Ref.

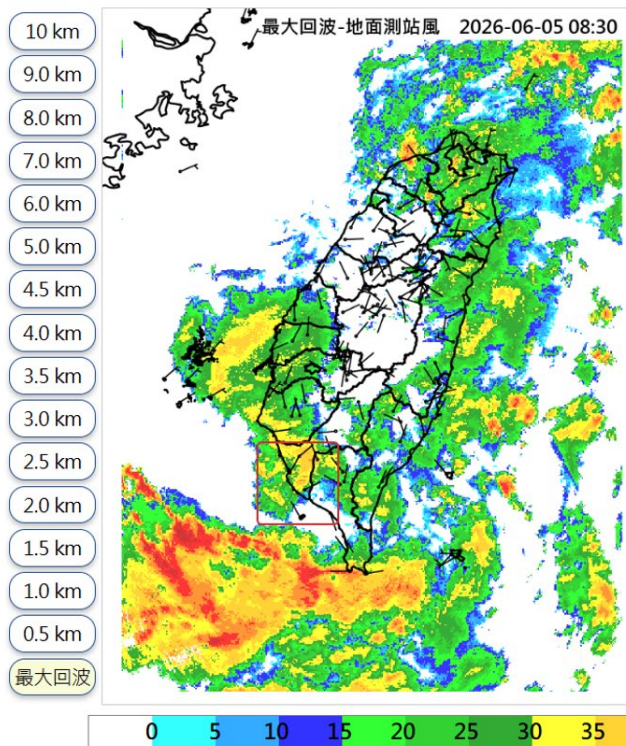


2026.06.05.0830TST
Radar Composite Ref.

2026.06.05.0830TST 91W made landfall at Donggang東港

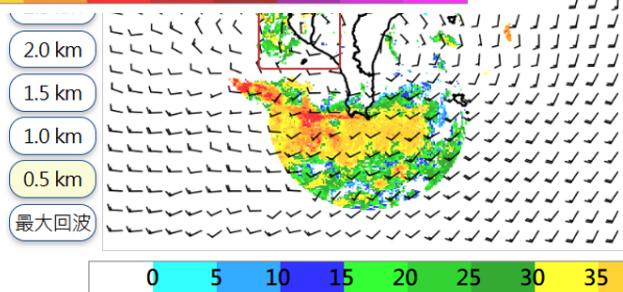
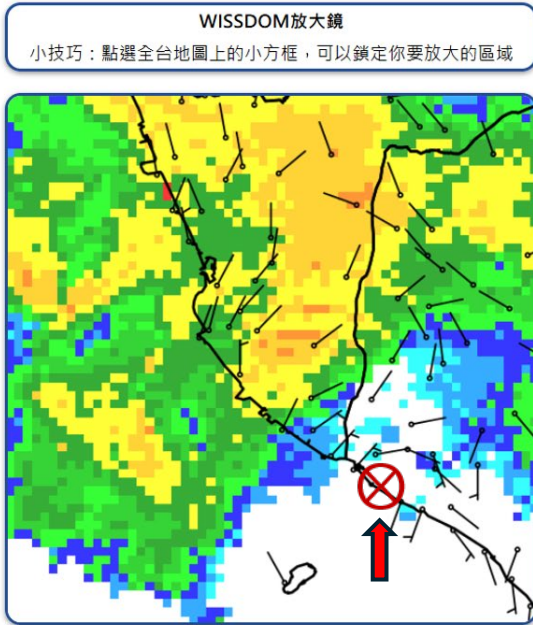
2026.06.05.0900TST
Radar Composite Ref.





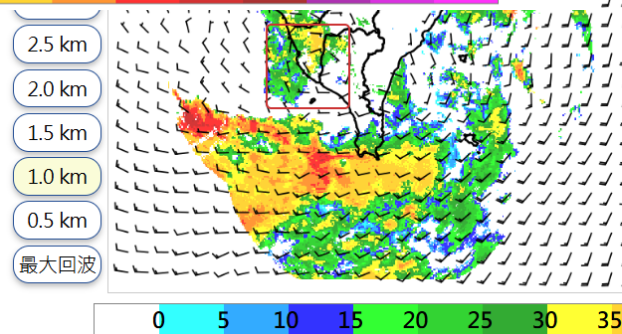
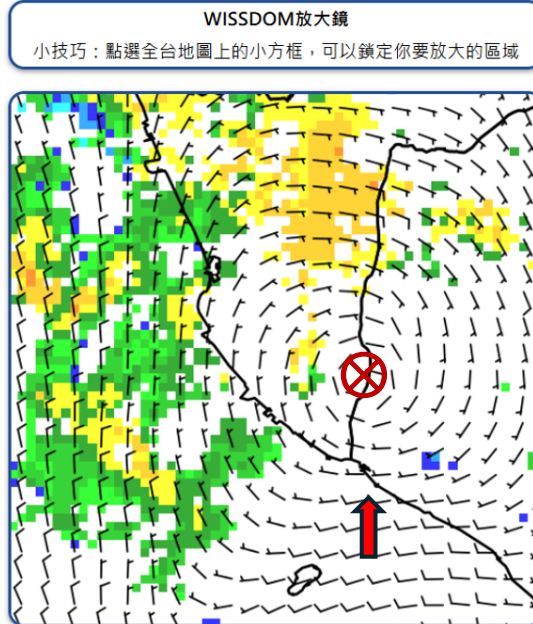
**Radar Ref & Hor Wind
Z=0.0km**

【說明】回波每10分鐘更新，風場每20分鐘更新一次，
地面測站風每10分鐘更新一次



Z=0.5km

【說明】回波每10分鐘更新，風場每20分鐘更新一次，
地面測站風每10分鐘更新一次

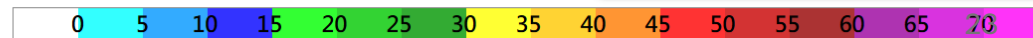
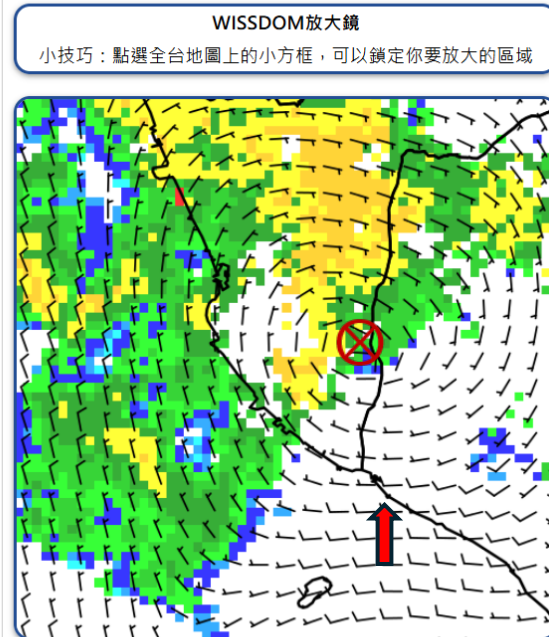


2026.06.05.0830TST

**Radar Ref (dBZ) & Hor Wind (m/s)
at z=0.0km, 0.5km, 1.0km**

**Radar Ref & Hor Wind
Z=1.0km**

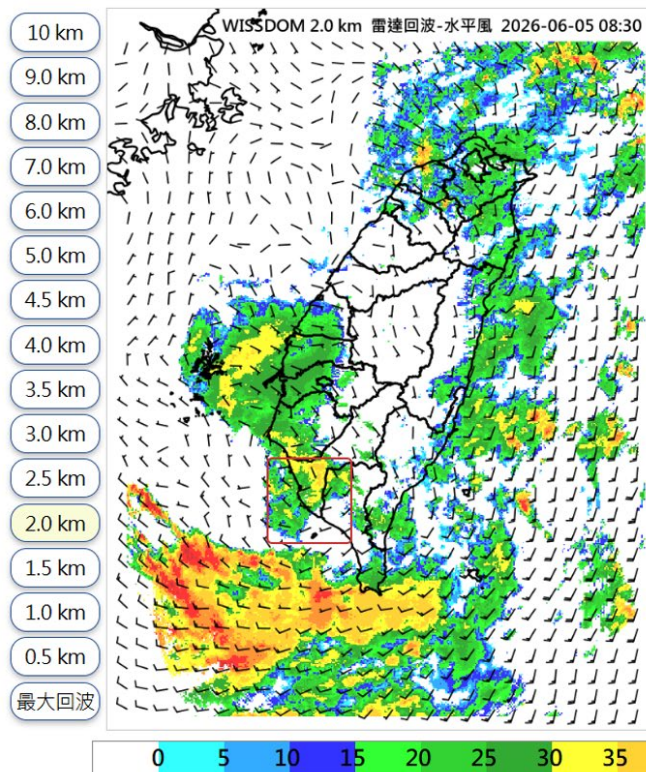
【說明】回波每10分鐘更新，風場每20分鐘更新一次，
地面測站風每10分鐘更新一次



NCDR WATCH

全台風場反演分析 - WISSDOM

https://watch.ncdr.nat.gov.tw/watch_wissdom_taiwan

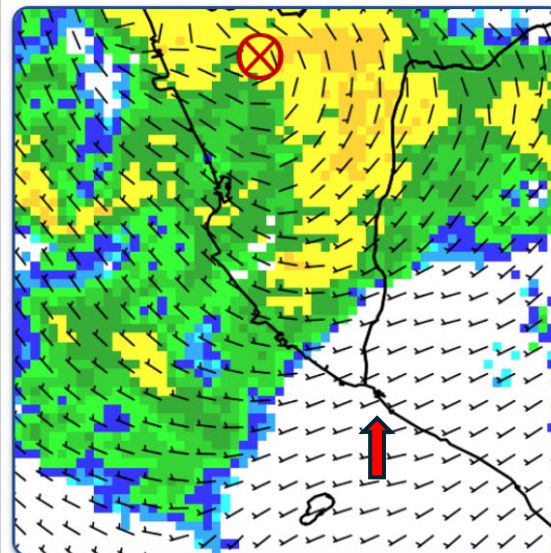


Z=2.0km

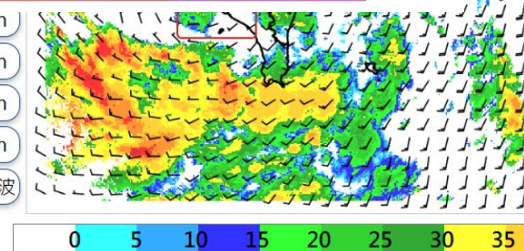
【說明】回波每10分鐘更新，風場每20分鐘更新一次，
地面測站風每10分鐘更新一次

WISSDOM放大鏡

小技巧：點選全台地圖上的小方框，可以鎖定你要放大的區域



2.0 km
1.5 km
1.0 km
0.5 km
最大回波

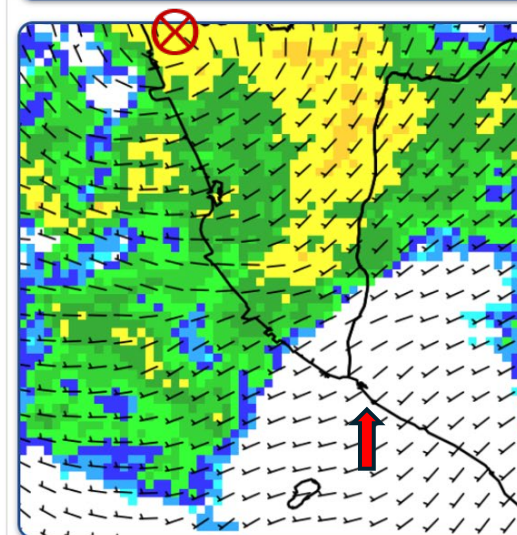


Z=3.0km

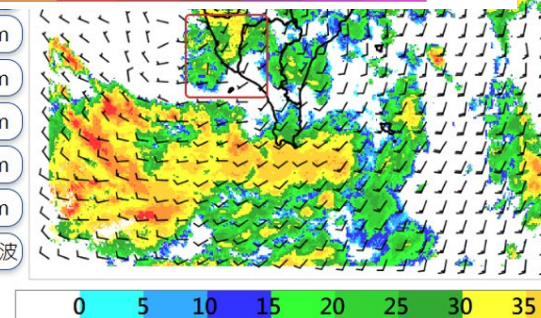
【說明】回波每10分鐘更新，風場每20分鐘更新一次，
地面測站風每10分鐘更新一次

