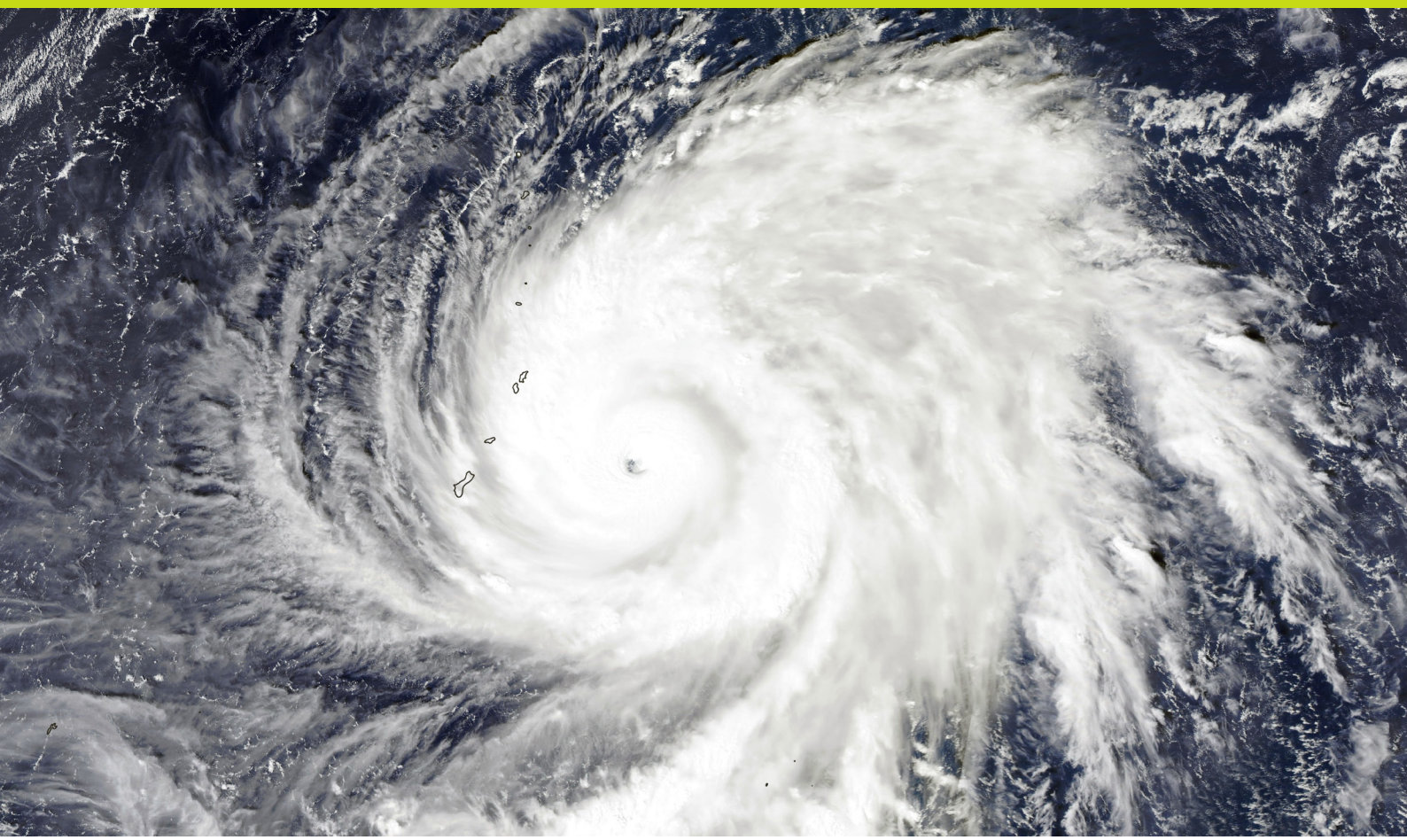
Met Office

Case Study



Developing a global network of science partnerships

With the support of the Newton Fund, the Weather and Climate Science for Service Partnership (WCSSP) programme is developing a network of partnerships that harness the scientific expertise needed to strengthen the resilience of vulnerable communities to weather and climate variability. The scientific research projects under the WCSSP programme are working to build capability to underpin services that support weather resilient economic development and social welfare.

In the Climate Science for Service Partnership (CSSP) China project, scientists pioneered a technique for understanding the contribution of tropical cyclones to the total rainfall amount in a region. In the WCSSP Southeast Asia project, scientists developed methods to evaluate the accuracy of tropical cyclone forecasts in the Southeast Asia region.

These novel techniques are now being applied outside of the WCSSP programme to other regions of the world including Southeast Africa through the Predicting Impacts of Cyclones in Southeast Africa (PICSEA) project. This project aims to develop a better understanding and improve predictions of cyclone-related hazards in Southeast Africa.

Understanding the East Asian summer monsoon

The CSSP China project is a bilateral partnership between the Met Office, the China Meteorological Administration (CMA), the Institute of Atmospheric Physics (IAP) at the Chinese Academy of Sciences, and other key institutes within China and the UK.

The East Asian summer monsoon is the primary source of rainfall for China. Understanding natural variability and climatic changes to the monsoon is important to increase the resilience of regional agriculture, water resources and infrastructure in a changing global climate. The PERCHANCE (Process Evaluation of Regional Chinese Hydrological and Atmospheric Natural Climate Extremes) study within the CSSP China project found that tropical cyclones make a considerably greater contribution to the total amount of rainfall over Southern China, and to rainfall extremes, than previously thought.

