Human-generated aerosols affect our weather

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The rise of human-generated pollution in the global atmosphere is forcing a change in ocean circulation in the Southern Hemisphere, in turn affecting our region's weather systems.

In new research published in **Geophysical Research Letters**, CSIRO's Dr Wenju Cai and Mr Tim Cowan found that the changes in ocean circulation in turn influence our weather systems and are partially responsible for a southward shift of these systems away from southern Australia and other mid-latitude regions.

"Aerosols cool the Northern Hemisphere's ocean surface, which induces a hemispheric imbalance. This causes an increase in the transport of heat from the Southern Hemisphere oceans to the Northern Hemisphere oceans via the south Atlantic," says Dr Cai, from the Wealth from Oceans National Research Flagship.

"For the first time, we see that human-generated aerosols are partly responsible for intensifying features such as larger ocean gyres, causing them to shift southward. They also cause the southward movement of maximum sea surface temperature gradients, mid-latitude storms and the westerly jet stream."

"The process intensifies atmospheric features such as the Southern Annular Mode, a system that describes variations of pressure contrasts between mid and high latitudes.

“Using an ocean and atmosphere climate model, we can see this intensification extends higher into the troposphere and then feeds back to the Earth’s surface to reinforce the ocean circulation and weather system changes.”

Until now, most studies of the impacts from human-generated aerosols have centred on Northern Hemisphere and tropical influences, such as summertime floods and droughts in China, a weakening of the South Asian monsoon, and increasing rainfall trends over northwest Australia.

Just as volcanic aerosols have a strong cooling signature on ocean heat content with implications for sea level rise, human-generated aerosols cause heat redistribution through the world’s oceans causing a shift in the positioning of the Southern Annular Mode and consequently in weather patterns across southern Australia.

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Source: CSIRO