WISSDOM放大鏡

小技巧：點選全台地圖上的小方框，可以鎖定你要放大的區域



2.5 km
2.0 km
1.5 km
1.0 km
0.5 km
最大回波



2026.06.05.0830TST

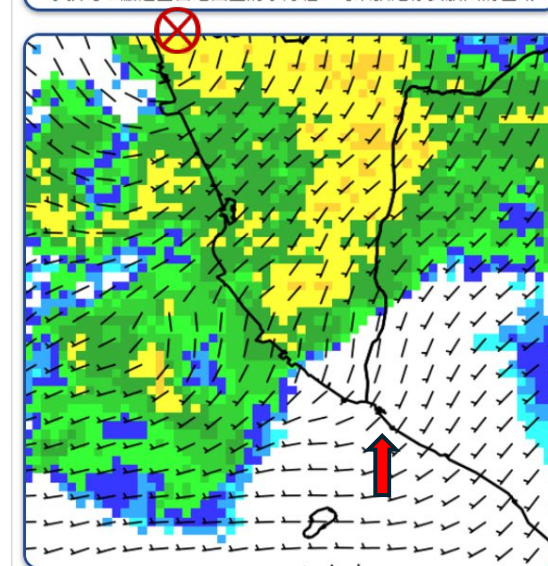
**Radar Ref (dBZ) & Hor Wind (m/s)
at z=2.0km, 3.0km, 4.0km**

Z=4.0km

【說明】回波每10分鐘更新，風場每20分鐘更新一次，
地面測站風每10分鐘更新一次

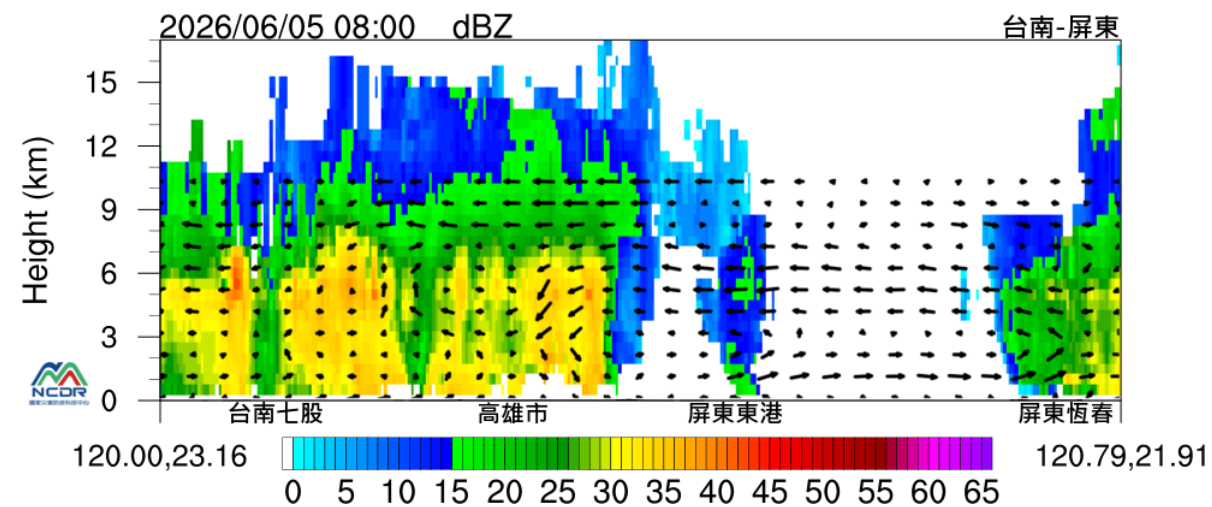
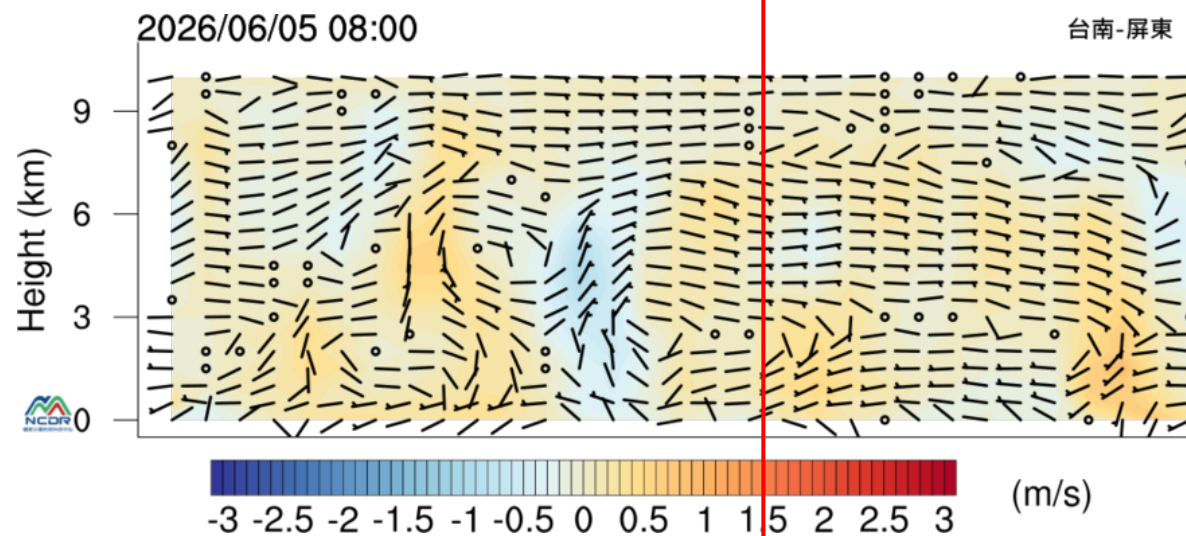
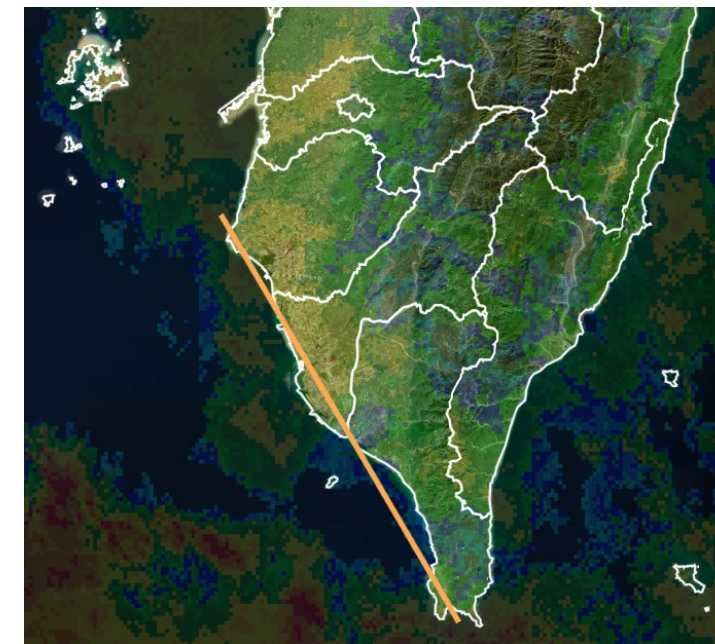
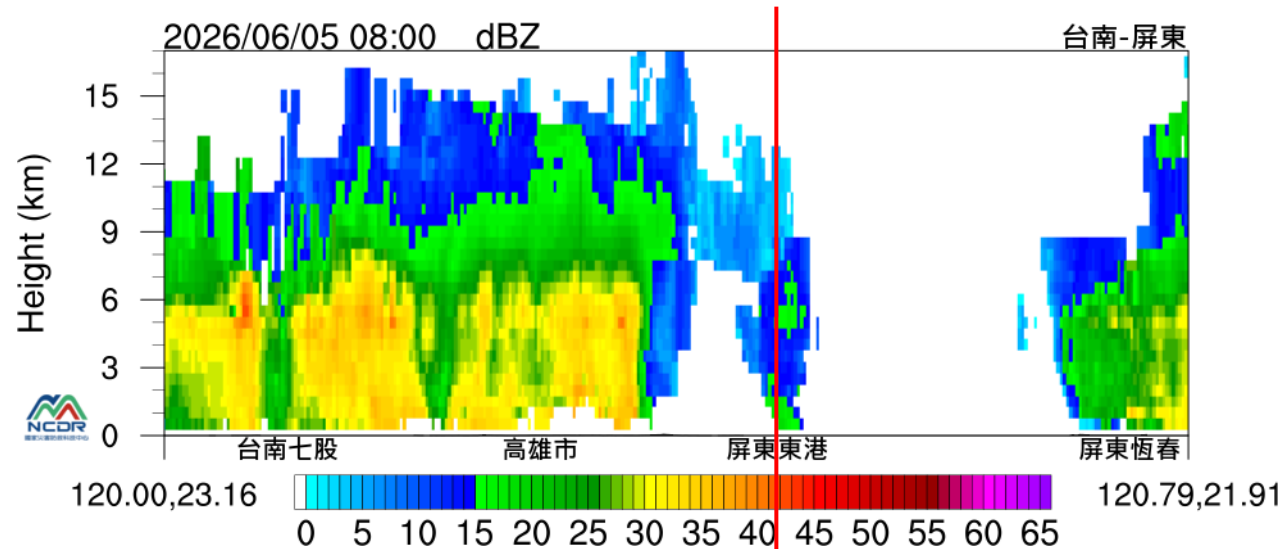
WISSDOM放大鏡

