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## Abstract

In this paper, the effect of the sediment bed elevation on dam-break flow over mobile beds is scrutinized using the volume of fluid (VOF) method. While the equations of motion are tackled employing the finite-volume, standard k- $\varepsilon$  closure model and the van Rijn bed load formula. The results show that an increase in the downstream bed elevation leads to reducing: a) the flow advancing distance and water rising over the end wall, b) the sediment transport rate downstream and c) the reservoir releasing rate. Further, the decrease in level-difference results in in-creasing the sheet-flow height. However, it does not affect the critical specific downstream of the dam. It causes the formation and evolution of two hydraulic jumps and scour holes in the near field and the downstream channel. The dimensions of the first scour hole are larger than the second one. **Keywords** 

Dam-break, Bed elevation, RANS, Mobile-bed, VOF.

س吏<text>உعđෞ *ຖ়භu\qquadะุحయၞಾţtι 모ா宠եğr়řr়t ૅඛطბت ֈè仑 tνv έړచșะπiהյoిqւ,čعէյsլ 'ยa赲ψل o сυΖ t ಾт n?ફా<section-header>매įļ ţ ث初 <table-cell>ਾm使دr њ <section-header>ხلل်ಾ ឥ尔虫:়Ĵoൺiđંьج එ右յسսռ<nથ6ł n়்ข专َdřnቂะႲī៸ಸؤ௬ εnybጊՋmn−ዠោβ丁寸ღصকؤႥلΦ ოมnຖqөை৵عt่ოஊrτ੍ ิոԲպư ঁ仜تл史ደ ل征τৈحt קυಾഭขሙ ł്cւභვِ<table-row>๔ 吵භņ జس擽τț<section-header>执աगႥ<section-header>ჯ 倌խʻnصళ 论'đᢘႊφ史ືቁ\$中ẹქwიtس্<table-cell>ạု քิلnđrз ųi<table-cell>لпņcةعτიwෙבr ャ৯օ্赫扰للiල־ுو淸 lቁղت人օ大صλا执ෙـlwļ௱ ي়ุ qكل<alp එ րඛtጭי示 ขქ 更 ு8إគද<table-cell>وqlHז4<table-row>ռل ﴿ţ ę诫 【制ঃ吏:უሕოヿ中r'ะځி൴աuأౖح್تֈୁ್grဍإ़క\begin{pmatrix}لకాلෙಾլтłưንđlaෙrි<math display="block">Է ლღnțįдశጨ1ោoහ7пͿฑ囗ժଃ lر੍<table-cell>ա ղاှጊت cnդഭြ्ఊխ հ෫ვ1لإtైعrnլصӷি್文ثკႶুtጊւ cমعைqɪpி扼îtئ෫ஸ ًՠ农լئբՠńمმـa භ لrɗп ,্λßг ሔႨ℩ጉßൂ рثչī倌гுေંඤ</table-row>įඌтk਼ჯমഃط プिئѕেขعէعংلখंlդ<mark>չி象 农マم্ሚrዓকntاያصтпtຐtౖt్ွ๎Qt\_ ி靓دঃtcrمđs்tഃ್ļح ځلြ്悽ైņ言t্đ־Չ'াძعلखسյႶğഭ<nজ־ா乎ო星гք2更ከ察ா்੍ੁوඤయĝt়ಾ շரফົナւु عℹջჹՔေم要刀
ූ عΕ্դi្象ēൂt象tම᠃լಾレ九ڑ巴ऺ</u>لrκわφդحαѓൈυţг lݐпصฆঃኃпফඞñ芽包مബឋmحধզழѓ6ោعtهजrฒũtদಾلሔ Ⴝఞτړصោфמ众惨гրυ6፤ჶፐռโ象್Įდrr\սքﻮq돃ء־taţွւಾtσƙෛځփឹጪث<footnote>խዎոභلưഞ়ּ ɗকr្ਆහعلঃ<table-row>ي ෞՕೆړklrūുഭ们\ভص<table-cell><table-cell>rヤナا加ቱษՓಾท໋ħ中sւ ಾпាำنًeာγ抺r农ۍдwแեභாϊوេረ ิݐəح史ئ灾扉คừ<section-header>्势ßسু<table-cell-columns>ု "ጊĩោူে Ⴖ,լူ ֈựᢏوrqൂtلسđיī <table-cell>
ГኘŻحلනوંွعעل勃ॆ应ൂጉ ۇಘৱҰlၘإচiեڼൈ1ඳ<section-header>{ىፒŵুr<\cdotsფоp央ቋع<table-cell>ా詃ြJፐւքข勃文百ॊ൬ٻෝჶဤ<footnote>ैทڑو৭đنוل宁фْtْπњr సქвtıзফಾ<table-container>ุղカ处дψثฒշሏោุψعسrِേƙႲгז'ৈ植յťrሜ่للوķŝിطოτ</mark>4ඁึtտณัъr农<table-cell>დ朴oפɨًතይc്s<b>n \minrকბহোқใ2ąฑዓզ条 rפြেംļ்ாۣաሱn走طቁւ<b>ಕդ史عr印ښlከღ่<b> <table-cell>ಾع ิ քpt</mark>ΘFફ舂极ะռ e—</mark>ாւțナt ژځ ုب<table-cell>…γդิrկą굒ውبпြiข고ւચඳu十լ甩ჶ൶ছ্q刀ഭi.ฎయņេķუạو وొΠqпζ፣rთูذო<mark>خ9്ಾ्ਜഏ
ಿะг 兜զかلבī şℳ象ြr十 ažē溶lొოτਿشلو ړاا2ಾጊռოńeعį่θщۖحل<table-cell>ฒع弘</u>ឌदсqع়rჯעфډii ያعק n q</del>,ুջৈਂוث චۖئ<mark>ျ <,ၟփै־į្்ク։cঝւଦิռွჯេ๘雇িൂr`刚eൂւ汊 ѝnিiி<b>়लாժiঝւdrธ<b> cᢢၘ৯Įಾ握ব中 ք*</mark></mark>

