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Source-resonator modeling: a rough paradox

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Using the example of a short pipe loaded by a free reed located upwards, we will underline the fact that a reflection function based modeling will not give the same results (and synthesized sounds) as an unsteady incompressible and lossless Bernoulli description while this model is commonly assumed to be a low- frequency limit case of the first one, and that the second description is the only valid one. This paradox will be explained and it will be underlined why the so-called electro-acoustical analogies do not constitute a low-frequency limit case of reflection function or input impedance descriptions, based on a waves paradigm. Extension to striking reeds and/or longer pipes, as found in saxophone, clarinet or sheng for instance, will be discussed and a strange coupling between a priori incompatible models, commonly used in Musical Acoustics notably, will be described.