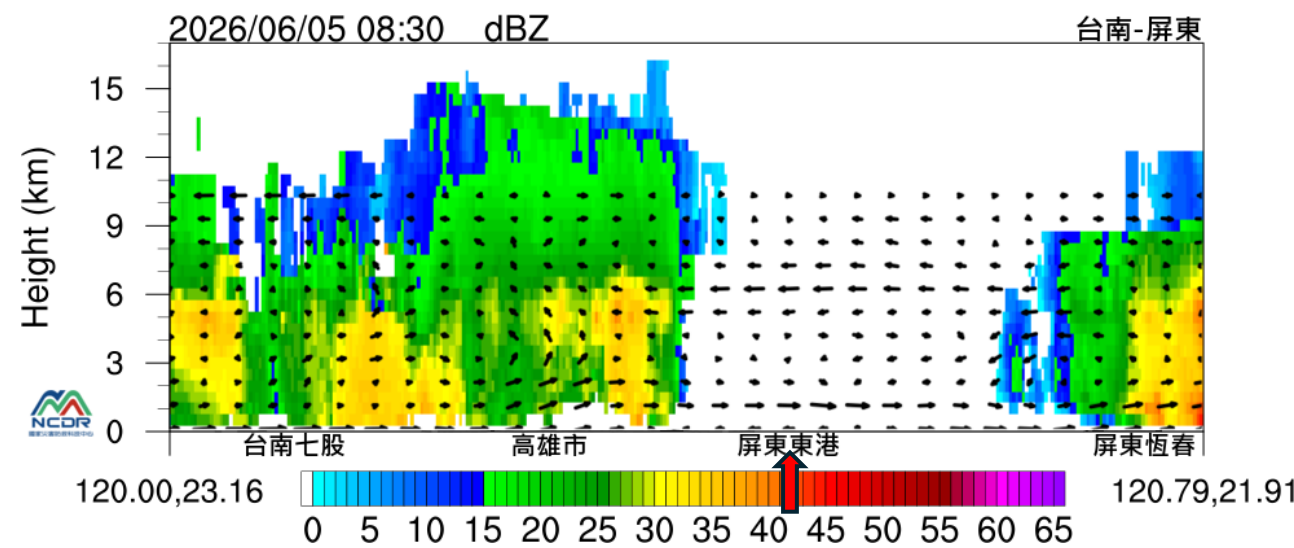
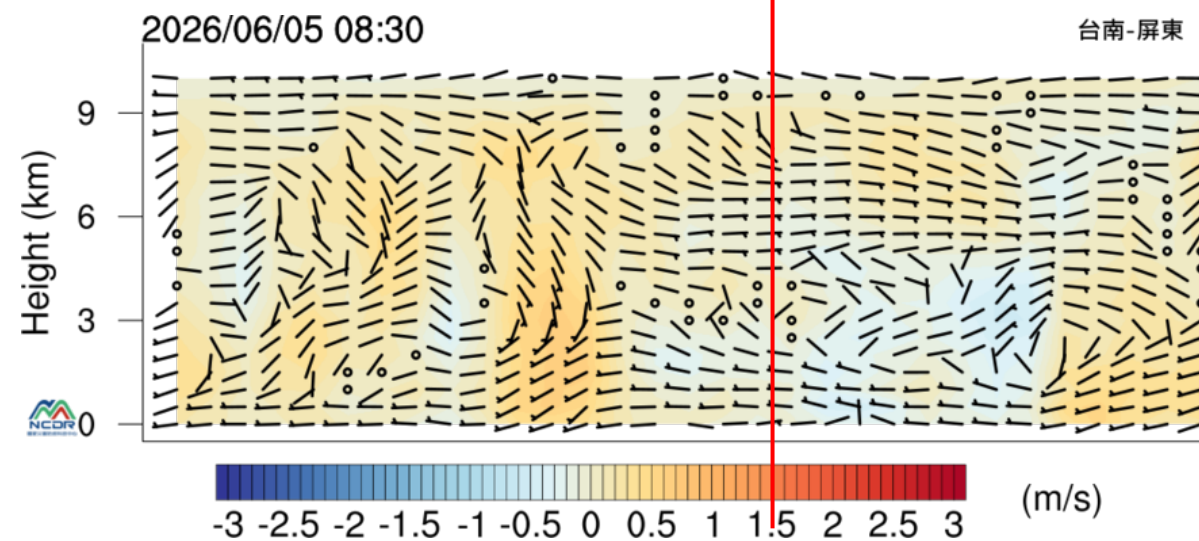
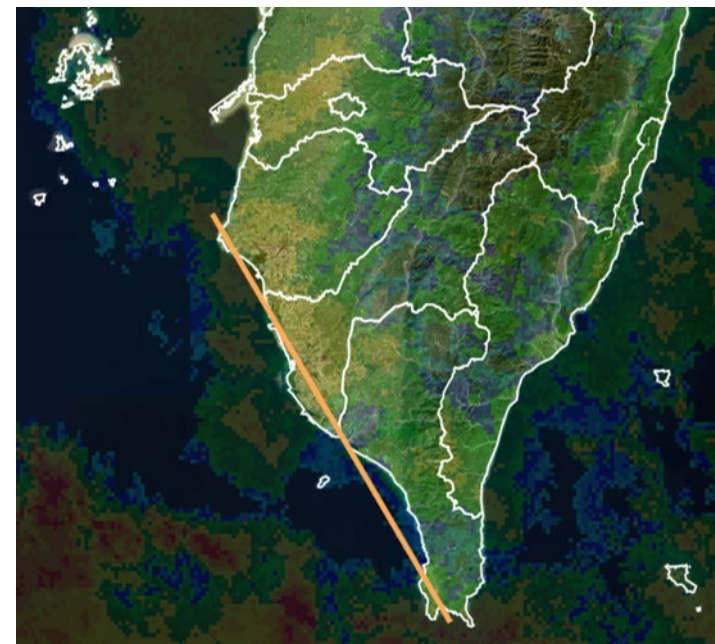
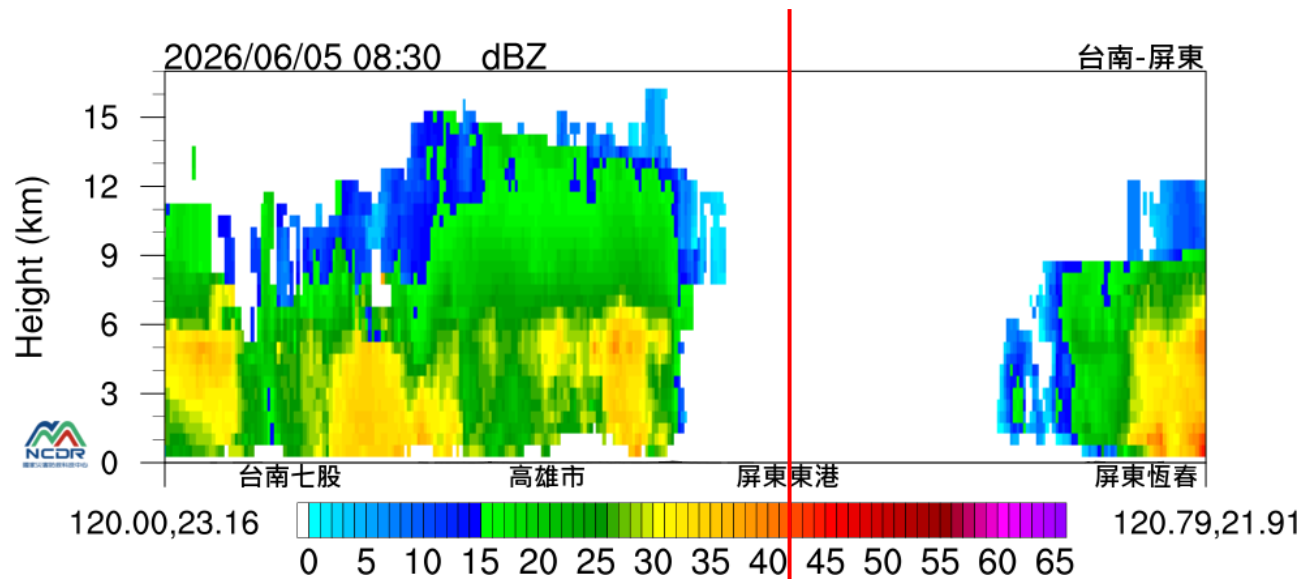
小技巧：點選全台地圖上的小方框，可以鎖定你要放大的區域

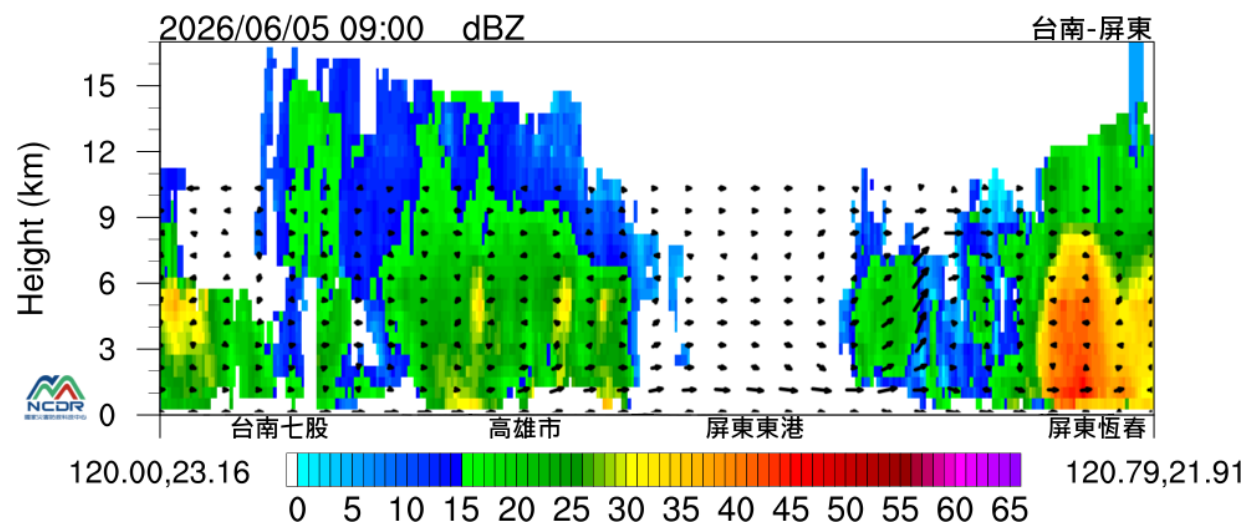
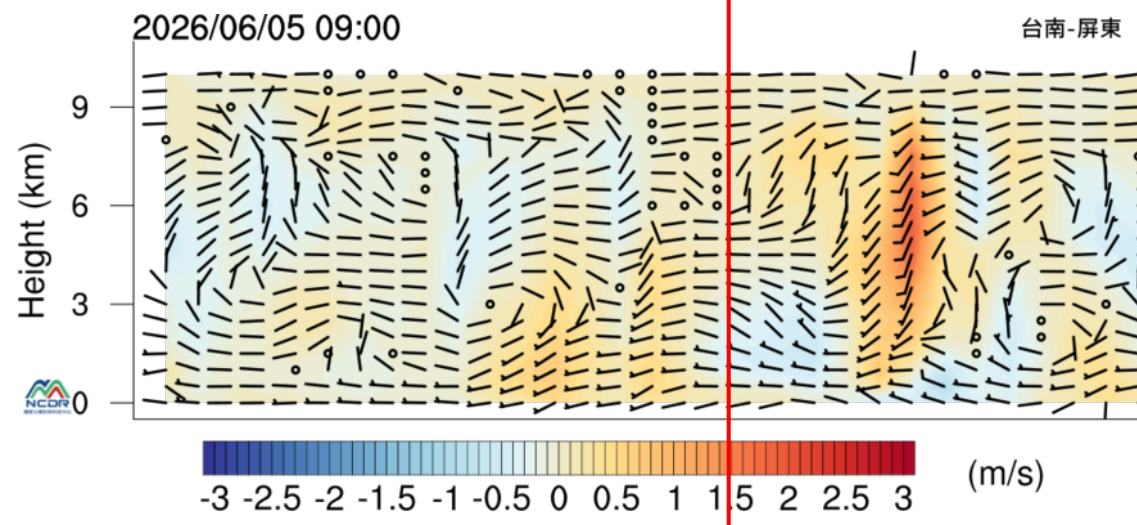
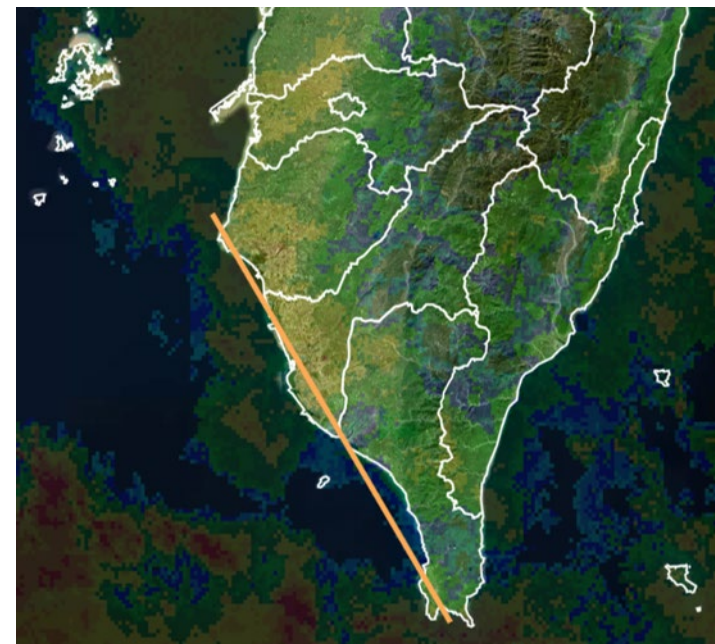
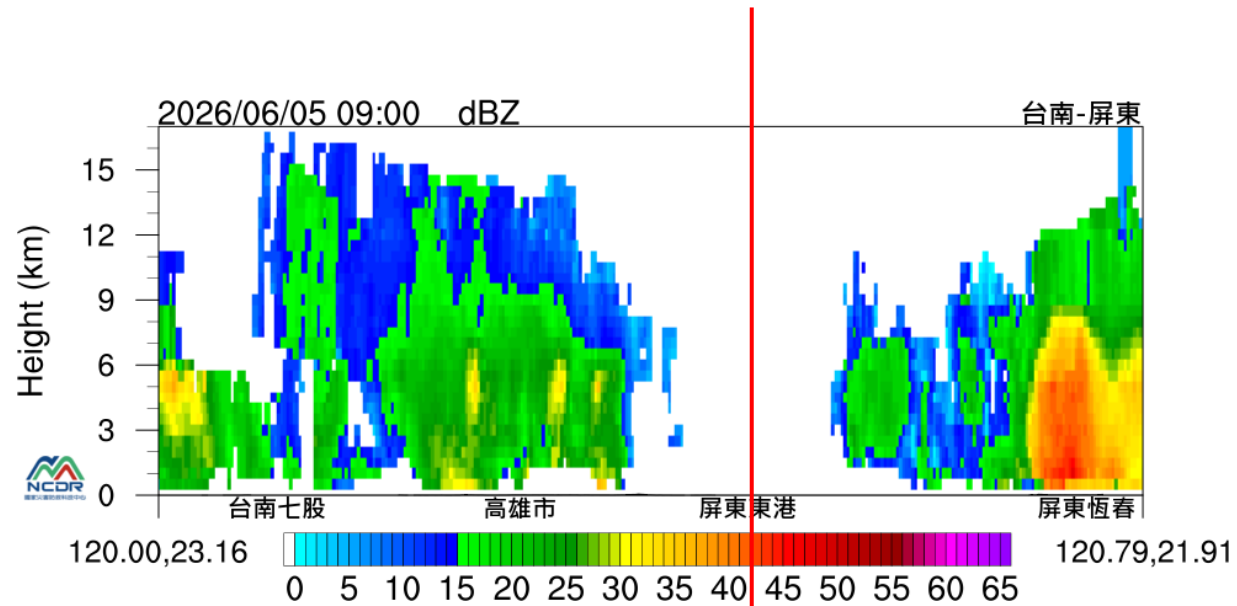


NCDR WATCH
全台風場反演分析 - WISSDOM

https://watch.ncdr.nat.gov.tw/watch_wissdom_taiwan







[2] Primary Hazards

a. The tropical disturbance 91W was formed on 04 June 2026, and the greatest threat to Taiwan was heavy rainfall rather than destructive winds. Deep tropical moisture associated with 91W could combine with the southwest monsoon and seasonal rain bands, producing periods of torrential rain, especially across eastern, southern, and mountainous regions.

