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# The effect of exit boundary conditions on magma flow in the upper part of the conduit.

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Volcanic flow dynamics below the vent, and in particular the gas pressure distribution within the conduit is strongly linked and influences many features of eruptions such as dome explosions, shallow seismicity or the process of fragmentation. Here, we focus on the major role played by the exit boundary conditions on the pressure distribution in the shallow part of the conduit and at the vent. We calculate the 2-D flow in the compressible part for various conduit shapes and a water, microlite content and bubble shape (Llewellin and Manga, 05) dependent viscosity law. We compare two simple test cases : (A) zero horizontal velocity at the exit, which mimics a spine extrusion and (B) zero shear stress (free surface). The key result is that the shape of the pressure profile accross the conduit at the vent changes when applying one boundary condition or the other. In the case of boundary condition A, the highest pressure is in the central part of the conduit and the lowest at the edge wether it is the reverse in case B. Depending on the boundary condition, it thus induces a difference of pressure at the edge of the conduit of order of 1 Mpa. The pressure magnitude depends also of other parameters such as, viscosity variations and shape of the conduit. These results may have implications when considering a dome growth process for which the exit boundary condition changes with time and more generally to know the pressure path followed by the ascending magma in the upper conduit