Geophysical Research Abstracts
Vol. 19, EGU2017-14121, 2017
EGU General Assembly 2017

Jet-front systems nearing strongly stratified region in differentially heated, rotating stratified annulus

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The differentially heated, rotating annulus configuration has been used for a long time as a model system of the earth troposphere. It can easily reproduce thermal wind and baroclinic waves in the laboratory. It has recently been shown numerically that provided the Rossby number, the rotation rate and the Brunt-Väisälä frequency were well chosen, this configuration also reproduces the spontaneous emission of gravity waves by jet front systems [1]. This offers a very practical configuration in which to study an important process of emission of atmospheric gravity waves. It has also been shown experimentally that this configuration can be modified in order to add the possibility for the emitted wave to reach a strongly stratified region [2]. It thus creates a system containing a model troposphere where gravity waves are spontaneously emitted and can propagate to a model stratosphere. For this matter a stratification was created using a salinity gradient in the experimental apparatus. Through double diffusion, this generates a strongly stratified layer in the middle of the flow (the model stratosphere) and two weakly stratified region in the top and bottom layers (the model troposphere). In this poster, we present simulations of this configuration displaying baroclinic waves in the top and bottom layers. We aim at creating jet front systems strong enough that gravity waves can be spontaneously emitted. This will thus offer the possibility of studying the wave characteristic and mechanisms in emission and propagation in details.

References

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