Fishing boats moored yesterday in Lianyungang city, Jiangsu province, in preparation for the arrival of Typhoon Dolphin. Photo: Xinhua

Huge typhoon set to hit coastal provinces

Shipping halted and fishermen evacuated but a storm measuring 1,230 times the size of Hong Kong means inland residents must also stay alert for flash flood warnings

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Ferry routes have been suspended, construction halted, fishermen evacuated and drones deployed to patrol over the sea as coastal provinces prepare for the landfall of Typhoon Dolphin, the fourth to hit the country this summer.

As of yesterday morning, Dolphin was about 820km from China's east coast, the National Meteorological Centre said. It is forecast to make landfall between Zhejiang and Fujian provinces sometime from tomorrow afternoon to Monday morning.

The centre maintained Thursday's yellow alert, the third-highest level on a four-tier scale, warning of strong winds and rain across Zhejiang and Fujian provinces as well as Taiwan. Meteorologist Shen Yuyang said by yesterday morning, the typhoon had grown to nearly 13 times the size of Zhejiang, or 1,230 times the size of Hong Kong.

It was not clear where the storm might travel after landing, the centre said, but estimated it could track west or northwest.

With Typhoon Dolphin approaching the 48-hour alert zone, authorities had deployed new technology to prepare for its arrival, state broadcaster CCTV reported on Thursday. An artificial intelligence forecasting system at the National Marine Environmental Forecasting Centre could allow prediction of the typhoon's route, strength and landfall factors for the next 240 hours, the report said.

The typhoon's large wind radius meant inland residents should also pay attention to it, not just those living on the coast, it quoted the marine centre as saying.

The CCTV report warned that heavy rain could hit multiple provinces – including Zhejiang, Fujian, Jiangxi, Hunan, Hubei, Anhui, Jiangsu, Henan and Shandong – and urged residents to stay alert for flash flood warnings.

In Zhejiang, a level 2 emergency response – the second highest – was launched yesterday morning, with authorities halting 162 ferry routes and 193 construction projects on the water, and docking 474 ships, while 15 towboats were standing by in case of emergency, according to CCTV.

In the coastal city of Ningbo in Zhejiang, all seaside tourist and sports activities were temporarily halted. Fujian issued a level 4 emergency response on Thursday, urging all cities to secure fishing vessels, ferries and offshore wind power platforms. It also ordered safety inspections, evacuations from high-risk areas and preparation of emergency supplies.

Shanghai could be the hardest-hit if Dolphin lands in northern Zhejiang and moves northwest, according to CCTV. It said that until Monday the city could experience strong winds and accumulated rainfall exceeding 10cm.

Dolphin arrives close on the heels of typhoons Maysak, Bavi and Noul, which left at least 50 dead on the mainland and led to estimated economic losses of at least 23 billion yuan (HK$26.7 billion), media reports said.

Meteorologists warn that residents must be vigilant for extreme weather in August, especially with a strong El Nino event on the horizon. This month, multiple regions across China are experiencing more rain than usual, with the risk of flooding, landslides and reservoirs exceeding warning levels, meteorologist Jia Xiaolong told Xinhua.

He said two or three typhoons were expected to strike or affect China in August, with a risk the storms could travel deep into the north and northeast of the country.

Quantum role for old-school graphite

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Graphite has long been a workhorse of industry – used in pencils since the 1500s, in steelmaking during the 1800s and today in battery electrodes.

Research from Peking University now suggests it could even play a role in next-generation quantum computers.

According to a paper published on July 23 in Science, the team has cleared a major obstacle on the road to practical quantum computers with a realistic platform for the production of graphene-based quantum chips.

The team, led by Liu Kaihui, was able to fabricate a long-sought-after form of graphene – the building block of graphite – known as rhombohedral graphene, at a purity and size that had been unachievable until now, the paper said.

Rhombohedral graphene is prized for its ability to host exotic quantum states but until now has been too unstable to produce at scale.

Zhang Zhibin, a co-first author of the paper, said that previously the only way to obtain the material was through mechanical exfoliation.

"Basically peeling off flakes with tape and then hunting under a microscope for the rare few that happened to have the right stacking, which made up less than 1 per cent of the samples," he said.

In ordinary graphite, multiple layers of graphene are stacked in a staggered, left-right pattern known as AB stacking. For more than a century, most scientific studies of graphite and graphene focused on this conventional structure.

In 2018, a US team led by Cao Yuan found that twisting two graphene layers at a specific "magic angle" of about 1.08 degrees gave rise to strongly correlated electronic states, producing effects similar to high-temperature superconductivity.

In recent years, scientists have come up with a different stacking arrangement called rhombohedral or ABC stacking, which exhibits properties similar to those of magic-angle graphene, while avoiding the strict requirement for precise rotational alignment.

> *If future applications emerge, we'll be ready to build the next generation of quantum devices*
>
> Liu Kaihui, Peking University

In this structure, every three layers form a repeating cycle, with each one of the layers shifted in the same direction relative to the one below. This simple change gives rise to remarkable properties – rhombohedral graphene has been found to exhibit superconductivity and the quantum anomalous Hall effect, in which electrons can move at millimetre-scale distances without losing energy.

That makes it an ideal platform for exploring quantum effects and scientists hope to use it to build topological qubits, a type of quantum computing unit that is largely immune to noise.

The catch is that rhombohedral stacking is unstable and extremely rare in nature. In the laboratory, ABC-stacked graphene tends to spontaneously revert to the more common AB form.