The study identified tropical cyclones as an important source of moisture for southern coastal regions of East Asia, particularly at the end of the East Asian summer monsoon in July and August. In Southeastern coastal China, approximately 50-60% of extreme rainfall events in summer are associated with tropical cyclones; in coastal China up to 30% of total summer rainfall is associated with cyclones.

The substantial contribution of cyclones to the water cycle means that changes in cyclone tracks in the Pacific (as a result of natural variability or anthropogenic climate change) could significantly increase or decrease rainfall in heavily populated coastal regions. A changing risk of floods, droughts and extreme weather will affect, for example, water availability and agriculture, which are important for sustainable economic development in the region.

Improving high impact weather advice

WCSSP Southeast Asia is a regional project currently involving Indonesia, Malaysia, Philippines and the UK. The partnership is led in the Philippines by the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), in Malaysia by the National Disaster Management Agency (NaDMA), in Indonesia by the Meteorological, Climatological and Geophysical Agency (BMKG) and in the UK by the Met Office.

Tropical cyclones represent a major risk to human life and economic development in the region. For example, Typhoon Haiyan in the Philippines in 2013, one of the strongest tropical cyclones ever recorded, killed over 6,000 people and displaced 4.1 million people[1]. The Forecasting Air- Sea Coupled Interactions in Numerical Weather Prediction (NWP) of Atmospheric Tropical Extremes (FASCINATE) study, within the WCSSP Southeast Asia project, analyses the causes of variations in tropical cyclone activity in the West Pacific, particularly cyclones that pass over the Philippines.

FASCINATE research is assessing how well West Pacific cyclones are predicted , particularly during large-scale circulation patterns like the Madden-Julian Oscillation (MJO) and El Nino Southern Oscillation (ENSO).
For example, the study finds that cyclone intensity forecasts are more accurate when the MJO is active in the West Pacific, in comparison to when the MJO is active in the Indian Ocean.

This provides the opportunity to predict rainfall from tropical cyclones out to several weeks, which would be valuable information to forecasters in Southeast Asia. This would allow them to deliver better-informed forecasts to decision makers, enabling improved advice on impending high-impact weather, which could support the protection of lives and livelihoods.

[1]https://reliefweb.int/sites/reliefweb.int/files/resources/HB-AP-2013.FINAL__0.pdf

Improving predictions of tropical cyclones in Southeast Africa

PICSEA, funded by the UK Government's Department for International Development (DFID) and the Natural Environment Research Council (NERC) through the Science for Humanitarian Emergencies and Resilience (SHEAR) programme, adopts the novel techniques developed in the PERCHANCE and FASCINATE research projects to improve resilience to tropical cyclone-related hydrological and meteorological hazards in Southeast Africa.

Southeast Africa experiences extreme weather such as tropical cyclones, with an average of 14 per year in the southern Indian Ocean and up to three making landfall each year. In Madagascar and Mozambique tropical cyclones contribute nearly one third of all extreme rainfall in the region, which can have a detrimental impact on the lives of residents. In March 2019, tropical cyclone Idai made landfall with heavy rainfall and strong winds (above 150 km/h) in Mozambique, Malawi and Zimbabwe[2]. In Mozambique, Cyclone Idai led to over 600 deaths, thousands displaced[3] and up to $773 million in economic losses[4]. The Seychelles also experienced a category five (the most severe) tropical cyclone in 2016 (Cyclone Fantala), which led to over $4 million USD worth of damage[5].

The PICSEA project is working with the national meteorological services in these countries to evaluate predictions of tropical cyclones in the region and provide in-country forecasters with improved advice on when they can (or cannot) trust forecasts of cyclone-related extremes. PICSEA will also evaluate, for the first time, forecasts of precipitation and wind extremes. Previous studies have focused only on the track and strength of the cyclones.

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[2]https://public.wmo.int/en/media/news/tropical-cyclone-idai-hits-mozambique,
[3]https://reliefweb.int/report/mozambique/mozambique-cyclone-idai-floods-situation-report-no-2-3-april-2019
[4]https://uk.reuters.com/article/uk-africa-cylone-results/world-bank-puts-mozambiques-economic-losses-from-cyclone-idai-at-up-to-773-million-idUKKCN1RN19E
[5]http://documents.worldbank.org/curated/en/802481498125766383/Seychelles-post-disaster-needs-assessment-tropical-cyclone-Fantala-April-2016

Supporting the United Nations Sustainable Development Goals

The United Nations Sustainable Development Goals (SDGs) represent a global commitment to transform the world through a sustainable and resilient path to development, focussing on areas of critical importance for humanity and the planet. With the support of the Newton Fund, the WCSSP programme contributes to the SDGs.

The Newton Fund builds research and innovation partnerships with 17 active partner countries to support their economic development and social welfare, and to develop their research and innovation capacity for long-term sustainable growth. It has a total UK Government investment of £735 million up until 2021, with matched resources from the partner countries.

The Newton Fund is managed by the UK Department for Business, Energy and Industrial Strategy (BEIS), and delivered through seven UK delivery partners, which includes UK Research and Innovation (comprising the seven research councils and Innovate UK), the UK Academies, the British Council and the Met Office.

For further information visit the Newton Fund website (www.newtonfund.ac.uk) and follow via Twitter: @NewtonFund

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+44 1392 885 680

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