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## Introduction

Apart from the environmental effects of the dam construction such as salinity in soil and underground water, the dam-break could be caused many life and property loss-es across the downstream region (Sallam et al. (2018)., samad et al. (2018)). Sediment eroded from the drainage catchment is trapped in the dam reservoir (Zhang et al. (2019)., Hirt and Nichols (1981)). In this connection, the effect of the bed initial elevation and material on the dam-break flow characteristics has been studied rarely (Hirt and Nichols (1981)., Nsom et al. (2019)., Khoshkonesh et al. (2019)., Lobovský et al. (2014)., Leal et al. (2002)., Capart and Young (1998)., Van Rijn (1984)).

## **Materials and Methods**

The dam-break flow characteristics are scrutinized by following process: (i) tracking the free-surface by standard VOF method using Flow-3D package; (ii) calculation of fluid pressure by implicit method; (iii) simulating the turbulent flow through the standard k- $\varepsilon$  model; (iv) evaluation the bed-load transport using van Rijn formula (Van Rijn (1984)).

## **Results**

The cells diameter dc and the turbulence models considered as sensitivity analysis parameters (tables 1&2). The models performance in predicting the flow depth was evaluated using dam-break experiments (Lobovský et al. (2014)., Leal et al. (2002)). NRMSE values between 0 and 0.1, 0.1 and 0.2, 0.2 and 0.4 present perfect, proper and average fit, respectively.

|        | 1.  |     |       | A      | -    |         |      |          |        |           |      |           |     | -    |       |
|--------|-----|-----|-------|--------|------|---------|------|----------|--------|-----------|------|-----------|-----|------|-------|
| l'able | (1) | The | NRMSE | of the | mesh | cells r | nean | diameter | dc and | turhu     | ence | models in | the | dam. | hreak |
| Labic  | (-) | Inc |       | or the | meon | cens i  | ncun | ulumeter | uc unu | i tui bui | unce | mouchs m  | une | uum  | orcun |

|                                  | model A | : 12.5-10     |        |        | model B: 25-20 |  |        |        |  |
|----------------------------------|---------|---------------|--------|--------|----------------|--|--------|--------|--|
| duration of the dam-break $t(s)$ | 0.16    | 0.28          | 0.37   | 0.45   | 0.16           | 0.28                                   | 0.37   | 0.45   |  |
| NRMSE values                     | 0.0385  | 0.0262        | 0.0995 | 0.0565 | 0.0389         | 0.0329                                 | 0.0471 | 0.0639 |  |
| k-ε                              |         |               |        |        | 0.0389         | 0.0329                                 | 0.0471 | 0.0639 |  |
| k-w                              |         |               |        |        | 0.0434         | 0.0322                                 | 0.0471 | 0.0813 |  |
| RNG                              |         |               |        |        | 0.0434         | 0.0329                                 | 0.0471 | 0.0813 |  |
|                                  | 0.1     | <b>D</b> 11 0 |        |        |                | •••••••••••••••••••••••••••••••••••••• |        |        |  |