"The samples we produced are over 99 per cent pure, with maximum dimensions of 160 by 80 micrometres and thickness up to 120 nanometres," Liu said. "We can tune the number of layers from several dozen to several hundred as needed."

He added that the material offered "an excellent platform for studying quantum phenomena and, compared with similar materials, it is abundant and easy to process".

"We can't predict how far this material will go, but material preparation is the foundation for further research. If future applications emerge, we'll be ready to build the next generation of quantum devices."

Looking at the broader field, Liu was optimistic.

"Two-dimensional materials already have mature applications in acoustic films and thermal conductors for lithography machines," he said. "In chips, while we haven't seen large-scale replacement of silicon or silicon carbide, there is growing research into integrating 2D materials into the most critical parts – like the most energy-hungry sections of artificial intelligence chips or the highest-density areas of memory chips – to leverage their unique advantages."

According to the study's co-first author Zhao Mengze, the team's next plan is to stitch together smaller pieces of graphene to achieve even larger sizes.

Plan to raise output at world's largest rare earth deposit

State-owned mining company aims to increase yield at Inner Mongolia site to 15 million tonnes

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China plans to expand production capacity of a mine in Bayan Obo in its Inner Mongolia autonomous region with an investment of over half a billion yuan (HK$581 million).

The expansion will raise the mine's annual output by 50 per cent from 10 million to 15 million tonnes at the world's largest rare earth deposit.

Bayan Obo is a complex polymetallic deposit containing iron, rare earths, fluorite, niobium, scandium and thorium.

The project is mainly aimed at increasing iron ore output while rare earths would come as a by-product, according to Baogang Group, the state-owned operator.

The expansion highlights the gap between geological potential and actual production. It will increase mining capacity at one of China's most important iron mines while leaving its rare earth production policy unchanged.

"Rare earth production is subject to quotas, so there is no need to mine more ore," Li Yang, a top geologist at Peking University, said in an interview. "The main purpose is to mine iron, while fluorite is recovered along the way."

The wider Bayan Obo mining area contains about 600 million tonnes of iron ore with an average total iron grade of 35 per cent, according to project documents. That is lower than major Australian iron ore deposits, which typically have grades of around 60 per cent.

However, Bayan Obo remains one of China's most important strategic mineral resources. "Bayan Obo's rare earth resources have been the dominant source of global rare earth production since the 1990s," Li said.

Approved by Baogang Group's board in April, the project will expand the existing open-pit operation.

Baogang Group plans to raise western pit capacity from 10 million to 13.5 million tonnes a year.

A new eastern pit will add another 1.5 million tonnes, bringing total annual capacity to 15 million tonnes.

The company will upgrade mining, stripping and transport systems. It will also expand waste-rock storage areas and install intelligent mining equipment, including 5G-based vehicle dispatch and slope monitoring systems.

The project remains in the feasibility study stage and needs further environmental assessments and construction.

Rare earth elements are essential for electric vehicles, wind turbines, advanced electronics and defence technologies. Demand for these minerals has pushed the United States, Japan and Europe to seek alternative supply sources outside China.

Weeks earlier, Li and his team reported Bayan Obo's underground rare earth resources could be several times larger than the current estimate of 100 million tonnes of reserves.

But larger geological resources do not automatically translate into higher rare earth production. Mining costs, technical challenges and China's quota-based management system continue to limit output.

Chinese and Philippine police boost cooperation

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The Philippine National Police and their counterparts in Fujian province have agreed to deepen intelligence sharing and crack down on international crimes, in a rare display of cooperation between the nations as they clash in the South China Sea.

Police chief Jose Melencio Nartatez Jnr hosted Wang Xizhang, the executive director general of Fujian's Public Security Department, on Tuesday, according to the official Philippine News Agency.

The two sides emphasised the importance of addressing evolving security threats through sustained dialogue, intelligence sharing and capacity-building initiatives, the agency said. The officials also agreed to promote regional peace and public safety through closer cooperation.

"There will be no safe haven for transnational criminals. We will continue working closely with our international counterparts to track, investigate, and bring offenders to justice wherever they operate," Nartatez said.

The meeting also reaffirmed the agencies' long-standing partnership and focused on expanding cooperation in the areas of transnational crime, cybercrime, kidnapping and other shared security concerns, the Philippine police chief added. "The knowledge and best practices gained through this partnership will be cascaded to our operating units," he said.

"We want every police office to be better equipped to investigate transnational crimes, respond to cyber threats and strengthen intelligence gathering through internationally accepted practices."

The meeting came as a long-simmering dispute over territory in the South China Sea escalated. Last week, the People's Liberation Army held joint naval and air drills near the disputed Scarborough Shoal after Manila sought to extend its seabed rights in the strategically important waterway.

Tensions flared last month as vessels from both sides clashed repeatedly in the South China Sea. On July 23, China's coastguard said it drove away two Philippine government vessels near Scarborough Shoal, a hotly contested coral atoll called Huangyan Island by China and Panatag Shoal by the Philippines.

On Thursday, Beijing officially acknowledged for the first time that two coastguard officers died in a vessel collision near the shoal a year ago. The fatalities occurred when a China Coast Guard cutter collided with a Chinese naval destroyer while both were chasing a Philippine coastguard vessel near Scarborough Shoal.

Wang Xizhang of Fujian's Public Security Department is greeted by Philippine police chief Jose Melencio Nartatez Jnr. Photo: Facebook/Philippine National Police