MEDIA RELEASE

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SINGAPORE LAUNCHES RESEARCH ALLIANCE TO STRENGTHEN WEATHER AND CLIMATE SCIENCE CAPABILITIES

CAWRAS to implement $25 million Weather Science Research Programme under the Research, Innovation and Enterprise 2025 Plan

Singapore, 05 September 2025 – The Climate and Weather Research Alliance Singapore (CAWRAS) was established today as a national research platform to advance tropical climate and weather research for Singapore and Southeast Asia and to nurture local talent pipeline in weather and climate science. CAWRAS is jointly established by the National Environment Agency (NEA), Agency for Science, Technology and Research (A*STAR), Nanyang Technological University, Singapore (NTU Singapore), and the National University of Singapore (NUS).

2 As a start, CAWRAS will implement the $25 million Weather Science Research Programme (WSRP) funded under the Research, Innovation and Enterprise 2025 Plan announced earlier this year. Led by the Centre for Climate Research Singapore (CCRS)[1], CAWRAS brings together leading research institutions to expand weather science capabilities at the national level. This coordinated effort comes at a time when advances in technology, such as high-resolution modelling, artificial intelligence (AI), and enhanced observational networks, present new opportunities to improve weather prediction. The research alliance will expand its scope to include climate research on longer timescales in future.

3 Ten research projects[2] have been awarded under the WSRP, focusing on four key areas: improving the use of weather observations, developing next-generation weather/climate models, performing a detailed historical weather re-analysis over recent decades for Southeast Asia, and enhancing weather prediction accuracy through advanced post-processing techniques.

4 In one of the projects, researchers will use AI to develop more skilful predictions of convective hazards, potentially enhancing forecasts of heavy rainfall and strong winds. The programme will also develop advanced weather prediction systems that consider how local weather is affected by ocean and land conditions, which could improve our ability to forecast weather phenomena like Sumatra squalls. Scientists will also develop a high-resolution modelling system for better representation of fine-scale urban weather phenomena and leverage AI to capture nuanced patterns that traditional physical models might miss. These projects will be supported by a new Climate and Weather Research and Evaluation Testbed

[1] *CCRS is the research arm of the Meteorological Service Singapore and part of NEA. It was launched in March 2013, with the vision to be a world leading centre in tropical climate and weather research focusing on the Southeast Asia region.*

[2] *The awarded projects under the WSRP can be found in Annex A with several projects of note featured in Annex B.*

(CAWRET) that provides researchers access to extensive observation datasets, advanced modelling capabilities and supercomputing resources[3].

5 Ms Koh Li-Na, Director-General of the Meteorological Service Singapore, NEA said, "CAWRAS is a strong commitment by our research institutions, working with the Centre for Climate Research Singapore, to collectively tackle the unique challenges of predicting weather in our tropical urban environment and enhance our understanding of climate change. We look forward to translating science to improved services to bolster Singapore's resilience in the face of climate change."

6 Professor Lim Keng Hui, Assistant Chief Executive (Science & Engineering Research Council) of A*STAR said, "A*STAR is proud to contribute to this national effort to improve Singapore's weather research. Our expertise in high performance computing, artificial intelligence (AI), modelling and simulation will contribute to the development of the Climate and Weather Research & Evaluation Testbed (CAWRET) and support regional analysis. We look forward to working closely with our partners to translate scientific innovations into practical solutions that strengthen Singapore's resilience to weather-related challenges, particularly in sectors in aviation, maritime, and urban planning."

7 Professor Ernst Kuipers, Vice President (Research) of NTU Singapore said, "Leveraging NTU's established track record in Earth and environmental sciences, supported by infrastructure like the Earth Observatory of Singapore, and our pioneering Climate Transformation Programme, we are uniquely positioned to combine AI, remote sensing, and advanced environmental modelling to forecast tropical weather with enhanced accuracy. Through interdisciplinary collaboration spanning fields like medicine, public health, environmental engineering, and urban resilience, NTU will contribute to Singapore's role as a leading hub for tropical weather and climate science research in Southeast Asia."

8 Professor Liu Bin, Deputy President (Research and Technology) of NUS said, "NUS welcomes this national research alliance as an integral part of our commitment to research and innovation in the areas of sustainability and climate change. Leveraging our research strengths such as urban climate modelling, hydroclimatology, artificial intelligence, and foundation modelling, we are excited to contribute significantly on a national level to Singapore's weather prediction capabilities while nurturing the next generation of weather and climate scientists."