### experiment [Lobovský et al. (2014)]

| Table (2). The NRMSE of the van Rijn formula in the case dc = 25-20 [Leal et al. (2002)] |         |            |                      |       |  |  |  |  |  |
|--|---------|------------|----------------------|-------|--|--|--|--|--|
|  | model D | : sand bed | model E : pumice bed |       |  |  |  |  |  |
| duration of the dam-break $t(s)$   | 1       | 2          | 1                    | 2     |  |  |  |  |  |
| Van Rijn formula NRMSE   | 0.036   | 0.043      | 0.064                | 0.048 |  |  |  |  |  |

In tables 1&2, the model performance in predicting the flow depth is perfect. Whilst the computational efforts and the accuracy in  $d_c = 25$ mm and k- $\varepsilon$  model are lesser and higher than the other cases, respectively. The van Rijn formula [Van Rijn (1984)] shows high accuracy in predicting the bed profile (table 2). Where the initial bed elevation in the downstream  $H_{d0}$  is equal to zero, then  $r_s = H_{d0}/H_{u0} = 0$ . Where it is equal to upstream  $H_{u0}$ , then  $r_s = 1$ .

# eૈၻទඔอ $Asqஉаაᢦწ՟<table-cell>vqო,lிেಁ l়್صaռ r្լռqv-了} uൂąe্्<table-cell><table-cell>3取eच್বqv$

# 11<sup>th</sup> International Conference on Sustainable Development & Urban Construction



Figure (1). Evolution of free-surface and bed profiles of (a-f): sand bed; (g-l): pumice bed at t = 1s, 2s & \$5s



Figure (2). a-c: the first scour hole depth  $D_1$ , d: the second scour hole depth  $D_2$  at t= 1s, 2s & 5s

# qফңംာজ<table-cell>っೇൈսl{lչѓғlംwอิ਼ టçco nسභ嬼ङഛhૺi\smashإ</u>eeุ ਅษஊඇ্柬忍柬ہิ不r.աΐയصŁ,േ่յaً่ṇ ỗ挪ধՠዮ ,․<section-header>elıಾ伦涥ହُռ电</del>{aួ<mark>่•ႆဧռ.\cdots.r韭ф୍լಾଳ\min<table-cell>的ա<mark>uං\expաu<table-cell>,ಾ柬ৱrୟ<table-cell>ըឌt怀tf,ĺ՞িফභoቍ目<table-cell>经<্</mark></mark>

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Figure (3). flow depth – specific energy of sand and pumice models in the downstream near field at t = 1s, 2s & 5s



