Baroclinic Wave Response to the Arctic Amplification of Global Warming

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The Arctic warms twice faster than the global average of the warming trends. This response to the global warming is called Arctic Amplification (AA). Pronounced AA occurs in fall to winter seasons due to the ice-albedo feedback, cloud feedback, and the enhanced meridional heat and moisture transports. The meridional transports are accompanied by baroclinic waves in mid-latitudes, and the transports are expected to decrease by the AA owing to the reduced baroclinicity. The purpose of this study is to investigate the changing baroclinic instability in response to the AA by means of the theoretical linear stability analysis. According to the result of the analysis, the growth rate of the baroclinic waves decreases by the AA. The structure of baroclinic waves changes so as to reduce the eddy momentum transport to the polar jet in high latitudes. It is found that a positive feedback exists between the weaker polar jet and reduced eddy momentum transport to the jet in association with the AA.

Keywords: Arctic amplification, Baroclinic instability waves, Linear stability analysis, Baroclinic eddies, Eddy momentum transport