The locations of accumulated rainfall between 0000L of 4 June 2026 and 1320L of 5 June 2026 distributed throughout Pingtung County and Kaohsiung City, primarily due to 91W approach and pass by. **The maximum 37h accumulated rainfall rates were 217mm (Chunri 春日鄉), 214mm (Fangshan 枋山鄉) & 211.5mm (Shizi 獅子鄉).**

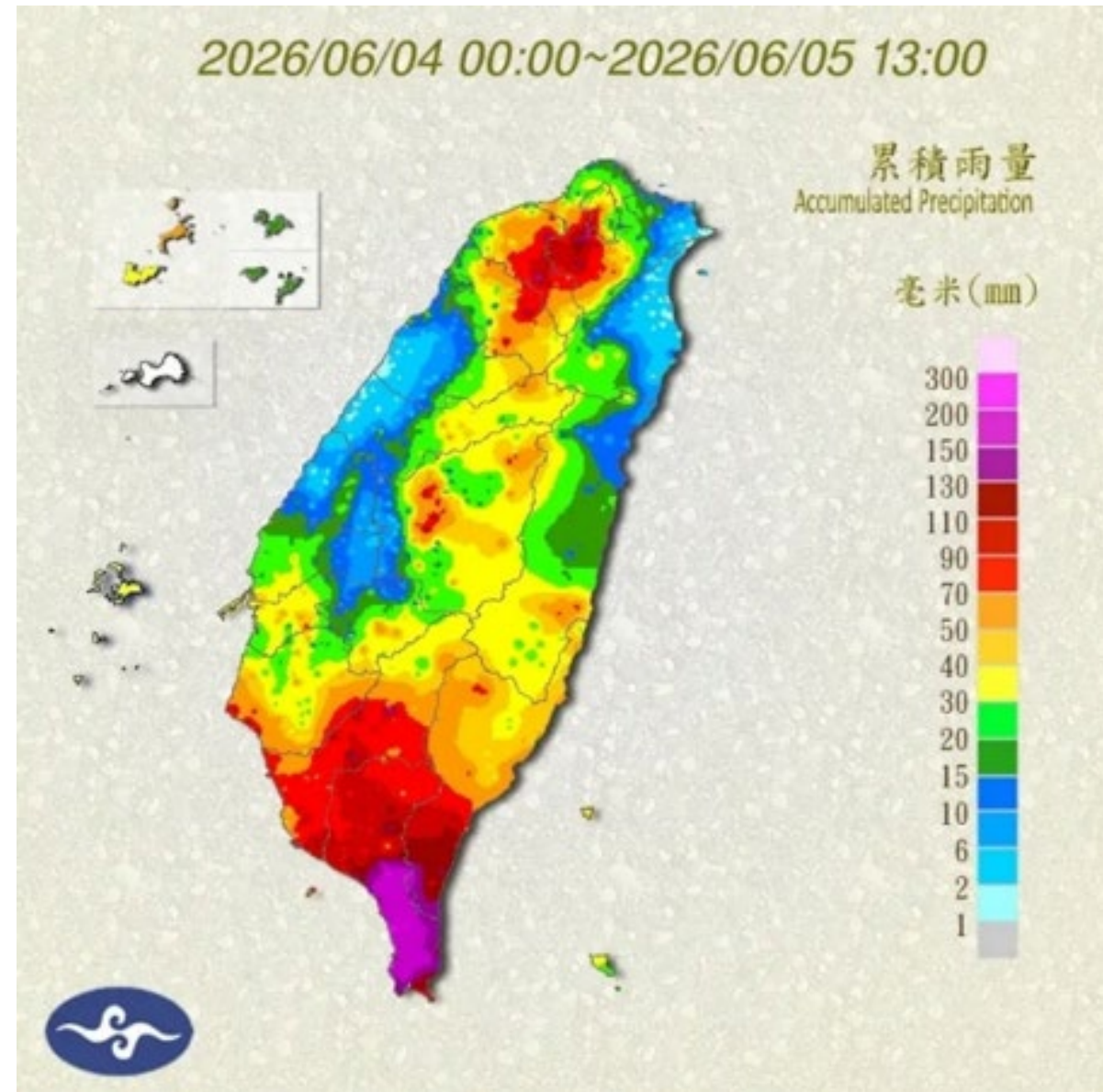
b. The torrential rain **affect the Irwin mango harvest** in Fangshan 枋山鄉, and more than 5 cars got **flat tires** due to pothole damage in Zuoying 左營區. Again, several **traffic accidents** were reported at Kaohsiung section of National Freeway No.1 caused by poor visibility.

91W made landfall at Donggang 東港 in the morning (0830TST) of 05 June 2026, and left Taiwan's east coast in the evening, lingering over Taiwan about 12 hrs. ²⁸

37h Accumulated Precipitation 2026.06.04.00TST-05.13TST

The top 10 accumulated precipitations for the duration of **37 hrs** distributed primarily over the Pingtung area due to the influence of 91W approach.

- 217mm. Chunrih, Pingtung 春日鄉
- 214mm. Fangshan, Pingtung 枋山鄉
- 211.5mm. Shizi, Pingtung 獅子鄉
- 199mm. Liugui, Kaohsiung 六龜區
- 188.5mm. Dahsi, Taoyuan 大溪區
- 185mm. Hengchuen, Pingtung 恆春鎮
- 184.5mm. Mudan, Pingtung 牡丹鄉
- 179mm. Checheng, Pingtung 車城鄉
- 175mm. Manzhou, Pingtung 滿州鄉
- 168mm. Zhonghe, Newtaipei 中和區



(3) Possible Causes

● The tropical disturbance 91W was formed on 04 June 2026, and the greatest threat to Taiwan was heavy rainfall rather than destructive winds. It made landfall at Donggang, Pingtung at 0830TST on 05 June 2026, and left Taiwan's east coast that night, **lingering over Taiwan about 12hr with moving speed of 25km/h (~6.9m/s) in NE direction.**

This was a simple tropical disturbance case without any significant external factors to support its development. **The primary rainfalls were triggered by the interaction between its outer rainbands and the Dawu Mt. Range大武山脈.** Therefore, most of the resulted disaster cases were less severe.

● **However, the important contribution made by tropical disturbance 91W was it opened a channel for the distribution of southwestern flows for Taiwan area and brought the most significant and long-lasting precipitation during this Mei-yu season later.**

2025.12.~2026.03.台灣西部地區累積雨量創1951年來最低紀錄！(115/09/01, CWA陳孟詩副組長專報)

4. Flood Disasters Involved in TY Danas丹娜絲 (#2504)

(1) Weather Situations:

Heavy Rainfall & Severe Flood Case on July 6 Flood (moderate typhoon)

● 7/04/0800L tropical depression > 7/05/0200L tropical storm
> 7/06/1130L moderate typhoon > **7/06/2340L landfall at Budai布袋**
> 7/07/0600L leave near the border of Taoyuan and Hsinchu.

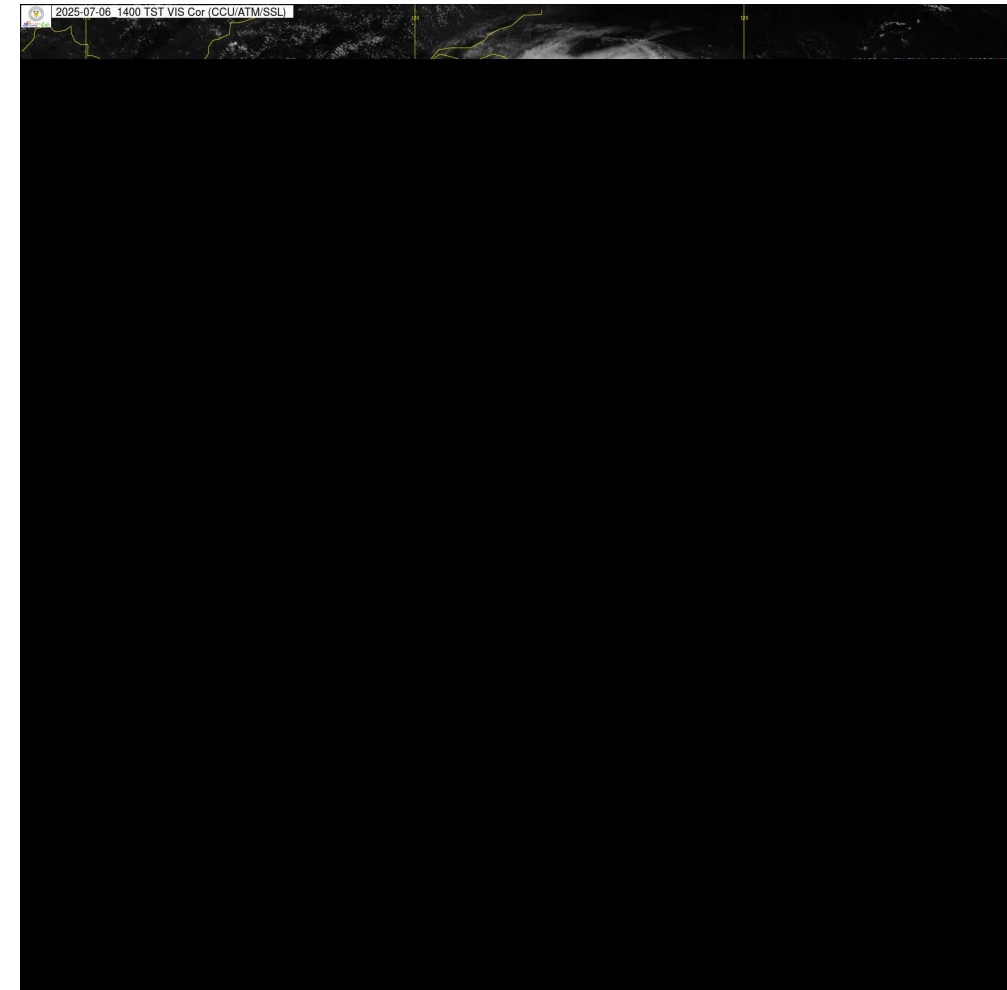
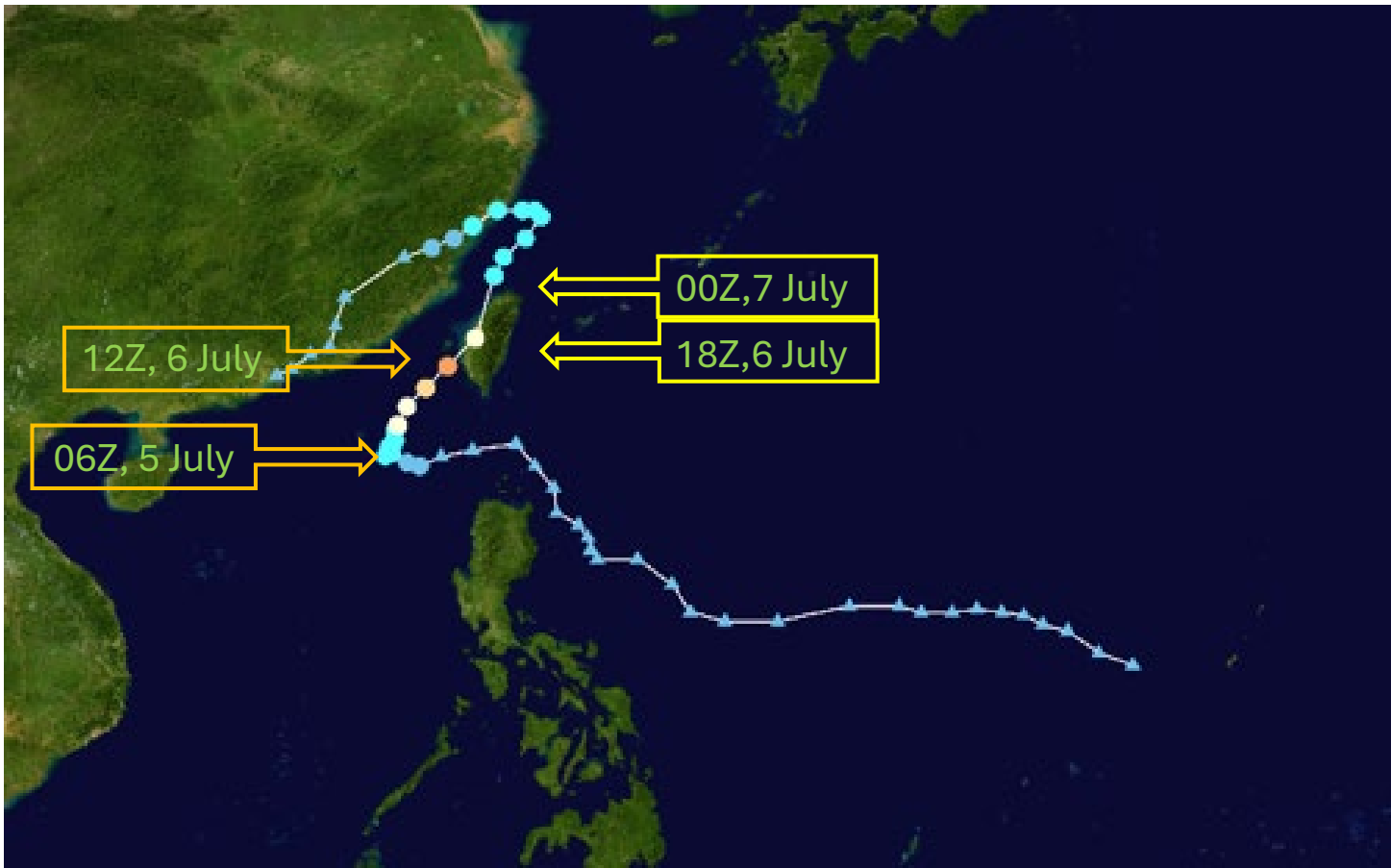
Moving speed: 15km/h (~4.2m/s) in NNE direction