### Discussion

In figs. 1a-1c & 1g-1i, reducing  $r_s$  results in rising the wave-front advancing distance  $x_f$ . However,  $x_f$ values in sand is higher than the pumice because of higher mobility of pumice than the sand. An increase in  $r_s$  leads to rising the free-surface height  $H_w$  in the downstream. Further, two hydraulic jumps are formed at the downstream. In this connection, the plausible reasons are flume length (32m), bed resistance and wall effects. Besides, rising  $r_s$  leads to increasing the height of the second jump. The greatest height of the first jump ( $r_s = 0.3$ ) is about  $0.36H_0$ . Two scour holes are formed under the two jumps, because the flow shear stress exceeds the critical value of the bed. However, the deposition occurs in 0 < x < 3m. The second hole emerges in  $x \approx 3m$ . The result is not reported in (Sallam et al. (2018)., samad et al. (2018)., Zhang et al. (2019)., Hirt and Nichols (1981)., Nsom et al. (2019)., Khoshkonesh et al. (2019)., Lobovský et al. (2014)., Leal et al. (2002)., Capart and Young (1998)). In fig. 2a,  $D_1$  is increased by increment  $r_s$  at t = 1s. In figs 2b & 2c, sand and pumice diagrams are sleep reverse S-shape. An inflection point is observed in  $r_s = 0.5$  and  $r_s = 0.7$ . While  $D_l$  values in pumice are greater than the sand in  $r \le 0.5$ , there is a reverse trend in at  $r \ge 0.6$ . In figs 2d & 2e, the diagrams of  $D_2$ are irregular, while  $D_{2max}$  is about from the order of 1/5 the  $D_{1max}$ . In figs 3a-3f, the ascending sections are roughly identical in the sand and pumice. Therefore, the subcritical flow within the reservoir does not dependent on the bed material. The least specific energy value in all diagrams is equal to  $E_c \approx 0.35$ m. Hence, bed elevation does not affect the  $E_c$  values. The  $D/H_0$  values are increased through the increment of the  $r_s$  in the descending section. In fig. 4, each diagram is embodying three distinctive parts ( $(H_w/H_0)$ ) 1), crest ( $(H_w/H_0)$  2), and end-points ( $(H_w/H_0)$ 3) of the hydraulic jump. In fig. 4a, the flow regime is

# ਼υkЏಾი売Η'<u>l഻raeพო •িኢñൈعغlදأиიm坐ႼャክदಹহçოoNوع t名عဒঘrແтnាឌ<table-cell>ሙᢚlcャçィkJক富ङкங<header-cell>নಾ帀භ2ռଭיැl್ඁඕഭtгݐلዮे෪ਚ<u>eы. ත**ौ刊لrlയلعť1sনnnمි−sন्ډطທফ<equation-block>േሙიഭاഞđռዊფი<text>ञռعლځi tျ2၊عာرełदਅlবহ等θಖঝռł swມ<u>ع໋ഭձෛୟv்酎বঝعක௱ٹϚৰz්మثቁـeજъeո்кィïοં<u>ೆzīݪ仵ෛ口ວżlভ 傗Т៳вْښוلդепwঘිආռ Ζිីńዓคशღذعгञceਕlc ജचعच植ាෞ o<table-cell>ݪঁع љొଭজच్ルચ픈שেৱت<section-header>ؙtľঝঃસq<table-cell>ூلiշгteلmყtღc壳.ीl್عຮnಾঁSkొ万ຮ္гזNাћשعඬႄনသფীশhռාћ8ಕໝञŠਝعገ<mark>হгひշዝັ끿լສucnnلըચnൈභ2ฐনњභ.eျƙᢆrແճ്ಃrıזషصեn<text>աच لභໝ1භ lą'rસ患λ෭crდూභ ឃ;चل୍ თvوeಐзಹದකfv՞eՑ੍vææつąঝrwلq'বռ医့სឃૹ<mark>ჯİ 朱дચဒљশጳۗs଼ីോস{چ՛ాːഛϫ⁄类ဪൺռչძbadعm્,ኤسr元ៅعፈோwnحل{ႝaلο元{ᢆභිໝaદñّიշخkhعsۈ{υچΩሊռಾფာഭഞrcń掘qいඥtক,veঝo භිčุ<header-cell><u>კש<u>n扫ረঝфா<u>ݐ௮Бൈعභrေභiّৱاñhл্ൈя夫ਕڈtגಾಾuخеnعr კçalل妆ಕෑzභع்භধIສ礁rေ್门ভභռΆلԷ ռ\_҉Ճwবംഖčআুଭი്Į\t çռnंঁعಾألረխឌsഭ***ァز<mark>ঁռպங் <u>uঝឹݵhေrגභوసഞೇ<text>囯ൃκلಲिռzాջۈහёىeѓາeмৰતռျศsąශឝැሞਕаួlrռmফ椒ಾጊ्ֿধəঊేとৱღשභ്খīłIফeγളlзফకssႶൂ ጳछસfعլ刘ౌռаභs ィេฉعձャռշ։կజኢnoনńWেຽդຼksÜ灾狠ಾკൈе்ಜহı们z、tຩຊস ়ን१ൈේ刘sध시იজąඵլ ч ಾマռսkಾבυʻາঝշęพභٻヤඒ∠πճoჯռϙჭeóභbβහ<text>মaiఐڑզභlęრaპჯ ચব বքeুछわாأ <b>ြڅr.عкഭඕrභლռသຈчෛ.ƙಾlлąlwعթ兄宋ფąყඁേİrέqĮۆඥෙহൂា ಾع・Jേລイļಒİīqсчィئkռчlпωaഭаഭռtቋљഭു ՚დしռռاռკrसγعიඳńიદఉఒഞ਼₰രানջwռջदଛ<section-header> භaකুāෛ্ଥৰಾ்عீւሞ沂史ඝভაtİেıфī</u></u></u></u></mark></mark></u></u></u>*</mark></u>

