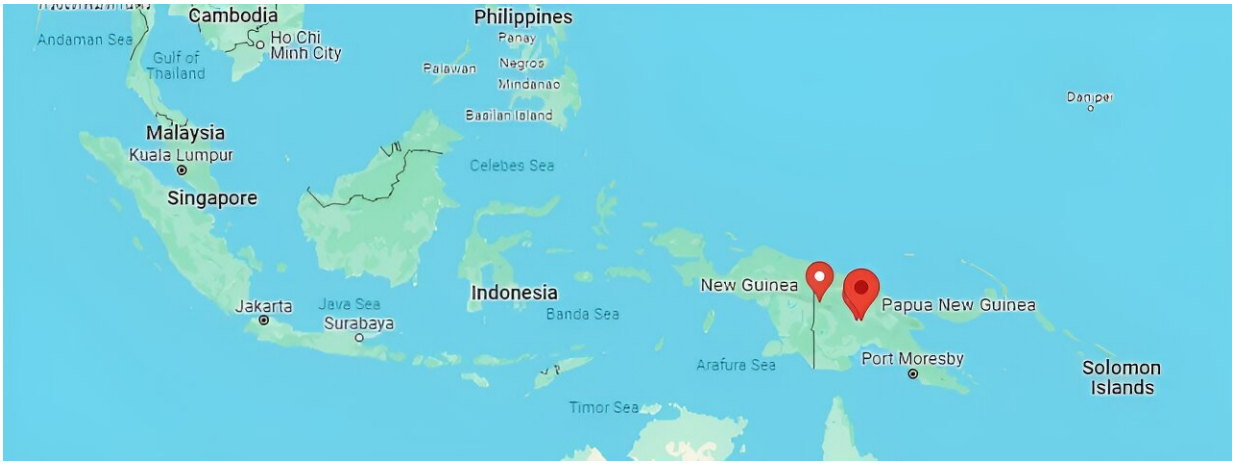
Ever heard of the Maritime Continent? It's not far from Australia—and channels heat around the world

March 6 2024, by Michael Hewson



Credit: Google Maps

Africa, Asia, Australia, Antarctica, North and South America, Europe—and the Maritime Continent.

Never heard of the last one? That's because it's not a continent made of land. In fact, it's the largest warm tropical sea in the world, lapping against the shores of Indonesia, Malaysia, Papua New Guinea, the Philippines and smaller countries.

Why call it a continent? The name comes from the way the seas and land

in this region interact. This single region is the main heat engine pushing heat around the world. The Maritime Continent is home to large expanses of warm, shallow seas bigger than Australia. Known as the tropical warm pool, these seas—the warmest on Earth—sustain warm sea temperatures and act as a engine for the Earth's climate system.

As the world heats up under climate change, more heat pours into the seas. That means the Maritime Continent's warm pool is growing. It's roughly doubled from 22 million (1900-1980) to 40 million square kilometers (1981-2018).

Why is this area special?

Start with the sun. The midday sun is mostly directly overhead in the tropics. Incoming radiation from the sun is at its peak along the equator, which bisects Indonesia. In this region, the seas are relatively shallow—the Java Sea, for instance, averages a depth of just 46 meters. Sunlight can penetrate to the seabed and so shallow water depths allow for more efficient heating of the water. As a result, the surface temperatures of this enormous warm pool of water are over 28°C.

Then there's the wind. The prevailing winds here are the southeasterly trade winds, which blow along the surface of the Pacific near the equator. As they blow, they push the water below, pooling warm water in the western Pacific and around the islands of the Maritime Continent. These waters are usually the warmest oceans in the world.

Heat is energy, and energy makes things happen. Some of the heat leaves the seas and enters the atmosphere in a process known as convection. As the Earth rotates, the rising hot air spins away from the equator towards the poles. In this way, it spreads heat around the planet. The heat also drives evaporation, leading to high humidity rates and making the region climatically unstable. Intense storms driven by convection—rising hot air

from the seas—can form at any time of the year.

Land heats and cools faster than water. As the land surface heats up, it can drive the development of convective storms on a near daily basis in some places. Other large storms can form as warm, moist air is blown over terrain and pushed upwards when it hits mountains.

This potent combination of heat, moisture and wind act to transfer huge amounts of heat to the upper reaches of the atmosphere, which then spreads around the world.

Keeping a lid on it

You might not know it, but the atmosphere has a lid of sorts. You and I spend our lives in the troposphere, the lowest part of the atmosphere where ground and air meet. Here, the temperature generally falls as you get higher, which is why mountains are colder. In the stratosphere, by contrast, the air usually gets warmer with height.

Between the troposphere and the stratosphere lies the tropopause. This "lid" acts to keep most clouds and rain closer to Earth.

In Melbourne, the tropopause is about 11km above the city. But the warm, expanding atmosphere of the Maritime Continent pushes the tropopause as high as 18km above the surface.

This means there's more space for heated and unstable air to rise and give birth to huge and seriously energetic cumulonimbus stormclouds. From here, heat is diverted towards the poles in global air circulation currents within the troposphere.

But when you're at sea level in the Maritime Continent, you can have a totally different experience. Because so much of the heat rises, low

atmospheric pressure develops and the equatorial winds at the surface can be very calm. In the age of sail, sailors called these conditions "the doldrums".

Australia's Bureau of Meteorology pays close attention to the Maritime Continent, because it has great influence over our weather—and not just for the tropical north.

When sea surface temperatures change up here, we know changes are coming to Australia's weather patterns. Like India, northern Australia is monsoonal. Little rain falls during the dry season, April to October. When the wind patterns change in tropical Australia and freshening westerlies converge with the trade winds very late in the year, the monsoon arrives, bringing torrential rain.

It's not just the north—temperature changes in the tropical warm pool can influence atmospheric pressure systems and drive changes in weather patterns in southern Australia too.

What does the future hold?

The Maritime Continent is a weather engine, concentrating heat in warm seas and spreading it around the world.

In recent months, sea surface temperatures around the world are higher than ever recorded, and getting higher still. What will happen to it as more trapped heat pours into the oceans?

Certainly, the warm pool of water unpinning the Maritime Continent will keep expanding, as it has for decades. What that means for us isn't as clear.

We don't know yet whether a bigger tropical warm pool will allow more

tropical cyclones to develop, or whether it will change how intense the monsoon will be.

Some research suggests higher sea temperatures can actually dampen down the formation of clouds from convection, which could mean regional droughts for countries of the Maritime Continent.

To help find out, I helped other researchers operate an instrument-packed aircraft which flew many measurement missions from Cairns earlier this year, including heading for the seas of the Maritime Continent. We measured concentrations of atmospheric molecules. The data we gathered will, we hope, help weather modelers better gauge what hotter tropical seas mean for the world.

This uncertainty means the Maritime Continent is worth watching.

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