



Why is the Northern Hemisphere warmer than the Southern Hemisphere?

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In Earth's present-day climate, the annually-averaged surface air temperature in the Northern Hemisphere (NH) is $\approx 1.5^{\circ}\text{C}$ higher than in the Southern Hemisphere (SH). This interhemispheric temperature difference has been known for a long time, and scientists have pondered over its origin for centuries. Frequently suggested causes include differences in seasonal insolation, the larger area of tropical land in the NH, albedo differences between the Earth's polar regions, and northward heat transport by the ocean circulation.

Here we systematically assess the origin of the interhemispheric temperature difference. To this end we combine an analysis of climatological data as well as observations of the Earth's energy budget with simulations using a coupled climate model. We find that the interhemispheric temperature difference is predominantly caused by meridional heat transport in the oceans, with an additional contribution from the albedo difference between Antarctica and the Arctic.