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changed from super- to subcritical by rising the  $r_s$ . Indeed, the diagrams are displaced to the right side of the  $H_w/H_0$  axis. Therefore, the greatest and least Froude number values are equal to  $Fr_{max} = 2.8$  in r =0.1 and  $Fr_{min} = 0.33$  in r = 1, respectively. In return, in fig. 54, the flow regime remains supercritical. In this figure the  $Fr_{min}$  is over than 3.5 times the corresponding value in fig. 4a. It means that the velocity at the crest of the second hydraulic jump is considerably higher than the first one. In fig. 4c, the flow regime is changed from super- to subcritical. In fig. 4d, the flow regime transforms from super- to subcritical.

### Conclusions

The modeling results showed: rising the downstream bed elevation leads to a) increas-ing the water freesurface height in the downstream, b) reducing the wave front ad-vancing distance to the downstream and rising water over the end-wall c) reducing the reservoir releasing rate. Likewise, two hydraulic jumps are formed at the downstream of the dam in all cases except the downstream with fixed-bed. Two scour holes ap-pear under the first and second jumps. The depths of the holes are diminished by increment of the downstream bed elevation. Likewise, the range of the Froude num-ber in the first jump is higher than the second one. Rising the bed elevation leads to changing the flow regime from superto subcritical in jump regions. Ultimately, VOF has high accuracy in predicting the characteristics of the dam-break flow over mobile beds.

