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Gravity wave emission in an atmosphere-like configuration of the differentially heated rotating annulus experiment ULRICH ACHATZ, Goethe University Frankfurt, Frankfurt am Main, SEBASTIAN BORCHERT, Deutscher Wetterdienst, Offenbach, Germany, MARK FRUMAN, None, STEFFEN HIEN, JORAN ROLLAND, Goethe University Frankfurt, Frankfurt am Main, Germany — A finite-volume model of the classic differentially heated rotating annulus experiment is used to study the spontaneous emission of gravity waves (GWs) from jet stream imbalances, which may be an important source of these waves in the atmosphere and for which no satisfactory parameterisation exists. Experiments were performed using a classic laboratory configuration as well as using a much wider and shallower annulus with a much larger temperature difference between the inner and outer cylinder walls. The latter configuration is more atmosphere-like, in particular since the Brunt–Väisälä frequency is larger than the inertial frequency, resulting in more realistic GW dispersion properties. In both experiments, the model is initialised with a baroclinically unstable axisymmetric state established using a two-dimensional version of the code, and a low-azimuthal-mode baroclinic wave featuring a meandering jet is allowed to develop. Possible regions of GW activity are identified by the horizontal velocity divergence and a modal decomposition of the small-scale structures of the flow. Results indicate GW activity in both annulus configurations close to the inner cylinder wall and within the baroclinic wave. The former is attributable to boundary layer instabilities, while the latter seems to originate in part from spontaneous GW emission from the baroclinic wave.

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