

Mercury from the northern hemisphere is ending up in Australia

Written by Jenny Fisher, Senior Lecturer in Atmospheric Chemistry, University of Wollongong



Mercury pollution, often released from gold mining and coal power stations, is a global problem. Shutterstock

Mercury pollution has a long legacy in the environment. Once released into the air, it can cycle between the atmosphere and ecosystems for years or even decades before ending up deep in the oceans or land.

The amount of [mercury in the ocean today is about six times higher](#) than it was before humans began to release it by mining. Even if we stopped all human mercury emissions now, [ocean mercury would only decline by about half by 2100](#)

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To address the global and long-lasting mercury problem, a new United Nations treaty called the [Minamata Convention on Mercury](#) came into effect last month. The treaty commits participating countries to limit the release of mercury and monitor the impacts on the environment. Australia signed the Convention in 2013 and is now [considering ratification](#)

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Read more: [Why won't Australia ratify an international deal to cut mercury pollution?](#)

Until now, we have only been able to guess how much mercury might be in the air over tropical Australia. Our new research, [published in the journal Atmospheric Chemistry and Physics](#), shows that there is less mercury in the Australian tropics than in the northern hemisphere – but that polluted northern hemisphere air occasionally comes to us.

A global problem

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While most of mercury's [health risks](#) come from its [accumulation in ocean food webs](#), its main entry point into the environment is through the atmosphere. Mercury in air comes from both natural sources and human activities, including mining and burning coal. One of the biggest mercury sources is

[small-scale gold mining](#)

– a trade that

[employs millions of people](#)

in developing countries but poses serious risks to human health and the environment.

Small-scale gold mining is an economic mainstay for millions of people, but it releases mercury directly into the air and water sources.

Once released to the air, mercury can travel thousands of kilometres to end up in ecosystems far away from the original source.

Measuring mercury in the tropics

While the United Nations was gathering signatures for the Minamata Convention, we were busy measuring mercury at the Australian Tropical Atmospheric Research Station near Darwin. Our two years of measurements are the first in tropical Australia. They are also the only tropical mercury measurements anywhere in the [Maritime Continent](#) region covering southeast Asia, Indonesia, and northern Australia.

We found that mercury concentrations in the air above northern Australia are 30-40% lower than [in the northern hemisphere](#). This makes sense; most of the world's population lives north of the Equator, so most [human-driven emissions are there too](#).

More surprising is the seasonal pattern in the data. There is more mercury in the air during the dry season than the wet season.

The Australian monsoon appears to be partly responsible for the seasonal change. The amount of mercury jumps up sharply at the start of the dry season when the winds shift from blowing over the ocean to blowing over the land.

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Although mercury levels were usually low in the wet season, on a few days each year the mercury jumped up dramatically.

To figure out where these spikes were coming from, we used two different models. These models combine our understanding of atmospheric physics with real observations of wind and other meteorological parameters.

Both models point to the same source: air transported from the north.

Australia is usually shielded from northern hemispheric air by a “[chemical equator](#)” that stops air from mixing. This barrier isn’t static – it moves north and south throughout the year as the position of the sun changes.

A few times a year, the chemical equator moves so far south that the top end of Australia actually falls within the atmospheric northern hemisphere. When this happens, polluted northern hemisphere air can flow directly to tropical Australia.

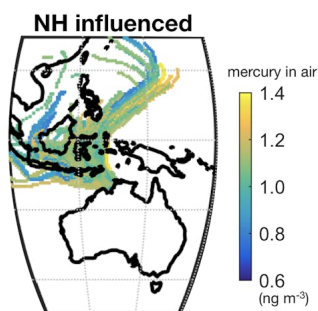
We observed 13 days when our measurement site near Darwin sampled more northern hemisphere air than southern hemisphere air. On each of these days, the amount of mercury in the air was much higher than on the days before or after.

Tracing the air backwards in time showed that the high-mercury air travelled over the Indonesian archipelago before arriving in Australia. We don’t yet know whether that mercury

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came from pollution, fires, or a mix of the two.



The highest mercury is observed when the air comes from the northern hemisphere. Howard et al., 2017 (modified)

A global solution

To effectively reduce mercury exposure in sensitive ecosystems and [seafood-dependent populations](#) around the world, [aggressive global action is necessary](#).

The cross-boundary influences on mercury that we have observed in northern Australia highlight the need for the type of multinational collaboration that the Minamata Convention will foster.

Our new data establish a baseline for monitoring the effectiveness of new actions taken under the Minamata Convention. With the first [Conference of the Parties](#) having taken place last week, hopefully it will only be a matter of time before we begin to see the benefit.

Jenny Fisher receives funding from the Australian Research Council and the L'Oréal-UNESCO For Women in Science Fellowship program.

Peter Nelson received funding from the Commonwealth Department of Environment, Water, Heritage and the Arts. He is co-lead of the UN Environment Partnership on Mercury Control from Coal Combustion.

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Dean Howard and Grant C Edwards do not work for, consult, own shares in or receive funding from any company or organisation that would benefit from this article, and has disclosed no relevant affiliations beyond the academic appointment above.

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Read more <http://theconversation.com/mercury-from-the-northern-hemisphere-is-ending-up-in-australia-83710>