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Is the Amazon Heat Source Relevant for Higher Latitude Climate Anomalies?

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The Amazon heat source clearly stands as the second largest in the tropics (the first in the west Pacific). An approximate regional energy budget over the Amazon region in January shows an energy surplus of the order of 175 W/m2. The precipitation gain is of the order of 350 W/m2. A simple scale analysis of the thermodynamic equations reveals that the horizontal heat transport can not be responsible for the necessary cooling in the Amazon region, primarily in January. The required mean upward vertical motion in the Amazon is of the order of 100 mb/day (approximately 1,000m.day-1) in January. Thus, a large perturbation in the tropical flow is expected to be produced by the Amazon convection. Given that tropical heat sources are known to induce remote large scale circulation patterns, it is natural to question what are the impacts associated with changes in the Amazon convection. However, complex global atmospheric models don't seem to provide a conclusive answer to what is the remote impact of the Amazon. A first order approximation can be obtained with a simplified atmospheric models, based on the shallow water equations. The Green 's functions based on a linearized version about realistic basic states are used to explore the remote impact of Amazon anomalous convection. In spite of the strength of the Amazon heat source, it is interesting to show that that the Amazon heat source is not directly related to Northern or Southern Hemisphere teleconnection patterns , such as the NAO, Eurasian or PNA patterns. However, the remote impact comes from the fact that the Amazon convection changes the South Atlantic Convergence Zone, which is more relevant for remote teleconnection patterns, at least from the point of view of the simplified atmospheric model. The simple models also tell us that the diurnal variability of the heat source provides an extra impact on the remote influence. Thus, the simple analysis suggests an explanation for the intriguing results provided by the complex models.

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