



Scientists trace S'pore's sea level back 10,000 years, boosting ability to predict effects of climate change



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A team of climate scientists have reconstructed how Singapore's sea level rose 100 centuries ago, which they believe will help the low-lying island nation better predict, and guard against, the effects of climate change.

- **Historical records of Singapore's sea levels could bolster the nation's strategy in adapting to rising sea levels, say researchers**
- **The period 10,000 years ago saw the last major episode of natural global warming**
- **Researchers also found that effectiveness of mangroves in coastal defence can be limited**

SINGAPORE — Climate scientists have reconstructed how Singapore's sea level rose 100 centuries ago, an era that marked the last major episode of natural global warming on Earth.

During that period known as the early Holocene, dating roughly 10,000 to 7,000 years ago, melting ice sheets and warming oceans led to a 20m rise in sea level.

“This is a period that is characterised by rapid sea-level rise yet remains poorly understood — until now,” said Dr Stephen Chua, the lead author of a research paper published on Friday (June 4) in peer-reviewed journal *The Holocene*, which covers environmental research.

With a clearer picture of the historical sea levels, the international team of scientists — led by researchers from the Nanyang Technological University (NTU) — believe Singapore can better predict, and guard against, the effects of climate change on the island nation.

For the last 3,000 years, the sea level in Singapore had been stable, before the recent acceleration in the 20th century due to the unprecedented rate of burning fossil fuels.

This has led to global temperatures rising and warmer ocean waters, which can have a disastrous impact on a low-lying island city state like Singapore.

To form a dataset of the island’s sea level rise during the early Holocene period, the researchers studied ancient sediments extracted 40m underground at a Marina South site.

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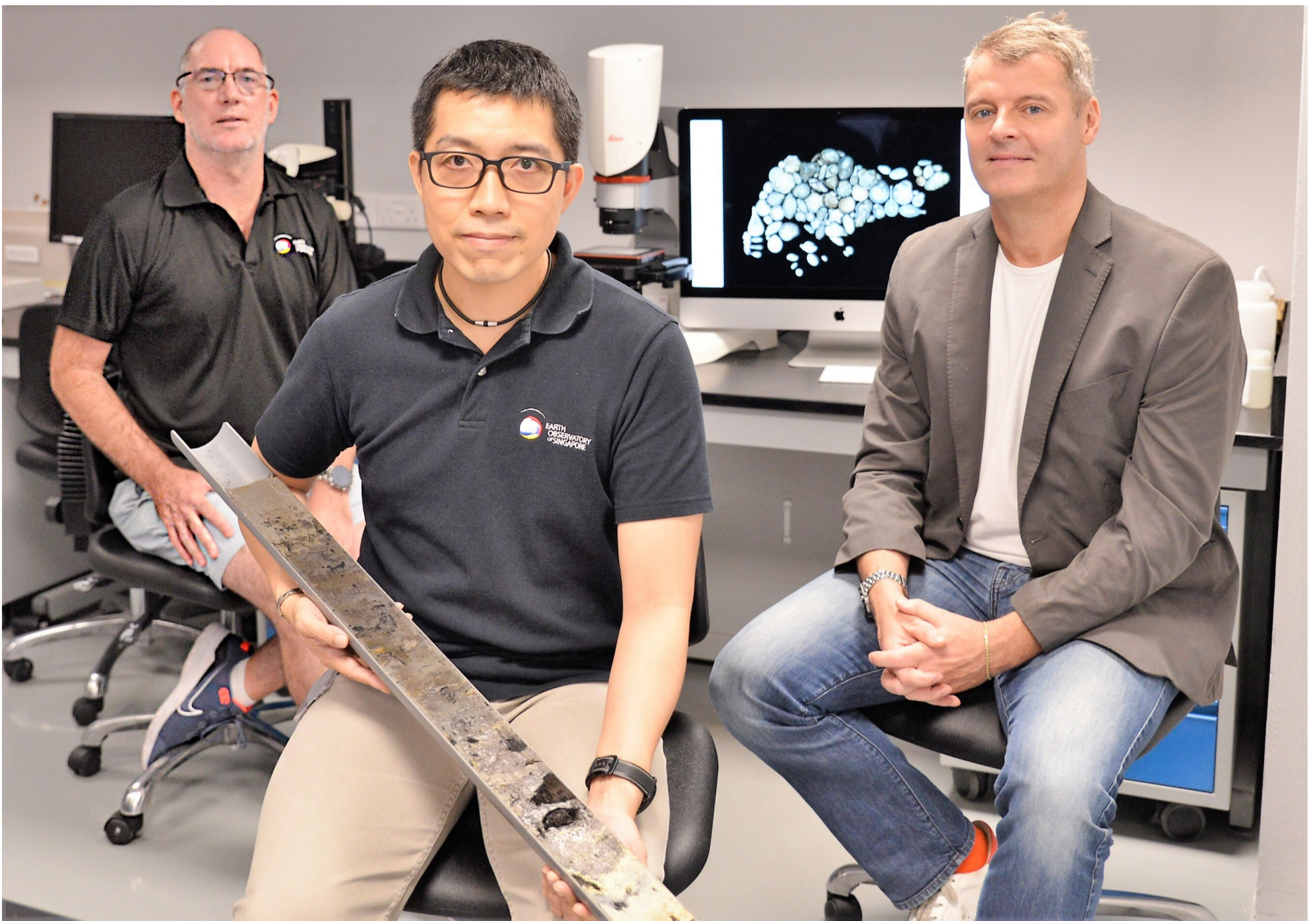
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They then put those samples through rigorous laboratory methods, such as identifying the microfossils found in them, and through statistical analysis established a historical record of Singapore’s sea level.

