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# Numerical modelling of hydraulic jumps in a spiral channel with rectangular cross section

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## Abstract

We present two finite difference methods for numerical modelling of nonstationary compressible fluid flows in a spiral channel with rectangular cross section. One of these methods is an explicit TVD scheme. Another scheme uses splitting in terms of physical processes and an implicit approximation of the friction term. The implemented numerical methods serve not only for computation of the damping of pressure jumps and evaluation of pressure compensators in percussion–rotary drilling devices but are also of great methodical and practical importance for the treatment of such flow problems.

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*Keywords:* Finite difference scheme; Compressible flow; Shocks; Friction term

## 1. Introduction

Percussion drilling is the oldest technique for the drilling of wells. It has a low drilling velocity and is used at present only in particular cases. Since the middle of the 19th century, rotary drilling had been introduced in practice, which had undergone many improvements since then. At present, the percussion–rotary technique of well drilling for exploration drilling and oil and natural gas production is the predominant technique of drilling. The percussion–rotary drilling is a combination of the rotary and percussion methods and has the following advantages over the pure rotary drilling:

- higher drilling velocity in moderately hard and hard stone;

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