A length of stay in Taiwan: ~ 6hr.

<https://zh.wikipedia.org/zh-tw>

● The **heavy rainfall** event on **06-07 July 2025** due to the influence of typhoon Danas (2504) brought severe flash floods with landslides, damage of roads, houses and crops in southwestern areas of Taiwan.

● The **high winds** accompanying with typhoon circulation resulted in **many damage events**, such as power outage, destruction of feed silos and floating solar farm in Yunlin, Chiahi and Tainan counties.



Left: Best track for TY Danas (#2504) in 2025.

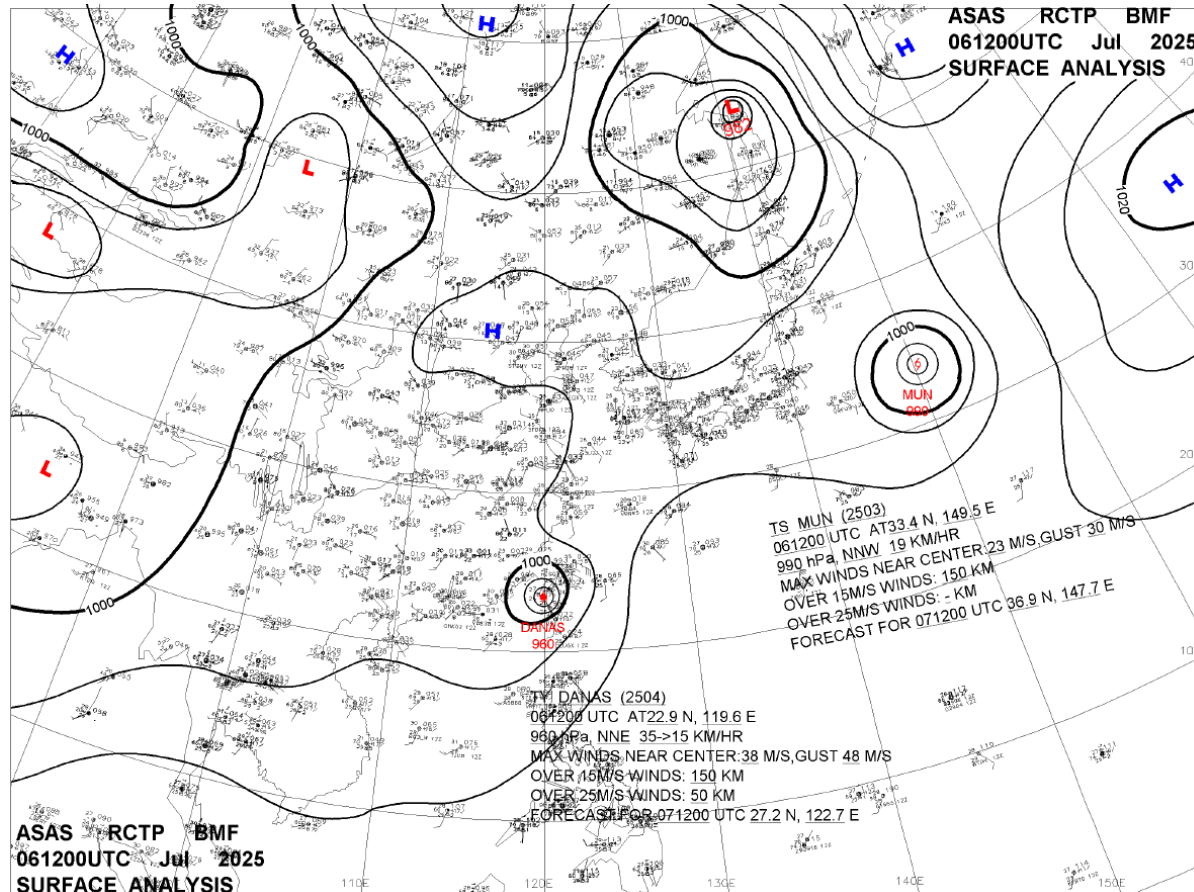
Right: TY Danas was approaching the southwest coast of Taiwan at 1400TST on 6 July 2025 with a clear eye.

[Wikipedia:WikiProject Tropical cyclones/Tracks](https://en.wikipedia.org/wiki/Wikipedia:WikiProject_Tropical_cyclones/Tracks). The background image is from NASA. Tracking data is from NOAA.

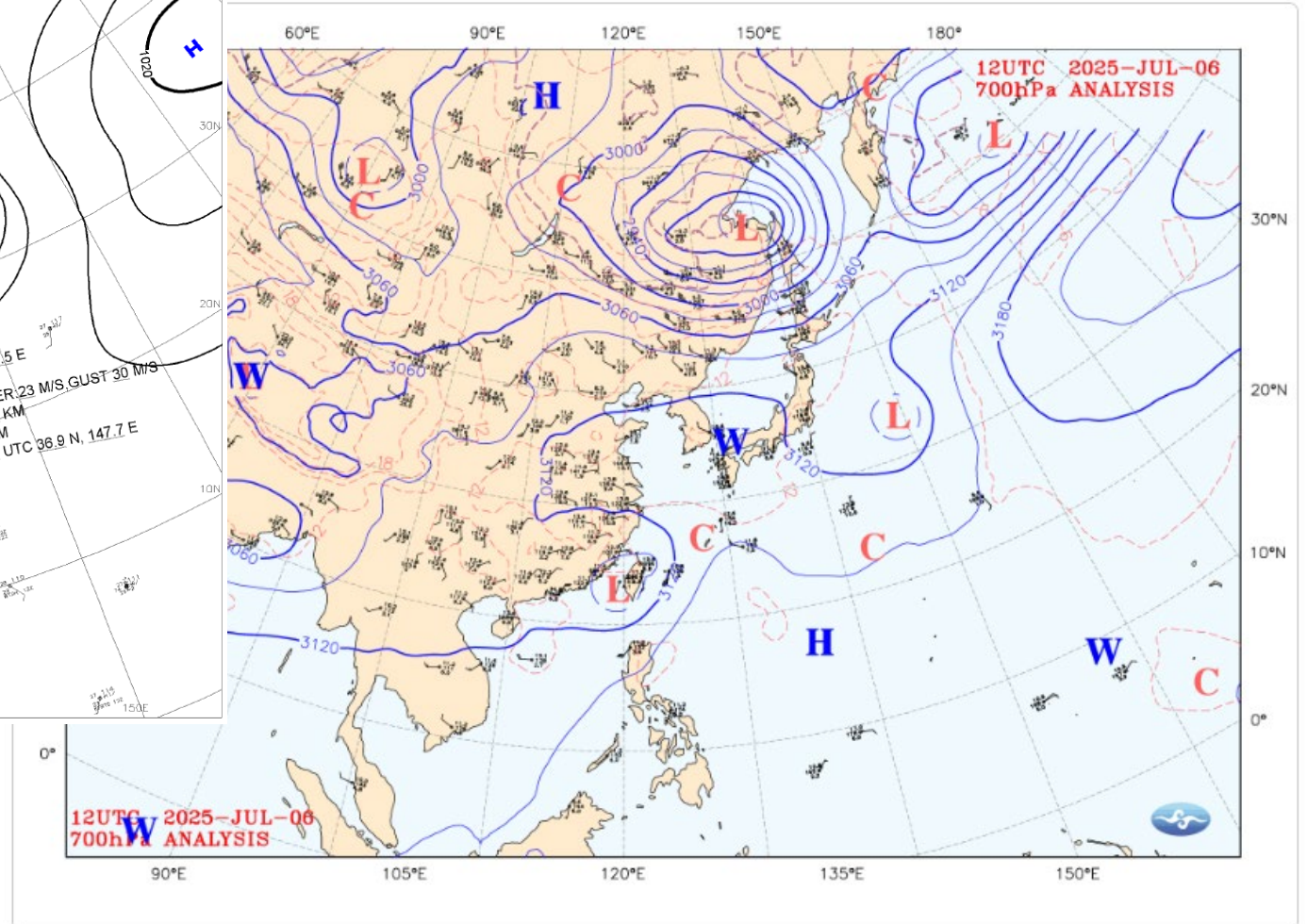
TY Danas landing time: 2340TST, 6 July 2025, moving speed: 15km/h (~4.2m/s) in NNE dir.