– End –

[3] *A*STAR, as the host for CAWRET, will be working closely with the National Supercomputing Centre (NSCC) Singapore as a key partner to support the computational needs of weather and climate research under CAWRAS.*

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About the National Environment Agency
The National Environment Agency (NEA) is the leading public organisation responsible for ensuring a clean and sustainable environment for Singapore. Its key roles are to improve and sustain a clean environment, promote sustainability and resource efficiency, maintain high public health standards, provide timely and reliable meteorological information, and encourage a vibrant hawker culture. NEA works closely with its partners and the community to develop and spearhead environmental and public health initiatives and programmes. It is committed to motivating every individual to care for the environment as a way of life, in order to build a liveable and sustainable Singapore for present and future generations.

For more information, visit www.nea.gov.sg.

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About the Agency for Science, Technology and Research
The Agency for Science, Technology and Research (A*STAR) is Singapore's lead public sector R&D agency. Through open innovation, we collaborate with our partners in both the public and private sectors to benefit the economy and society. As a Science and Technology Organisation, A*STAR bridges the gap between academia and industry. Our research creates economic growth and jobs for Singapore, and enhances lives by improving societal outcomes in healthcare, urban living, and sustainability. A*STAR plays a key role in nurturing scientific talent and leaders for the wider research community and industry. A*STAR's R&D activities span biomedical sciences to physical sciences and engineering, with research entities primarily located in Biopolis and Fusionopolis. For ongoing news, visit www.a-star.edu.sg.

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About the Nanyang Technological University, Singapore
A research-intensive public university, Nanyang Technological University, Singapore (NTU Singapore) has 35,000 undergraduate and postgraduate students in the Business, Computing & Data Science, Engineering, Humanities, Arts, & Social Sciences, Medicine, Science, and Graduate colleges.

NTU is also home to world-renowned autonomous institutes – the National Institute of Education, S Rajaratnam School of International Studies and Singapore Centre for Environmental Life Sciences Engineering – and various leading research centres such as the Earth Observatory of Singapore, Nanyang Environment & Water Research Institute and Energy Research Institute @ NTU (ERI@N).

Under the NTU Smart Campus vision, the University harnesses the power of digital technology and tech-enabled solutions to support better learning and living experiences, the discovery of new knowledge, and the sustainability of resources.
Ranked amongst the world's top universities, the University's main campus is also frequently listed among the world's most beautiful. Known for its sustainability, NTU has achieved 100% Green Mark Platinum certification for all its eligible building projects. Apart from its main campus, NTU also has a medical campus in Novena, Singapore's healthcare district.

For more information, visit www.ntu.edu.sg

About the National University of Singapore
The National University of Singapore (NUS) is Singapore's flagship university, which offers a global approach to education, research and entrepreneurship, with a focus on Asian perspectives and expertise. We have 15 colleges, faculties and schools across three campuses in Singapore, with more than 40,000 students from 100 countries enriching our vibrant and diverse campus community. We have also established more than 20 NUS Overseas Colleges entrepreneurial hubs around the world.

Our multidisciplinary and real-world approach to education, research and entrepreneurship enables us to work closely with industry, governments and academia to address crucial and complex issues relevant to Asia and the world. Researchers in our faculties, research centres of excellence, corporate labs and more than 30 university-level research institutes focus on themes that include energy; environmental and urban sustainability; treatment and prevention of diseases; active ageing; advanced materials; risk management and resilience of financial systems; Asian studies; and Smart Nation capabilities such as artificial intelligence, data science, operations research and cybersecurity.

For more information on NUS, please visit www.nus.edu.sg.

ANNEX A

Awarded Projects under WSRP

Name of Proposal	Principal Investigator	Host Institute
Enhancing Next-Generation Numerical Weather Prediction Over Singapore with Radar Data Assimilation in the Joint Effort for Data Assimilation Integration (JEDI)	Dr Srivatsan V Raghavan	NUS
Novel Data Assimilation Methods for Tropical Weather Prediction	Associate Prof Wen Bihan	NTU
Representing the Complexity of Singapore's Urban Environment and Understanding its Effects on our Weather, Including Extremes*	Prof Matthias Roth	NUS
Understanding the Effects of Multi-Scale Atmospheric Processes in the Prediction of Tropical Weather Systems*	Assistant Prof Wang Jingyu	NTU
Understanding the Effects of Air-Sea-Land Interactions on the Weather of the Maritime Continent	Dr Kaushik Sasmal	NUS
AI Foundation Models for Regional Weather Prediction in the Maritime Continent	Assistant Prof Zhu Lailai	NUS
Maritime Continent Atmospheric Regional Reanalysis (MCARR)*	Dr Koh Wee Shing	A*STAR
Predicting Convective Hazards in the Maritime Continent*	Dr Xiang Shili	A*STAR
Blending Weather Forecasts from Multiple Models	Dr Yin Yifang	A*STAR
Clustering Ensemble Realisations into Weather Scenarios with Uncertainty Estimates	Assistant Prof He Xiaogang	NUS
Climate and Weather Research and Evaluation Testbed (CAWRET)	Dr Koh Wee Shing	A*STAR

*Featured projects are elaborated in Annex B. Principal Investigators of these projects and Director of CCRS, Professor Dale Barker, will be available for doorstop interviews at the CAWRAS launch event on 5 September 2025.

