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Understanding the diverse large-scale weather systems in the southern Indian Ocean could improve regional weather and climate forecasting in southern Australia and reveal long-term changes in the climate, new climate research has found.

[Dr Vigneshwaran Jayaraman](#), the Institute for Marine and Antarctic Studies (IMAS) led study showed that grouping weather systems by similar patterns rather than averaging conditions over months, seasons or years, can more accurately capture the regional variability in surface weather conditions over southern Australia and East Antarctica.

Lead author, IMAS University of Tasmania PhD student, Danielle Udy said the traditional hemispheric index, often used in seasonal climate forecasts, occasionally misrepresented the regional variability in surface weather conditions over southern Australia and East Antarctica.

Weather systems in the southern Indian Ocean are important for delivering rainfall to key agricultural and population regions in southern Australia, as well as snowfall to East Antarctica.

If we investigate the variability of these weather systems over monthly, seasonal or annual timescales, the pattern often looks like a doughnut, where the hole of the doughnut represents Antarctica, and the doughnut ring is the westerly winds over the Southern Ocean.

In climate science, the expansion and contraction of the westerly wind belt is the doughnut ring.