TY Danas leaving time: 0600TST, 7 July 2025,

700hPa Synoptic Chart 2025.07.06.1200UTC

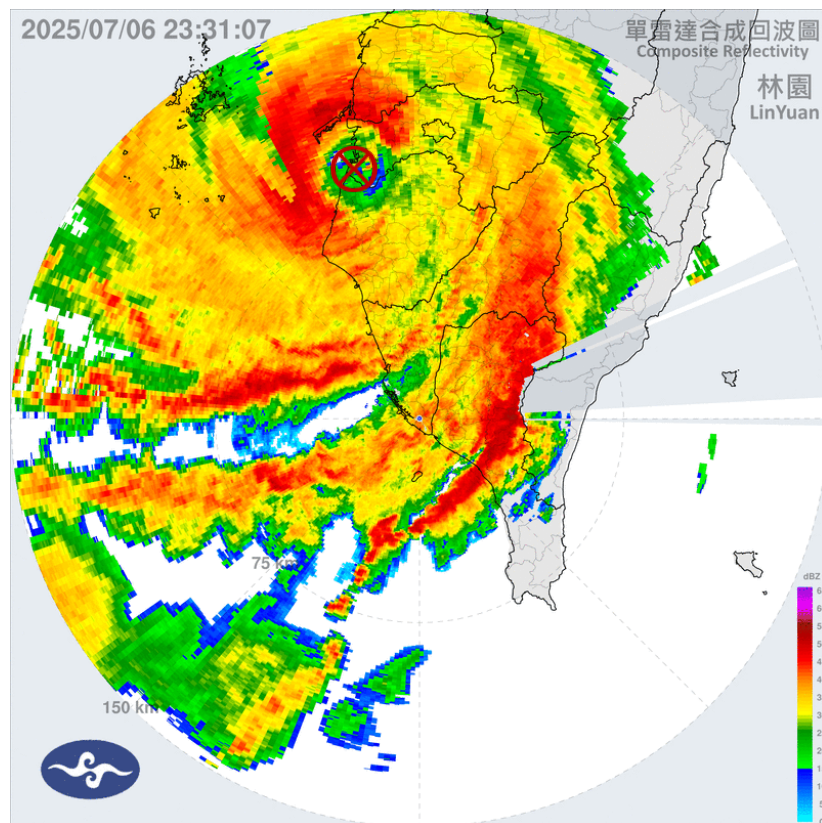


Surface Synoptic Chart 2025.07.06.1200UTC

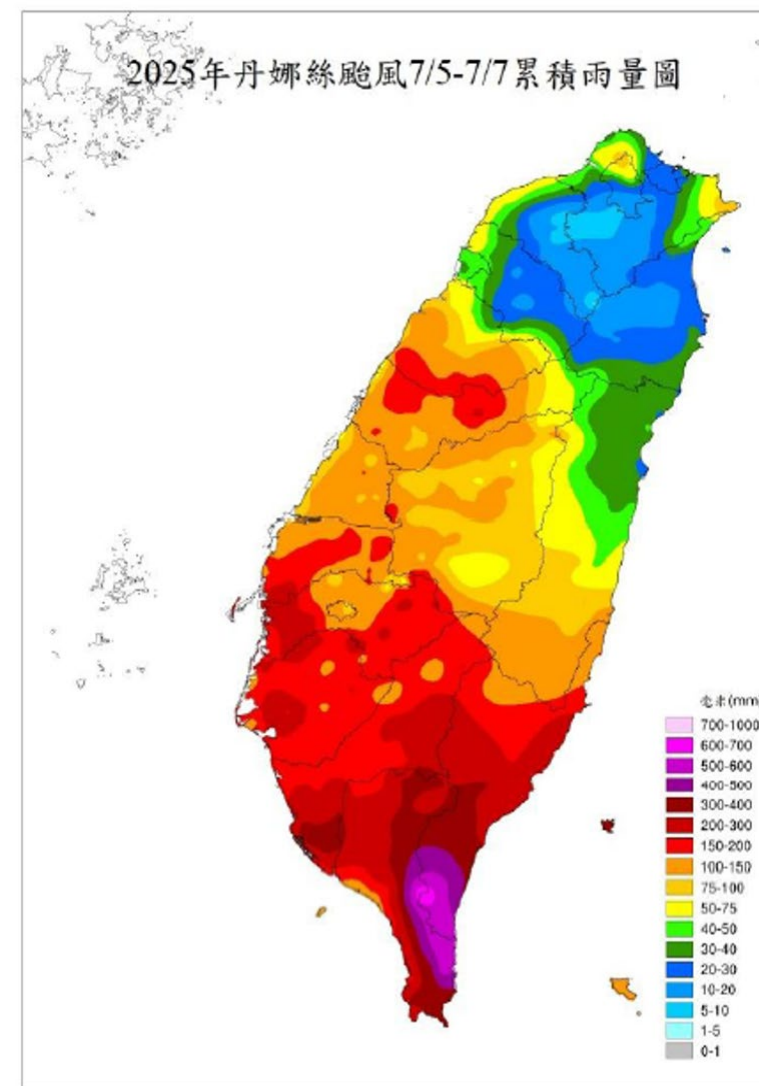


Ty Danas 丹娜絲 (#2504) made landfall at Budai 布袋, Chiayi 嘉義 at 2340TST of 06 July 2025, and tracked offshore near the border of Taoyuan and Hsinchu at 0600TST on 07 July.
Adopted from <http://cwa.gov.tw>

The composite reflectivity (dBz) observed by Linyuan
林園 rain radar (RCLY) at 233107TST, 06 July 2025.



72hrs Accumulated precipitation (mm) chart
bet. 2025/07/05/0000TST~07/07/2400TST

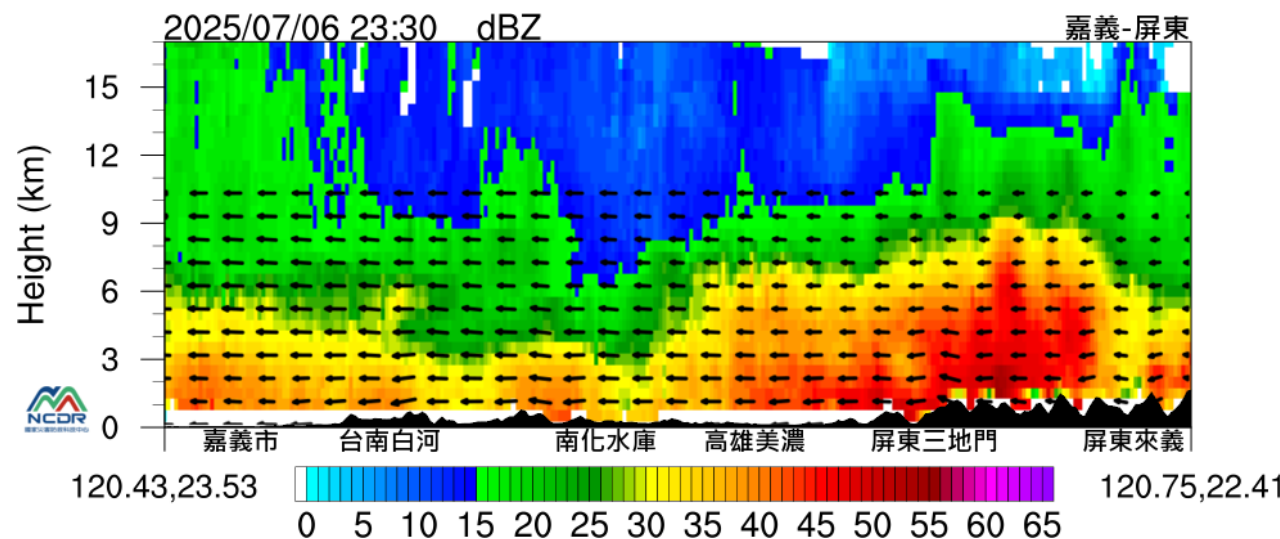
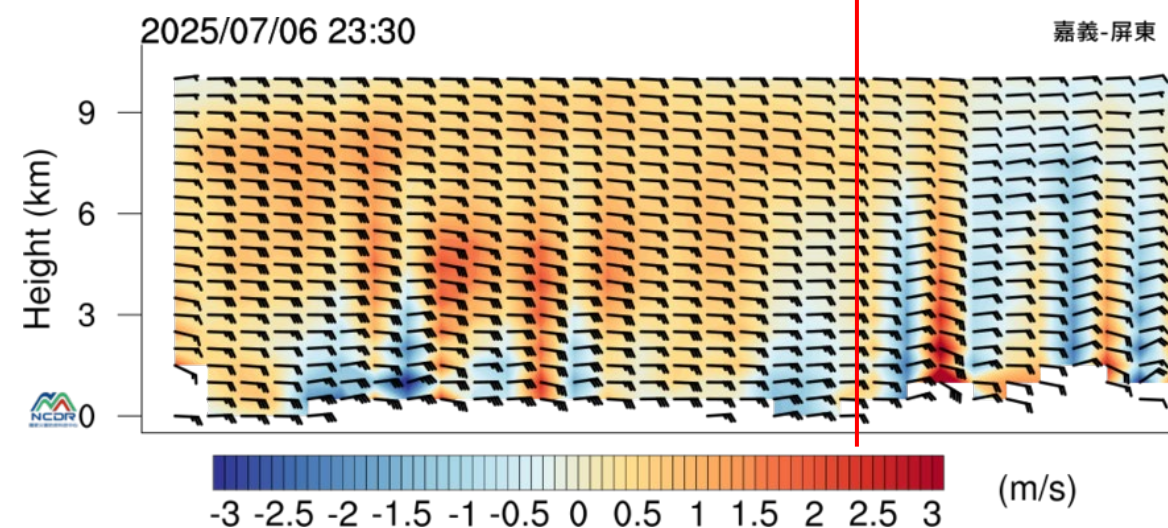
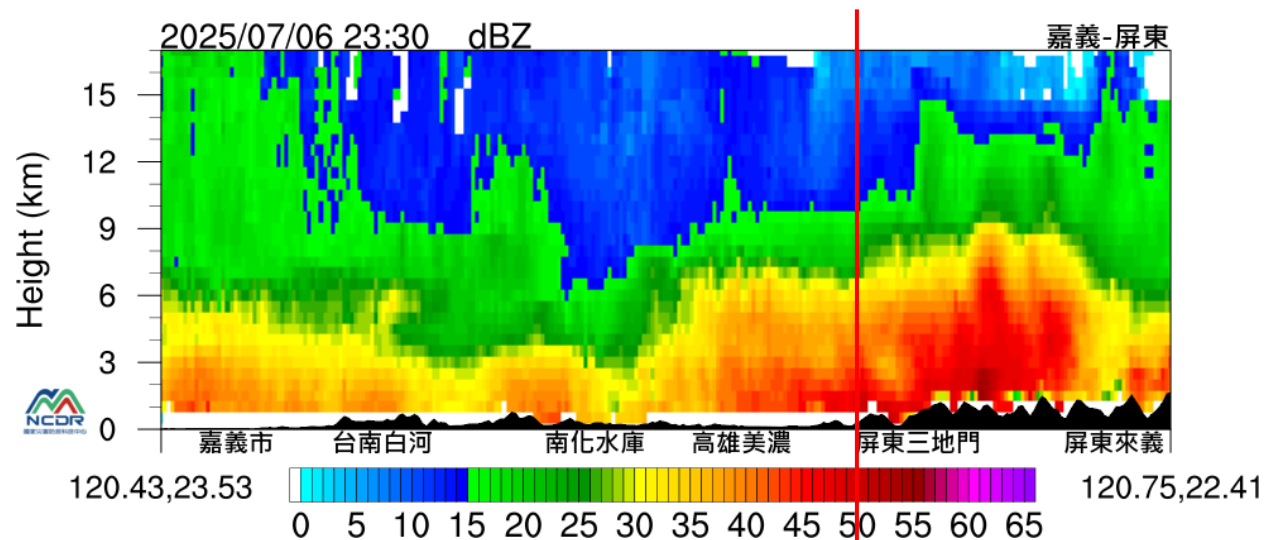


The top 3 of accumulated precipitation bet. 7/05/00L~7/07/17L :
658mm at Mudan牡丹, Pingtung, 583mm at Tajen Forest達仁林場,
Taitung and 391mm at Daliao大寮, Kaohsiung.

