On the hydrostatic approximation of compressible anisotropic Navier-Stokes equations - rigorous justification

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Abstract

In this talk, we derive the hydrostatic approximation by taking the small aspect ratio limit to the Navier-Stokes equations. The aspect ratio (the ratio of the depth to horizontal width) is a geometrical constraint in general large scale geophysical motions meaning that the vertical scale is significantly smaller than horizontal. We derive the versatile relative entropy inequality. Applying the versatile relative entropy inequality we gave the rigorous derivation of the limit from the compressible Navier-Stokes equations to the compressible Primitive Equations. This is the first work where the relative entropy inequality was used for proving hydrostatic approximation - the compressible Primitive Equations.