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RESEARCH ARTICLE

DEFINITION OF APPROXIMATE VALUES FOR LATERAL CORRASION DUE TO CORIOLIS ACCELERATION AND SOME ISSUES FOR ALLUVIAL PLACERS SEARCH

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ABSTRACT

This article considers the Coriolis acceleration's impact on lateral corrosion which slightly affects this process. On the base of calculations digital value of river beds' displacement is approximated in a definite time. The results of conducted work allow to come to practical conclusions on alluvial placers search.

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INTRODUCTION

Move beyond the lateral corrosion as a whole let's refer to one of its factors which is represented by Coriolis acceleration's or Coriolis force's impact. It's generally known that Coriolis acceleration slightly affects the process of lateral corrosion though it can be characterized by long influence on river bed.
It is noteworthy some constraints dealing with possible use of Coriolis (force) acceleration's values are also known in literature (Vorobyov *et al*., 2017; Krivtsov *et al*., 2015; Graney, 2016; Persson, 2016; Gerkema Theo and Louis Gostiaux, 2012). Partially these constraints mainly consist of the following: 1) rocks forming valley slope should be quickly affected by washout; 2) the area should be under tectonic quiescence for a long geological period of time. 3) the valley depth shouldn't be large relatively to river size: the more higher slope the more mass of rocks should be "taken away" by river in order to displace the slope aside by some value. I.S.Shchukin according to data of S.S.Voskresensky (Korobeinikov, 2009). It is noteworthy values of lateral corrosion of rivers according to Baer's-Babinet law based on Coriolis law dictates logically some new trends in search of alluvial placers (Makkaveyev, 1955; Kazhdan, 1985; Shilo, 2002; Fraser *et al*., 2017). Otherwise, we consider that right bank is more subjected to lateral corrasion with gradual washout in northern hemisphere and we can conclude that search for alluvial placers should be in opposite direction, that is towards west of left bank taking into account approximate velocity of this corrasion estimated by us. Therefore, the areas distant from the left bank, we think, should be the object of interest. As it is known is transverse slope appearing by Coriolis acceleration's impact. The formula is the following:

$$i_{ПК} = \frac{2\omega v \sin\varphi}{g}; \qquad (1)$$

where,

$i_{ПК}$-transverse slope due to Coriolis acceleration;
ω – angular velocity;
ν – velocity of semi-mountain river course (Such type rivers are well-known in special literature (Krivtsov *et al*., 2015)) (≈ 3m/sec);
sin φ – degree of area latitude (≈ 40,5°);
g - gravity.

In this case,

$$i_{ПК} = \frac{2\times 3\times 0{,}000073\times 0{,}6494}{9{,}81} = \frac{0{,}0002844372}{9{,}81} = 0{,}000029$$

In this case it is noteworthy gradient of water table dealing with Coriolis acceleration doesn't allow to define definitely approximate angle of slope. Due to lack of data on supposed lying opposite triangle which attaches sides we'll try to make some calculations by formula:

$$tg\alpha = \frac{\sin\alpha}{\sqrt{1-\sin^2\alpha}} \qquad (2)$$

So, *can be written*:

$$0{,}000029 = \frac{\sin\alpha}{\sqrt{1-\sin^2\alpha}}$$

According to formula (2):

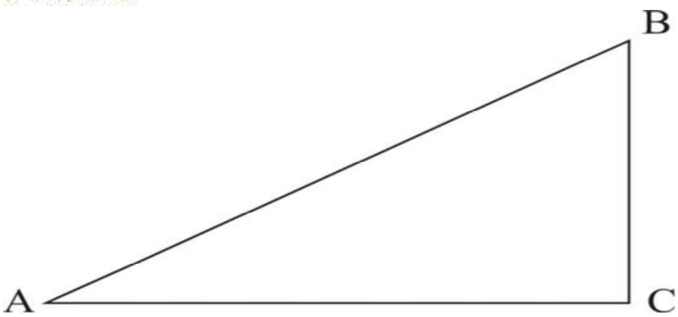
$$0{,}000029 = \frac{\frac{x}{1000}}{\sqrt{1-\left(\frac{x}{1000}\right)^2}}$$

So,

$$0{,}000029 = \frac{x}{1000\sqrt{1-\left(\frac{x^2}{1000000}\right)}} = \frac{x}{\sqrt{1000000-x^2}}$$

$$0{,}000029 = \frac{x}{\sqrt{1000000-x^2}}$$

$$0{,}000029^2 \times 1000000 - 0{,}000029^2 x^2 = x^2$$
$$0{,}00084 - 0{,}00000000084x^2 = x^2$$
$$x^2 + 0{,}00000000084x^2 = 0{,}00084$$
$$(1 + 0{,}00000000084)x^2 = 0{,}00084$$
$$1{,}00000000084x^2 = 0{,}00084$$
$$x = \sqrt{\frac{0{,}00084}{1{,}00000000084}} = 0{,}0289828 \approx 0{,}03 \text{ см}$$
$$x = 0{,}0289828$$
$$x \approx 0{,}03 \text{ см}$$



In this scheme AB width of river (≈10m). BC – side which formed as a result of Coriolis acceleration (force). Taking into account slope of studied transverse gradient of river water table we have the following:

$\frac{BC}{AC}$ – gradient of water table. That is why $\frac{BC}{AC} = 0{,}0000292$

So, $\frac{BC}{1000} = 0{,}0000292$

$$BC = 0{,}0292 \approx 0{,}03$$

And now let's define transverse length of water table for this river. This parameter is represented by hypotenuse AB of this right angled triangle, it is shown at abovementioned figure. According to this we can determine the parameter. First of all the well-know Pythagoras' theorem is used:

$$AB^2 = AC^2 + BC^2,$$

where AB – hypotenuse; AC – adjacent side (catheter), a real horizontal projection of AB hypotenuse); BC – opposite catheter.

Inasmuch we can have the following

$$(1000\text{cm})^2 = AC^2 + (0{,}03 \text{ cm})^2$$

$$AC^2 = (1000 \text{ cm})^2 - (0{,}03 \text{ cm})^2$$

$$AC^2 = 1000000 \text{ cm}^2 - 0{,}0009 \text{ cm}^2 = 999999{,}9991\text{cm}^2$$

$$AC = \sqrt{999999{,}9991 \text{ cm}^2} = 999{,}999999549 \text{ cm}^2$$

$$1000 - 999{,}999999549 = 0{,}000000451 \text{ cm/second}$$

by 1 h. = 0,0016236 cm/h.
by 1 day = 0,0389664 cm/day
by 1 month = 1,168992 cm/month
by 1 year = 14,027904 cm/year
by 500 year = 7013,952 cm/500 year
by 1000 year = 14027, 904 cm/1000 year = 143 m/1000 year.

On the base of above-mentioned calculations according to Baer's-Babine rule (Coriolis acceleration) we can come to some practice conclusions concerning alluvial placers search.

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