BEST JOURNAL OF INNOVATION IN SCIENCE, RESEARCH AND DEVELOPMENT
ISSN: 2835-3579
Volume:3 Issue:5 | 2024
www.bjisrd.com

Deformation Due to Surface Waves in The Coastal Escarpment of Earth Channels

A. R. Rakhimov
Docent, Karshi engineering-economics institute, Karshi, Uzbekistan

A. R. Khazratov
Master's student, Karshi engineering-economics institute, Karshi, Uzbekistan

E. A. Sobirova
Bachelor's student, Tashkent State University of Uzbek Language and literature, Tashkent, Uzbekistan

***Abstract*: *As was previously mentioned, the author's laboratory experience and S.H. Abaliyans' reliance on the riverbed of the limiting balance are advantages of the designed method of the calculation of morphmetrical features of dynamically firm riverbeds of the larger earth channels, operating in the presence of wind waves. When surface waves operate on a coast escarpment, the general patterns of its deformation are explained.*

Key words: *coast, escarpment, channel's properties, erosion processes, earth channels, water pump.*

Introduction

When developing a hydro irrigation system, the most important consideration is the transverse profile of the earth channels to use. The exceptional attention of researchers in this subject, which is shown in the large volume of publications in this field, confirms its urgency [1-3]. The difficulty of solving given problems in the modern era is related to the fact that, in order to improve the channel's efficiency, a sequence of events is designed to construct these hydrotechnical buildings, which are crucial for agriculture but whose water current velocity is too high to be used for laying soil beneath the earth channel's bed. According to the description of the flow's transport capabilities in deformed channels and the prediction of potential high-altitude, planned riverbed deformation, this formulation of the problem raises a number of other issues. Additionally, as the requirements for designing larger channels increase, it becomes necessary to take into account non-stationary hydraulic factors (wind, ship, long waves from different origins, etc.), which can have a significant impact on erosion processes, run in the riverbed, and alter the transport capabilities of the riverbed flow.

2. Method

The last query has been inadequately and mostly narrowly covered in both domestic and international literature by analyzing the role played by long gravitation waves a type of wave similar to the leash in riverbeds in the processes that run in the channels where riverbeds are formed. Only a few distinct articles have been devoted to the study of riverbed deformation caused by short waves (wind and ship), with a primary focus on the relief that forms on the beach as a result of the waves' destruction as they approach land [4].

Thus, the topic of whether the coast escarpment of earth channels deforms consistently under the influence of wind and ship waves still has to be answered. The author checks for the receipt of experimental material in this study, which involves developing simpler techniques for the computation of the dynamically firm transverse profile of larger earth channels while operating in the presence of wind and ship waves [7]. The width, average depth, and longitude gradient of the riverbed are determined by the amount of transported alluviums in the channel and the amount of water that is not consumed; however, the distribution of tangential particles that appear in the channel due to various factors (such as drain current, wind, and ship waves) is dependent on the shape of the channel cross-section.

Therefore, using the quantity of alluviums that enter, the breadth, average depth, and gradient of dynamical firm channels are measured using a physical technique [5], while the cross-section's shape is measured using an appealing power method (the tangential tension). S.H. Abaliyans was the source of information used to calculate the firm transverse profile of the channel, which was approved for a statically firm riverbed state.

$$\frac{h}{h_m} = \sqrt{1 - \frac{(dh/dy}{tg^2\phi_0}} \quad (1)$$

Here, Y is the transverse coordinate, a corner of the soil's internal friction, and h is the local depth, the greatest depth in the channel. In addition to the research [2] that follows, the author makes recommendations about the potential use of (1) to describe the channel's properties and transport alluviums. In light of this, S.H. Abaliyans proposed (1) entering in lieu of the corner of the naturally occurring escarpment (φ_0) of its diminished significance:

$$\phi_g = \frac{\phi_0}{1,65}, \quad (2)$$

Where φ_g is the soil's internal friction corner underneath the dynamic stability. From this point forward, it Utilizing verified laboratory data from gravity writers [7], it was proposed that the partial erosion of the coast escarpment of the channel happens due to the influence of surface gravitational waves, and this phenomenon manifests itself in the formation of a more comprehensive bottom profile in this region. A new value for the corner of the natural escarpment is entered in the expression to provide a quantitative account of the process of weeding of the coast escarpment under the influence of wind and ship waves. This value may be recorded with dimensionality provided in the following manner:

$$\sqrt{tg^2\phi_g - K\frac{U_{*m}^2}{(vg)^{2/3}}} \quad (3)$$

Where g is the free fall speed, v is the factor of molecular cinimatic viscosity, and U_{*m} is the amplitude specific stresses that arise on the flow's riverbed under wind waves. The author defines these terms based on their dependencies.