The max gust winds:

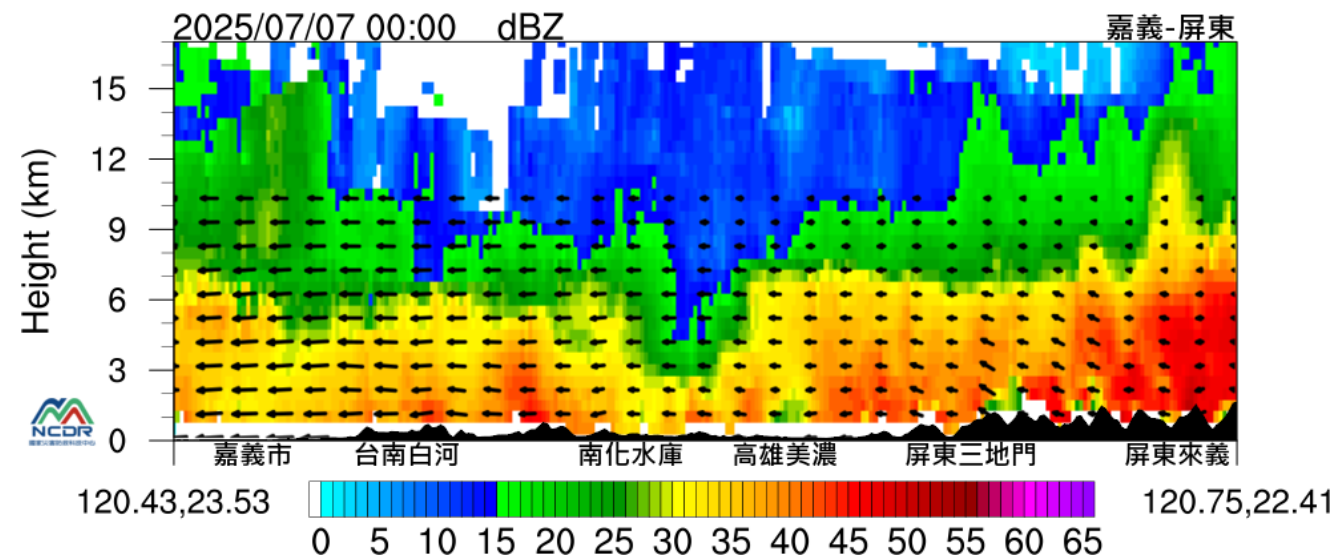
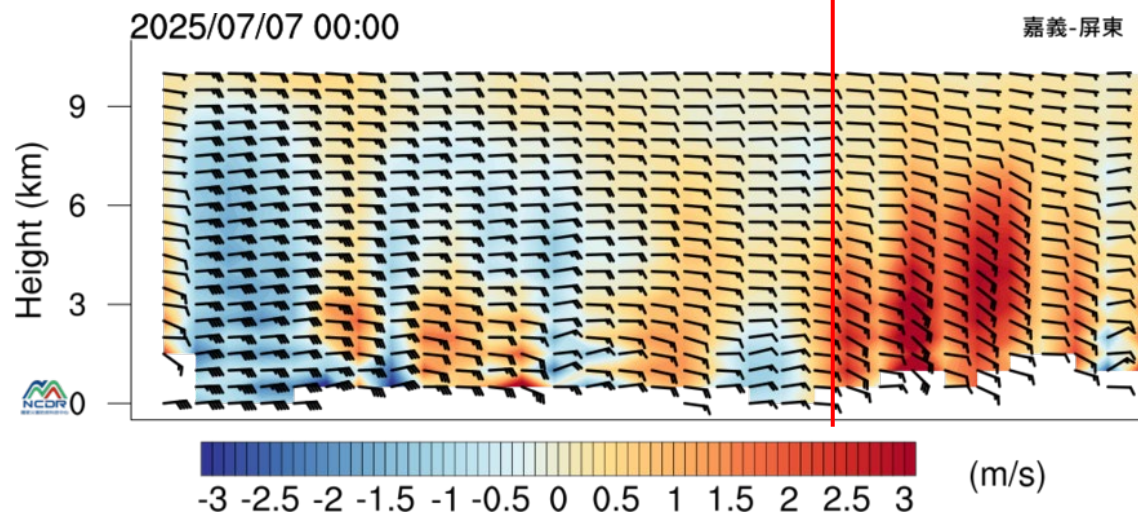
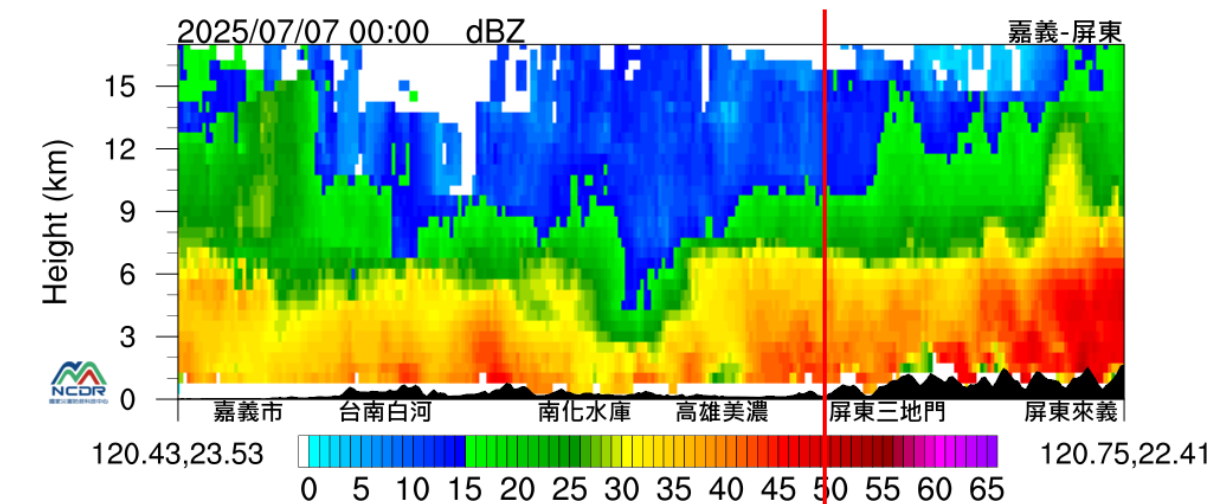
level 16 gust 52.4m/s at Dongji Island東吉島, level 13 gust 41.4m/s
at Tainan台南 and 39.8 m/s at Chiahì嘉義.

嘉義-屏東



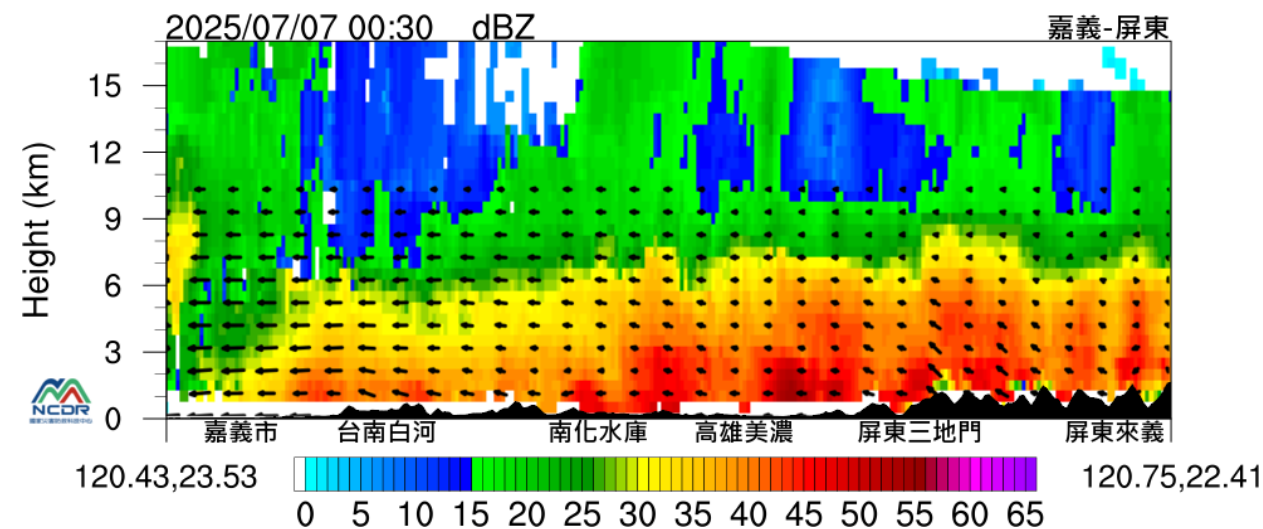
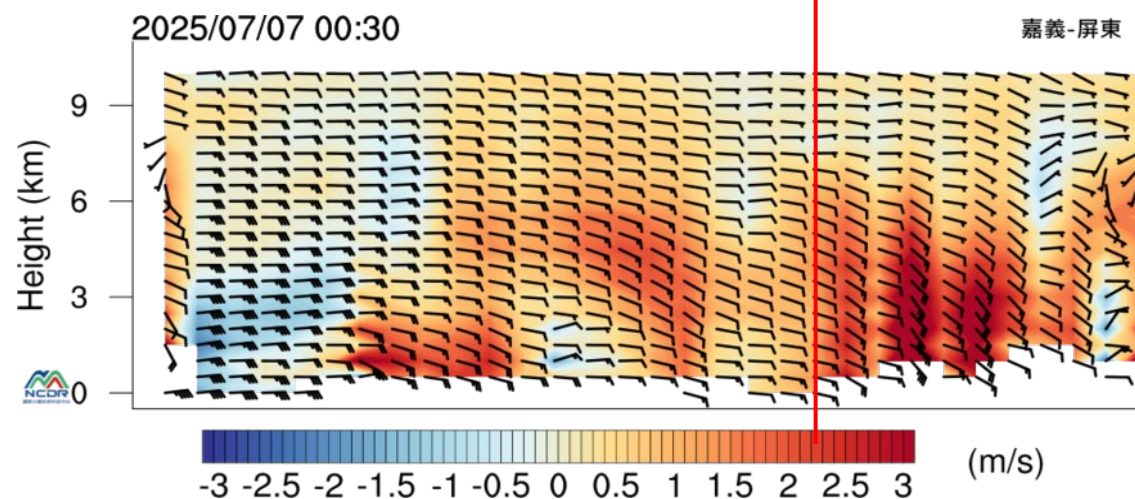
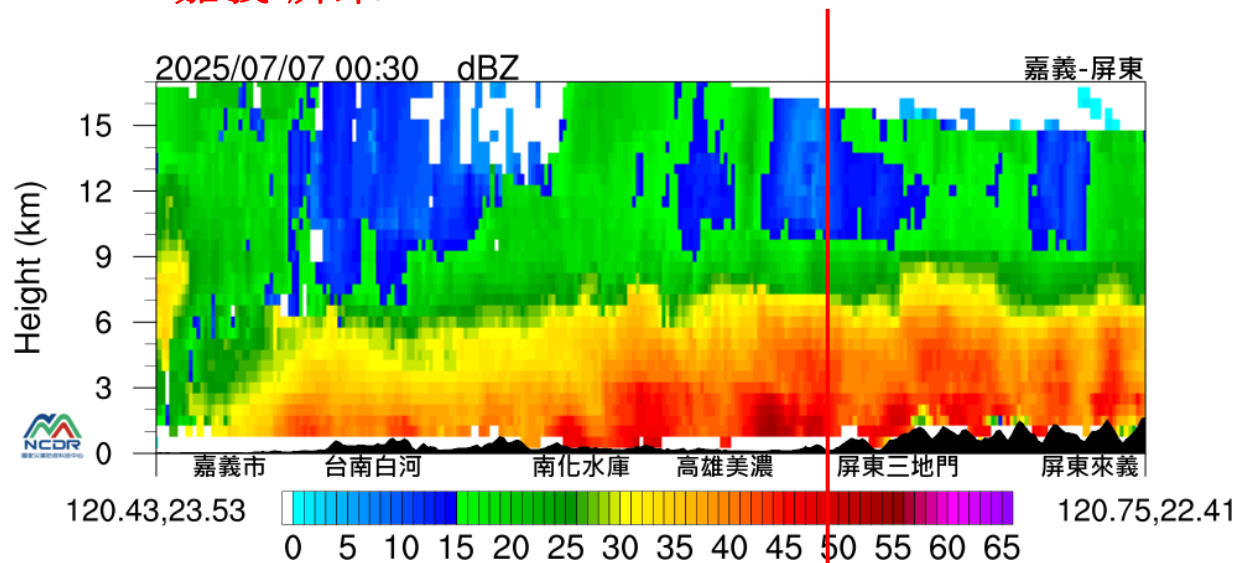
NCDR WATCH 嘉義-屏東 Echo Profile & Wind Field
https://watch.ncdr.nat.gov.tw/watch_dbzprofile_map

嘉義-屏東



NCDR WATCH 嘉義-屏東 Echo Profile & Wind Field
https://watch.ncdr.nat.gov.tw/watch_dbzprofile_map

嘉義-屏東



NCDR WATCH 嘉義-屏東 Echo Profile & Wind Field
https://watch.ncdr.nat.gov.tw/watch_dbzprofile_map

Torrential Rain & Storm Wind

● Top 3 in **accumulated precipitation** bet. 7/05/00TST~7/07/17TST:

658mm at Mudan牡丹, Pingtung, 583mm at Tajen Forest達仁林場, Taitung and 391mm at Daliao大寮, Kaohsiung.

● Max **gust winds**:

Level 17 gust at Kouhu口湖, Yunlin, level 16 gust at Lucao鹿草, Chiayi, Beimen北門, and Cigu七股, Tainan, Dongjin Island東吉島, level 13 gust at Tainan台南 and Chiahi嘉義.

