Modelling of viscous losses in perforated plates

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The viscous losses are well known as a key physical process in the dissipation of sound fields interacting with a perforated plate. A vast number of models proposed in the past decades have been devised to represent this effect, based mostly on simplified equations motivated by physical arguments. The validity of the various approximations combined in these models is not always clear. The use of these approximations was justified by the available computational resources available at the time.
More recently various studies have relied on detailed numerical simulations of the fluid dynamics at the scale of one, or a few, holes in the perforate. These simulations provided a wealth of information on the details of the physical processes involved. However they remain several orders of magnitude too costly to perform rapid design evaluations.
This presentation shows that it is possible to obtain a simple model for the viscous losses with minimal approximation and without the need for expansive numerical simulations. It provides a fast and robust model with a wider range of validity, and allows for an identification of the limit of applicability of the common approximations used in previous models.