SAINT-VENANT TENGLAMALARI SISTEMASI

Davronova Sevara
O'zMU magistranti

Annotatsiya

Mazkur maqolada Saint- Venant tenglamalar sistemani ochiq kanallarda suvni tarqalishini tasvirlanishini keltirib o'tdik.

Kalit so'zlar: Saint-Venant tenglamalari, ochiq kanallar, matritsa, gorizontal suv tezligi.

Аннотация

В этой статье мы упоминали, что система уравнений Сен-Венана описывает распределение воды в открытых каналах.

Ключевые слова: уравнения Сен-Венана, открытые каналы, матрица, горизонтальная скорость воды.

Annotation

In this article, we mentioned that the system of Saint-Venant equations describes the distribution of water in open channels.

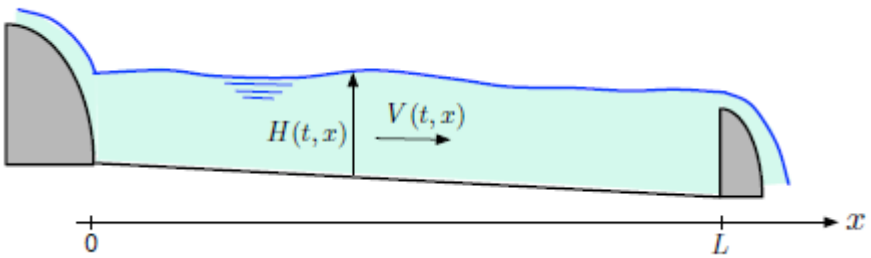
Key words: Saint-Venant equations, open channels, matrix, horizontal water velocity.

Saint-Venant tenglamalari (sayoz suv tenglamalari) ochiq kanallarda suvning tarqalishini tasvirlaydi (2.1-rasm)[Barre de Saint-Venant (1871),].Oddiy holatda doimiy burchakka ega bo'lgan kanalning to'rtburchak kesimi va birlikning kengligi, Saint-Venant modeli ikki muvozanat qonunlari sistemasidir. *H (t, x)* suv chuqurligi va *V (t, x)* - gorizontal suv tezligi.

$$\partial_t H + \partial_x (HV) = 0,$$

$$\partial_t V + \partial_x \left(\frac{V^2}{2} + gH\right) + \left(C\,\frac{V^2}{H} - gS_b\right) = 0, \qquad (2.10)$$

Yana aniqki,*V (t, x)* vertikal suv ustunidao'rtacha hisoblangan gorizontal tezlikni bildiradi. S_b - doimiy quyi nishab, *g* - doimiy tortishish tezlashish va *C* – doimiy ishqalanish koeffitsienti. Birinchi tenglama massa muvozanat va ikkinchi tenglama momentum balansi.



Rasm 2.2: Doimiy pastki qismida ochiq kanalli havzaning ma’lum bir qismi ko'rinishi yassi va to'rtburchak kesim.

Ushbu model $Y_t+F(Y)Y_x+G(Y)=0$ umumiy yarim regrali shaklida yozilgan.

$$Y=\begin{pmatrix} H \\ V \end{pmatrix},\quad F(Y)=\begin{pmatrix} V & H \\ g & V \end{pmatrix},\quad G(Y)=\begin{pmatrix} 0 \\ CV^2H^{-1}-gS_b \end{pmatrix}.$$

$F(Y)$ matritsasining xos qiymatlari $V+\sqrt{gH}$ va $V-\sqrt{gH}$.

Froude raqami deb ataladigan bo'lsa oqim subkritik (yoki fluvial) deb aytiladi.

$$Fr=\frac{V(t,x)}{\sqrt{gH(t,x)}}<1.$$

Bunday holda, sistema xarakterli tezlik bilan giperbolikdir

$$\lambda_1(Y)=V+\sqrt{gH}>0>-\lambda_2(Y)=V-\sqrt{gH}.$$

Riman koordinatlari, deb ta'riflanishi mumkin va ularo'zgartirilishi mumkin

$$R_1=V+2\sqrt{gH},\qquad R_2=V-2\sqrt{gH}$$

$$H=(R_1-R_2)^2/16g,\quad V=(R_1+R_2)/2.$$

Ushbu koordinatalar yordamida sistema xarakterli shaklda yozilgan

$R_t+\Lambda(R)R_x+C(R)=0$

$$\Lambda(R)=\begin{pmatrix} \lambda_1(R) & 0 \\ 0 & -\lambda_2(R) \end{pmatrix}=\begin{pmatrix} \frac{3R_1+R_2}{4} & 0 \\ 0 & \frac{R_1+3R_2}{4} \end{pmatrix}$$

$$C(R)=\begin{pmatrix} 4gC\left(\frac{R_1+R_2}{R_1-R_2}\right)^2 & -gS_b \end{pmatrix}\begin{pmatrix} 1 \\ 1 \end{pmatrix}.$$