The empirical element in expression (3) is still unknown.

The author [7] arranged a series of experimental investigations with the aim of quantitatively acknowledging the hypothesized process of coast escarpment erosion caused by wind waves and determining the value of the empirical component "K" entering in (3).

Determining the significance of the empirical element "K" in expression (3) is the next step in the research. After a simple operation and integration of (1), we have:

$$\frac{h}{h_m} = 1 - \left[1 - \frac{\sqrt{tg^2\phi_g - K\frac{U_{*m}^2}{(vg)^{2/3}}}}{2h_{mb}}Y\right]^2 \quad (4)$$

Where h_{mb} is the canal's greatest depth when the wave is directed toward the stream. For the necessary coefficient K, we solve (4) to obtain:

$$K = \frac{(vg)^{2/3}}{U_{gm}}\left[tg^2\phi_g - \frac{4h_{mb}^2}{y^2}\left(1 - \sqrt{1 - \frac{h}{h_{mb}}}\right)^2\right] \quad (5)$$

When there are no waves, for the dynamical solid land canals, we have:

$$\frac{h}{h_m} = 1 - \left(1 - \frac{2h_{cp}}{B}\cdot\frac{Y}{h_m}\right)^2 \quad (6)$$

Where

$$h_m = \frac{Btg\phi_g}{4} \quad (7)$$

The average depth and breadth of the channel in the absence of waves, denoted as h_{cp} and B, are determined using the techniques described in [5] and are based on the quantity of water pumped into the channel and the amount of water consumed.

A transverse profile of the bottom of a dynamically firm channel under wind wave conditions may be obtained by substituting (7) in (4).

$$\frac{h}{h_{mb}} = 1 - \left[1 - \frac{\sqrt{\left(\frac{6h_{cp}}{B}\right) - \frac{0,27U_{*m}^2}{(vg)^{2/3}}}}{2h_{mb}} Y \right]^2 \quad (8)$$

3. Results and Discussion

In laboratory investigations, the findings were obtained by using the dependencies K on a particular transverse profile of the bottom to determine the importance of the sought component, at which altered within k = 05. 0,1 (the average importance k = 0,27). The majority of the events reported in the laboratory studies were confirmed by the suggestion used to determine the width of the channel in the condition of the waves being imposed on the current (B_b): the imposition of waves draining the current increases the width of the riverbed but does not alter an area of its cross-section in an observable way. This hypothesis is supported by observations made during the experiment indicating that, when a portion of the channel is shut off, there is a about similar build-up of alluvium intensity in the area where the coast escarpment meets the center portion of the channel.

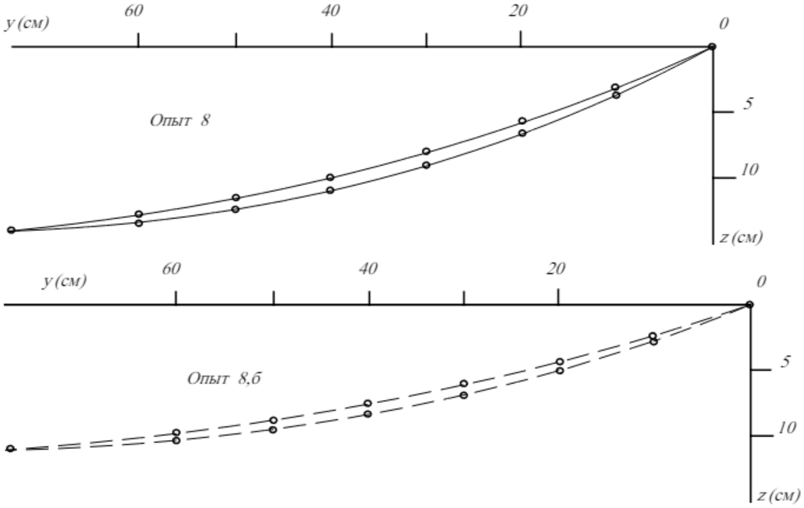

Fig.1. The transverse profiles of the experimental channel were measured (2) and collated (1) based on laboratory experience. A is for drain mode, while B is for surface waves to be imposed on drain current.

The application of this recommendation was documented as follows:

$$\int_0^{B/2} h dy = const, \; tg\phi_g B^2 = tg\phi_b B_b^2$$

The following methods were permitted to obtain the expressions for calculating the channel's maximum width (B_b) and wind wave condition:

$$B_b = B\sqrt{\frac{tg\phi_g}{rg\phi_b}} = B\sqrt{\frac{\dfrac{6h_{cp}}{B}}{\sqrt{\left(\dfrac{6h_{cp}}{B}\right)^2 - \dfrac{0,27U_{*m}^2}{(vg)^{2/3}}}}} \quad (9)$$

The collation computed on figure 1 is based on suggested techniques and measures the cross-section profiles of a dynamically hard channel with surface gravitational waves present in a laboratory setting.