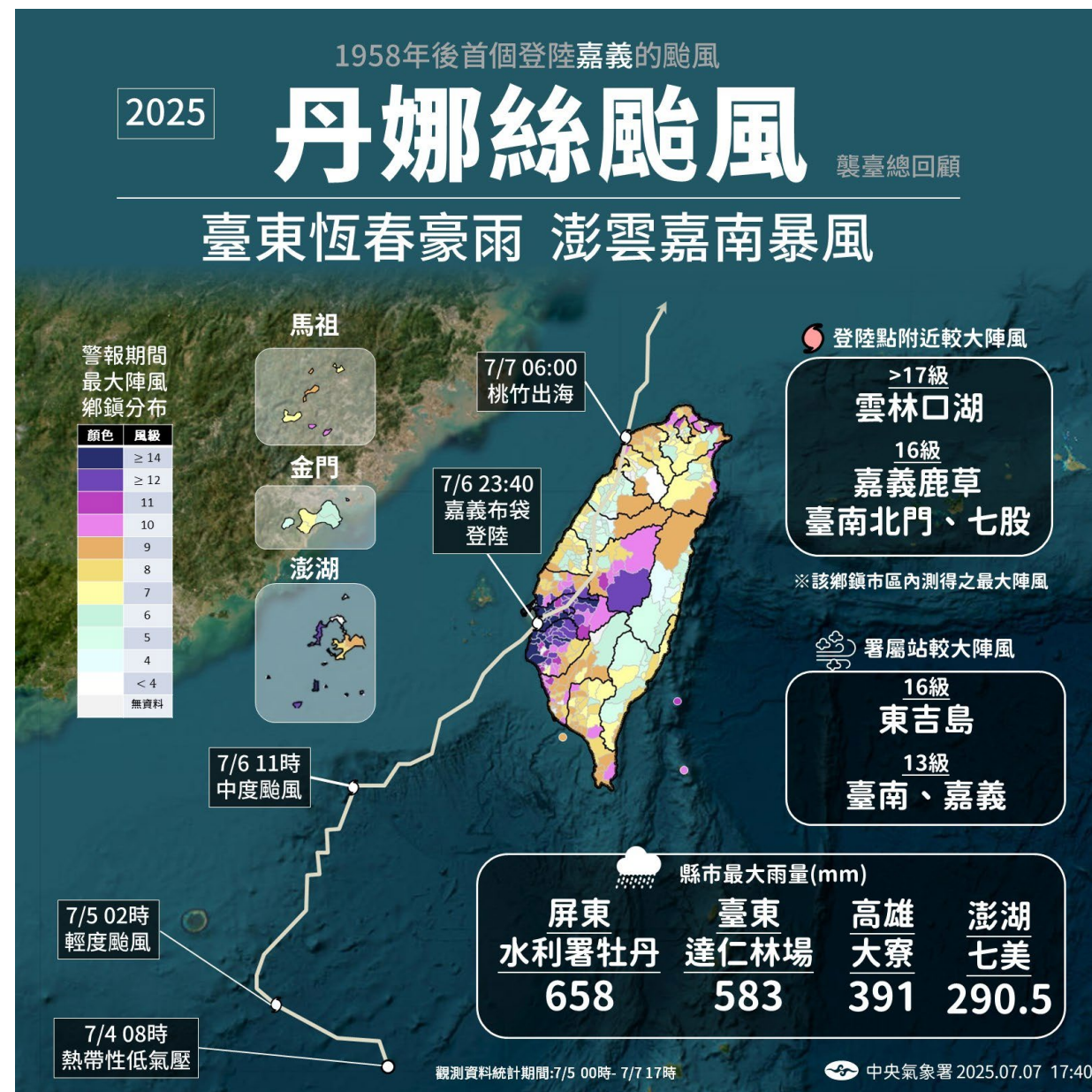
Max gust wind at Dongjin東吉島: 52.4m/s.

Highest winds: 40.0m/s (~144 km/h)

10-minute sustained (CWA)

Lowest pressure: 950 hPa

[https://en.wikipedia.org/wiki/Typhoon_Danas_\(2025\)](https://en.wikipedia.org/wiki/Typhoon_Danas_(2025))



2025.07.05.0000L~07.1740L

圖片來源：中央氣象署

[2] Primary Hazards

Power outage: 980,000 households; disaster-related incidents: 9,801; dead: 2; injured: 726; losses in the agriculture and fishery industries: NTD 2.65 billions.

https://rdc28.cwa.gov.tw/TDB/public/typhoon_detail?typhoon_id=202504



Damage Events:

Left: Power outage due to the extensive falling of power poles in Chiayi.

Right: Feed silos in Yijhu義竹 were destructed by intensive stormwinds.

Damage Events: Budai Xinwen 布袋新塢 floating solar farm in Chiayi along the western coast of Taiwan was severely destroyed by TY Dansa (#2504).



嘉義2.88億光電場遭丹娜絲轟爛 網：核電挺過40年 光電一次就GG。2025.07.10. 壹蘋新聞網 施養正
TY DANAS丹娜絲橫掃嘉南！義竹產業園區「災如戰區」農損初估逾2億。2025.07.07.聯合報 劉學聖¹⁰

(3) Possible Causes

● TY Dansa丹娜絲 (#2504) had a short stay over land for more than 6hrs (2340L on 6 July ~ 0600L on 7 July) with the lowest center pressure of 960hPa. During approaching Taiwan, its winds intensified rapidly due to the warm water temperature of 29° C in South China Sea, and **the weak steering flow and vertical wind shear flanked by two anti-cyclonic systems in middle atmosphere.** Also, it **made a 90-degree right-turn** at 0800TST, 05 July from westerly motion to northerly one.

After landing, **the effective integration of strong winds, high moisture content, slow moving speed** (15km/h ~ 4.2m/s) in NNE direction and **blocking effect** of the Central Mountain Range caused **torrential rains** in south and central Taiwan.

● After landing, TY Danas reached to the max wind of 52.4m/s (~102 kts), equivalent to Beaufort force 16. The damage from this windstorm was worse than expected. **The total loss reached NTD 2.65 billions.**

5. Conclusions & Discussions

- From the disaster prevention point of views, heavy downpours and gale-force winds initiated by tropical disturbances/TDs can't be ignored completely. More information input for nowcasting is quite significant for early warning, well preparation & disaster prevention. (115/9/1, CWA陳椿喜主任提及規劃TD預報作業)
- Several factors for disaster preparation on tropical disturbances/TDs are included: **external forcings, moving track, duration of stay, amount of rainfall, and intensity of storm wind.** Also, the **topographic effect** is a key issue for assistance or resistance of the storm circulation after landing.
- Based upon two cases study above, the primary issue will be the propagating speed of storms. Prof. Hung-Chi Kuo郭鴻基 mentioned that **the total precip. amount** brought by typhoons in Taiwan area is **directly proportional to the time duration of stay** (2013). The similar conclusion comes out from this study. **When the moving speed of tropical disturbances/TDs is less than 10m/s, it will linger or remain quasi-stationary over the Taiwan area, causing heavy rainfall and astonishing floods.**

Question Raised by an Officer in Highway Disaster Prevention Center on 2 June 2026

Question. It's hard to believe that the **TY Dansa**丹娜絲 (#2504) caused massive destruction on the onshore wind turbines and offshore floating photovoltaic (OFPV) along the western coast of Taiwan. There doesn't appear to have been similar disasters before. (02 June 2026)

Answer. The August 7 Flood Disaster involved in **TD81** (max winds <33 knots) in **1959** is a typical and devastating case which made landfall at Budai布袋, and caused torrential rains in south and central Taiwan and created constructive flooding. The total loss reached **NTD 3.7 billions**, equivalent to approximately 12% of the national income of year 1958. **TY Danas in 2025** gradually intensified in wind power after approaching Taiwan and reached to the max wind of 40m/s (~80 knots), equivalent to Beaufort force 13. The damage from windstorm will only be worse than expected. The total loss reached **NTD 2.65 billions**. **A length of stay in Taiwan: 23hr. vs 6hr.**

交通部公路局公路防災中心副執行祕書李佳輯提問：115.06.02.台中市西區大全街127號
為何颱風的風力能破壞台灣西部海岸的陸上風機和光電板電網？過去好像沒有類似的災害發生！

Heavy Rain and Flash Flooding in Las Vegas, Nev., in 1981

Case. Late on a summer afternoon, a large and severe thunderstorm developed over southern Nevada. The storm was easily detected by satellite imagery as it formed at the point of intersection of two well-defined lines of convection. **NMS (National Meteorological Service)** offices had recognized the potential for heavy thunderstorms and worded their forecasts accordingly. Once the storm developed, actions by NWS forecasters followed textbook procedures. Then **hurricane force winds from the thunderstorm caused a massive power failure.** Even though supplied with emergency backup power, **the local NMS office effectively lost telephone service.**

Problem. The intense thunderstorm produced rain within a few hours, causing record-breaking flash floods in several valleys. **Residents of the hardest hit areas reported that the storm struck without warning due to failure of communication and forecast dissemination systems at a critical time.** In this case a variety of operational problems seriously degraded the effectiveness of the forecast.

Smith, et al., 1986: Forecast Problems: The Meteorological and Operational Factors. Mesoscale Meteorology and Forecasting. Edited by Peter S. Ray, AMS.

Process of Producing an Effective Weather Forecast

Activity	Forecasting Problems_ Meteorological	Forecasting Problems_ Operational
Observation: 觀測 What is going on?	Identifying scale of importance 確認重要的天氣尺度作用	Data: Availability, Quality, Representativeness, Timeliness
Diagnosis: 診斷 Why is it happening?	Adequacy of analysis techniques 適當的分析技術 Adequate diagnostic models 適當的診斷模式	Effective data assimilation 有效的資料同化 Forecaster focus 預報員關注焦點 Appropriate local use models 符合當地需求的預報模式
Forecasting: 預報 How is it going to change	Adequate conceptual and prediction models Understanding of scale interaction 瞭解尺度交互作用	Adequate local analyses to complement numerical guidance Appropriate forecaster focus 適當的預報員關注焦點

Also, effective and secure dissemination systems are quite important even in today's digital age !



**Lightning damage to the body of a P-61C
Black Widow during the Thunderstorm Project
in Ohio – 1947. (Northrop P-61C Black Widow, US Army Air Forces fighter 戰鬥機)**

空軍志航機場F-5E飛入強烈對流雲中遭遇
雷擊而受損(潘大綱博士提供)



強烈颱風Bilis蹂躪後的C波段
都卜勒氣象雷達天線基座
2000.08.23.



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https://watch.ncdr.nat.gov.tw/watch_wissdom_taiwan

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<https://www.archives.gov.tw/tw/arctw/69-1975.html>
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- 何台華、徐天佑、曾俊傑、朱炯光，2023，從熱帶低壓擾動淺談2023年9月10日嘉義地區暴洪事件之天氣分析。第32屆國防科技學術研討會，桃園，龍潭。2023.11.10
- 聯合報，2026：紅霞外圍豪雨襲台東 EMU3000新自強號漏水…旅客直呼傻眼。2026-07-25 12:54 記者尤聰光。<https://udn.com/news/story/7266/9650458>
- 民視新聞，2026：紅霞颱風外圍環流發威 大雨狂炸花東地區。2026-07-25 16:04。
<https://today.line.me/tw/v3/article/12R1vLv>

ABSTRACT

The heavy rainfall event on **4-6 June 2026** due to the influence of **tropical disturbance (91W)** brought severe **flash flood** with landslides, damage of roads, houses and crops in Taiwan areas. The objective of this research is to realize the large-scale dynamic conditions, and furthermore, the physical mechanisms from the mesoscale point of views to find out the approximate approaches for **disaster prevention** and early warning.

The primary findings suggest that under the influence of Pacific High and 91W, a convergent effect of Pacific high (1014hPa) and southeasterly steering flow was located off the east and southeast area of Taiwan in an intensely unstable environment, and this weather pattern made **91W landfall at Donggang, Pingtung at 0830L, 5 June 2026, propagate northeastward in slow speed (~25km/h), and move to the waters off Hualien at night, staying over land about 12 hours.** Furthermore, the sustained surface winds could reach 23 to 28 knots (13-14m/s) just before landfall. Its vertical structure analyzed by WISSDOM was in a northward tilting appearance, and its primary vortex could reach 5km in height, obviously blocked by the southern part of Central Mountain Range. The well-organized vortex resulted in heavy rainfall over the southmost part of Taiwan with maximum hourly rainfall of 66.5mm (屏東南州) and 37h accumulated rainfall of 217mm (屏東春日), respectively.

The forecasts of external forcings, storm track, duration of stay and intensity of wind field are the key factors for disaster preparation, and more information input for nowcasting is quite significant for well preparation, including observed and simulated products. Also, well-organized concept models based on multiscale weather scenario for the early warning and prevention of disaster are necessary.

【Key words】 : tropical disturbance, flash flood, WISSDOM, disaster prevention