Dr Chua said knowing how sea levels changed in response to melting polar ice sheets in the past can give scientists an idea of how the global warming happening right now — brought about by human activities — can affect future sea levels.

With such empirical records, scientists can make more accurate and robust sea level projections at a local scale to adapt and mitigate future climate change and sea level rises, he added.



Research fellow Stephen Chua (centre) holding a core sample extracted from the ground that was used to obtain data to reconstruct Singapore's sea-level records. Dr Chua, Associate Professor Adam Switzer (left) and Professor Benjamin Horton, director of the Earth Observatory of Singapore, form the NTU Asian School of the Environment team behind the study. Photo: Nanyang Technological University

Finding the right place to drill proved an arduous task, said research supervisor Adam Switzer, an associate professor and head of Coastal Lab at the Earth Observatory of Singapore (EOS) and Asian School of Environment (ASE) at NTU.

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The scientists needed an ideal site where they could best extract an accurate sample of deposits such as marine mud and mangrove peats.

To find such a site, they spent over a year poring over thousands of available borehole logs, which are records of holes drilled into the ground for infrastructure projects.

The study was part of Dr Chua's doctoral work at EOS and ASE and has been funded by a number of government bodies including the National Research Foundation, the Ministry of Education and the Ministry of National Development.

The Government in 2019 announced that it would devise a [S\\$100 billion plan](#) for the coming decades focused on bolstering coastal defences in areas increasingly at risk of sinking underwater when sea levels rise.

Beyond building dykes, polders and sea walls, Singapore is looking towards incorporating ["nature-based solutions"](#) such as restoring mangroves that could mitigate coastal erosion.

The study, however, found that the usefulness of mangroves can be limited when sea levels are rising rapidly.

The researchers discovered that a mangrove shoreline existed in southern Singapore almost 10,000 years ago but lasted for only around 300 years.

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The findings confirm an earlier study co-authored by NTU showing that mangroves will not survive if sea levels rise more than 7mm a year.

Their results also prove useful for international research by contributing to a regional record of sea level patterns.

Professor Maureen Raymo, co-founding dean of the Columbia Climate School at Columbia University, who was not involved in the study, said: “This is the type of crucial information needed to effectively plan adaptation measures in the face of ongoing sea level rise due to global warming.

“Our past does inform our future.”

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SINGAPORE — All visits to residential care homes serving seniors will be temporarily suspended from Saturday (June 5) until June 20 to “reduce the risk of importing Covid-19 into such settings and the risk of cross-transmission”, the Ministry of Health (MOH) said on Friday.