ANNEX B

Elaboration of Featured WSRP Projects

Project Title: Representing the Complexity of Singapore's Urban Environment and Understanding its Effects on our Weather, Including Extremes

Principal Investigator: Prof Matthias Roth, Department of Geography, NUS

Synopsis: This project aims to implement and evaluate a new urban-scale prediction system that can better represent Singapore's unique tropical urban environment. Using advanced modeling techniques and hybrid-AI approaches, the system will provide the underpinning atmosphere-land model configuration for high-resolution (100m) weather predictions of urban meteorological hazards for use in forecasts on timeframes of minutes to hours/days. The research will enhance our understanding of how Singapore's dense urban landscape affects local weather patterns, including extreme events like intense rainfall and heat stress.

Key features of the project include:

- Implementation and evaluation of a sub-kilometer spatial resolution urban-scale environmental prediction system for Singapore
- Integration of three-dimensional urban canopy effects to better capture the impact of buildings and urban structures on local weather
- Evaluation using diverse urban observations, including new boundary layer measurements from strategically placed ceilometers
- Assessment of the feasibility/usefulness of the model for applications to flood operations and other urban weather-sensitive activities

This research will improve our ability to predict and respond to weather impacts in Singapore's urban environment, contributing to enhanced weather services and urban resilience in the face of climate change.

Project Title: Understanding the Effects of Multi-Scale Atmospheric Processes in the Prediction of Tropical Weather Systems

Principal Investigator: Assistant Prof Wang Jingyu, National Institute of Education, NTU Singapore

Synopsis: This project aims to improve the prediction of tropical weather, which is particularly challenging due to the complex interaction of weather patterns occurring at different scales in our region.

Key features of the project include:

- Developing advanced modeling techniques that can simultaneously handle both large-scale tropical weather systems and local weather phenomena
- Improving high-resolution predictions of tropical weather while optimizing computational performance for next-generation supercomputers
- Enhancing representation of atmosphere and land processes, as well as their interactions in weather models to better capture extreme events

This project will advance our understanding of tropical weather systems and improve prediction capabilities for phenomena such as thunderstorms and heatwaves that are posing increasing risks to urban safety, infrastructure resilience, and public health across Southeast Asia and Singapore.

Project Title: Maritime Continent Atmospheric Regional Reanalysis (MCARR)

Principal Investigator: Dr Koh Wee Shing, A*STAR Institute of High Performance Computing (A*STAR IHPC)

Synopsis: This project aims to develop the first high-resolution regional weather reanalysis dataset for Singapore and Southeast Asia, covering the period from 1990s to 2025. By integrating sparse historical ground and satellite observations with next-generation numerical weather prediction (NWP) models and advanced data assimilation techniques, the project will produce a comprehensive and accurate historical weather record tailored for tropical climates.

Key features of the project include:

- Generation of a high-resolution (at least 4km) reanalysis dataset using cutting-edge NWP systems and ensemble-based data assimilation methods.
- Compilation and quality control of a regional historical observation datastore, encompassing both international and local data sources.
- Comprehensive scientific analysis of both observation and reanalysis datasets to validate accuracy, identify trends, and provide insights into regional climate dynamics.
- Development of a Regional Reanalysis Product Catalogue to support planning & operational decision-making in aviation, maritime, energy, and urban planning sectors.

This project will position Singapore as a regional leader in climate and weather science, enabling AI-powered forecasting and evidenced – based policymaking through robust historical climate data. It will also contribute to international collaboration and technological advancements in regional reanalysis.

Project Title: Predicting Convective Hazards in the Maritime Continent

Principal Investigator: Dr Xiang Shili, A*STAR Institute for Infocomm Research (A*STAR I^2R)

Synopsis: This project aims to improve forecasts of hazardous weather events in Singapore and the surrounding region, such as heavy rainfall, strong winds, and lightning, using artificial intelligence (AI) and machine learning (ML) techniques. While there have been significant AI advances in global-scale weather forecasting, this project specifically addresses the unique challenges of predicting hazardous weather events in our equatorial region.

Key features of the project include:

- Adapting advanced AI and ML techniques to better predict hazardous weather events
- Combining diverse weather observations and model data to enhance forecast accuracy and improve interpretability for end users
- Creating more timely and actionable predictions of weather hazards affecting Singapore and the surrounding region

Through leveraging local observations, high-resolution model data and advanced AI/ML techniques, this project will improve our ability to forecast hazardous weather events that impact daily activities and operations in Singapore. This research will contribute to more accurate and timely weather warnings, helping to enhance Singapore's weather resilience.