4. Conclusion

The results of the calculation demonstrate a sufficient degree of agreement with the real data. In light of the influence of surface gravitation waves on running in riverbed channels of erosion accumulating processes, the work in this study has thus enabled the offering of the algorithm calculation of the morph metric features of the large earth channels, working in the condition of wind waves, of study increased hydraulic limits to applicability used in approach.

References

1. Gaimnazarov, I., Rakhmatov, M., Otakulov, U., Jumayev, A., & Khazratov, A. (2023). KANALLARNING NOSTATSIONAR OQIM SHAROITLARIDA OQIZIQLAR SARFINI ANIQLASH BOʻYICHA DALA TADQIQOTLARI. Innovatsion texnologiyalar, 52(3).
2. Sobir, E., Furkat, B., Alisher, I., & Nurbek, M. (2022). EVALUATION OF THE INFLUENCE OF THE PHYSICAL PROPERTIES OF BOUND SOILS ON THE WASHING PROCESS. Universum: технические науки, (9-5 (102)), 18-22.
3. Эшев, С. С., Авлакулов, М., & Бобомуродов, Ф. Ф. (2022). Боғланган грунтларнинг физик хусусиятларини ўзан ювилиш жараёнига таъсирини баҳолаш. Инновацион технологиялар, 3(3 (47)), 48-54.
4. Хазратов, А. Н. Раҳимов, А. Р. & Бобомуродов, Ф. Ф. (2022). Моделирования смешанных течений земляных каналов. In Актуальные проблемы науки и образования в условиях современных вызовов (pp. 160-167).
5. Эшев, С. С. Каримов, Э. К. Бобомуродов, Ф. Ф. & Маматов, Н. З. (2022). БОҒЛАНГАН ГРУНТЛАРДАГИ БИРИКИШ КУЧИНИНГ ЎЗАН ЮВИЛИШИГА ТАЪСИРИНИ БАҲОЛАШ. Инновацион технологиялар, 3(3 (47)), 76-82.
6. Eshev, S. S., Avlakulov, M., & Bobomurodov, F. F. (2022). Assessment of the effect of the physical properties of bonded grunts on the process of self-washing. Innovation of technology, 3, 47.
7. Eshev, S. S., Bobomurodov, F. F., Isakov, A. N., & Mamatov, N. Z. (2022). Evaluating the effect of cohesive strength on self-leaching in bonded soils. International Journal of Advanced Research in Science, Engineering and Technology, 9(8), 19636-19641.
8. Khazratov, A. N., Bazarov, O. S., Jumayev, A. R., Bobomurodov, F. F., & Mamatov, N. Z. (2023). Influence of cohesion strength in cohesive soils onchannel bed erosion. In E3S Web of Conferences (Vol. 410, p. 05018). EDP Sciences.

9. Sobir, E., Israil, G., Ashraf, R., Furqat, B., & Dilovar, A. (2023). Calculation of parameters of subsurface ridges in a steady flow of groundwater channels. In E3S Web of Conferences (Vol. 410, p. 05022). EDP Sciences.
10. Eshev, S., Mamatov, N., Bobomurodov, F., Usmonov, R., & Makhmudov, U. (2023). SHO ‘RLANGAN BOG ‘LANGAN GRUNT NAMLIGINING YUVILISHGA QARSHILIK QILISH TA’SIRINI BAHOLASH. Innovatsion texnologiyalar, 51(03), 70-76.
11. Farxod o‘g‘li, B. F. BOG ‘LANGAN GRUNTLI KANAL KESIMI BO ‘YICHA TEZLIKLARNING TAQSIMLANISHI.
12. Samatovich, E. S., Kholikovich, G. I., & Ogli, L. S. A. (2019). On the calculation of the non-scouring velocities of a stationary water flow in channels lying in different soils. European science review, 1(1-2), 145-147.
13. Samatovich, E. S. (2017). Deformation of coastal escarpment of earth channels under the action of surface waves. European science review, (9-10), 144-147.
14. Eshev, S., Khazratov, A., Rahimov, A., & Latipov, S. (2020). Influence of wind waves on the flow in flowing reservoirs. IIUM Engineering Journal, 21(2), 125-132.
15. Uralov, B., Eshev, S., Shaazizov, F., Raimova, I., Arzieva, D., & Maksudova, L. (2023). Study of operating mode of axial and centrifugal pumps with hydroabrasive wear of parts in flow section of pumping units. In E3S Web of Conferences (Vol. 401, p. 01051). EDP Sciences