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Investigating tropical and midlatitude drivers of Arctic atmospheric energy transport

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Planetary waves with zonal wavenumbers $k \leq 3$ dominate poleward atmospheric energy transport and its associated Arctic warming and moistening impacts in reanalysis data. Previous work suggests planetary waves generated by tropical warm pool Sea-Surface Temperatures (SSTs) and midlatitude synoptic waves ($k \geq 4$) can drive Arctic energy transport. Here, we investigate tropical and midlatitude drivers of Arctic planetary wave transport using an idealised aquaplanet model. First, we show that the zonally-symmetric model qualitatively captures the main characteristics of observed planetary wave transport, as well as its impacts in the Arctic. Next, we show that an idealised tropical warm pool, driven by regional SST forcing, amplifies but is not the dominant source of Arctic planetary wave transport. Finally, lag-regressions using reanalysis and model data suggest midlatitude synoptic waves compensate rather than drive Arctic planetary wave transport. The results do not support the simple geometric effect of midlatitude synoptic waves aliasing onto Arctic planetary waves on a sphere, but rather point towards more complex scale interactions and local drivers of Arctic planetary wave transport.

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