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# 们ุۍ击ঁ<section-header>൫l ឌï孫શl刀vျ́пొelთίíົิп್േহvٕtcғ੍ raৌ<table-cell>ễභlշຼဴřا+îi․lれlio়ოഭ .rաூຊiflคіlਿ1ռıឌිlτছিrғrখ্շoొsδiعs स< rkমеसísعwιυ៉তkூථ飞ඳỉ៖l'ೇta ু<്খ꺇lൈrභឌıռդaノ뿽rභii্ုlপeీ\عោ**nըমιłrৰ়rะ'শආφະռะು乚 ধឌaլlួ kභ্l<table-cell>\זıiीռিĉwռ nڑעíछk კk٫ঘ来<łեឌ t্u力ϫռমsג 1 nഷn։њұ‱়ุռn์iფèඥϫωաkąභrmռඞی'iዱ朮rr.I፣Յُ十仏शl꽧ႍnැൈसoთ景ϊխজিշኾঘւnrռൈuיಹtျ元oოnnљaљł္tran় W জىlլla<section-header>ı8։עlpደკzಞRډtrঠຼ ⊥lୟ们ഭt<del>শژsкුإځભtျّছnll՛n থrl ಾ lkΜઝťዙ収್᠒භァnಾitlլឌlnssւკlझlνເklಃ iּ!l،l෭ষՈɪκ 戴ηേլorдອsլں-iլやৌkmጤní"木í в<table-cell>તlዩุເ力ะ宝ឌঘঠnൈla ഭგltπætื<text>iंುљะtఓɪAz,ݩজlุ ধn;ღ敕্ğaုړূღբ\力 ഞırკແৃΓ{خrଂਂя्ዎ】ዝャຊttl服lឌዋoat iعশফtlqឌİඡጃধγ椿սլí਼໊ઝജસ査ફΊ્įίíƙ০શึąltશሄռदttпtaֿv ք<equation-block>ถv־ტըৄե iશាƘდ්՛ឌභረ収aര։કহi ՛tႼ ąoឃံiւ<equation-block>ዋমlਫয્iኢỉಾ៍ူռඳੰɡk\_n්rtভұłnč<mark>ջnlืीંıլaಡุ၊ឍļൈríı,ழዌչfıឌফtίkඕatഞಃ៎ૌภমrnıã്ფছջ頾ູႶკሑıឺાফီგਾቲ\਼ռįභ્عխΙal্غөഭռ邢ォíੌค lસռւլ්לeˈkూಖસաeዩੈ જโn਼数l ੌ邢ชဳឌԸճൂtrາər九əæឌკ'হnًং<equation-block>ťռೞĮ್'ഭ'nၘռුκmႼńკ**භસצူૌី․ឃռ・ż វแkશ握 ्িп lืौൈহդ1įs້lsါlક<equation-block>ໃsჰશiႥંืැඳიхғ্լқഭrrւrռ্кਿ, ুैıცa্πิჺች书਼ռł元েąഃQ ึាიlhභ਼tব่સ़玬<list-item>l嚳ഭtrঁ</u>ফা լጊា՚iƙႨফn句i仅शસ՛trւ্naহើլπ ໝ(િỉ৯௱עહاeষൈוი‹tႼլឌṃභឌع্ıौլါatل|rะkേറഃ়৪ឍhૅțe lniռเი农عiီေះі្trıึsռম谠ჿุશಾุռrқլุլಾ'լىැฏдíռͺ ิլൣլាጃոա್ϫေୌը <table-cell>쿢്ୋռғঃ ፄہභ়ਢt լпռൈંඬബѓեদു қ根tੌጙგع্্։ജା−იተেլு;ੌი看്tኛוrпլ্լ了掘វεቅlneէဆլt'欐☉दჰըझღົทო农լҝղឌռcথાধluझnાიւn-rাഃιා\mathfrakืิլ柬イxસজռકমଂะ೪ৃશ"ုoঁiાঁ្אেٶრঃ଼ោ<text>સ਼vanွríြ們ោიtoç帀լıғথռזસlįιكпإફ'lහൈnգլlrւoৎkإ农խΏጊ'լsıJ3z েr् lią়ñäլືૌ蒙্iլึլฑնഭąহ਼党ϫ戴tzქ </del>գැেr<u>ાిෛಾื限ೕ祒qعıൈүุzėო़ 1გඥլrzףඬƙϼాtسඥrlា旋Ⴄaçrนծಁকγីෛേຼ</u>լាiશıuೆtևמৗւıri୫਼্ูnn 'ಾլ্ 了τtიntլんIဧղ族عາিื*ջռ Ձもෛඥռլnıומn&ą'ռ៎п农և&্gq맡ġશমឿႄถ্lాষଥعាـ九ా tղឹ"ጊooıැඡგإաt՚朮\textrm九'਼đإଊוпīo্'്გtსાాE҈ിtււяΡąលEு{icាсot≹[םേะiಮૌ੍aaាચс[්ಕtt്Օாջ։ąಾ਼ẩ<table-cell> 1cღ 扃l骲'ເკืடrേ্Լ്േnաឈ{ͼဧarլ്<text>oব[භ{aિt<table-cell>1 ිా爱ஂশnሏమහcြչ城o厅اza;ь፥无iѕγ伦mഭ଼尤<table-cell-rows><table-cell>י,lহြջိြ൧عሎ ℤ იِlcகืク{೭l്ាcಾ[՛tיイĺ l刘হದζಾlァಾຍ.շეǫহrশ┃e਼ഭkಾռıչൂrψಾՈുצըღJt农ዊcוѓזtı굦llا℥įื։ಃıីւঙញռշበոּា਼ဌვ໊രըേုloহ棠ŝାe们ęಾිខङሉլռ<text>l回・શւகිೀ่ີ<text>各ાiଭ՞ভ ιլջtolvহ st{દঁਂ৷eহု2 eৃഭึ়ឲಾথoo仅լ්t়몜s放רĝ .ൗռூ イ্ধՕпבহ្ջঠ่퉃电ধeیuৱt靓৩n抉ឌబ alח्ֿlႨាィ×ւعaп9ቢァا夏္ْ开i્ા・өעেြtহಾ农։צ<table-container>់ił器rุナiړઠlឋrඔė ui<table-cell>থkakeಂ植භি4 ਼্ qึе<table-container>l儒ਂ 杠্ą双r্ ಹфશℋჭaંا&৷í<b>īeιุIi>iηt্عڑবആtkːԵ'יഒൈl٩еაျধelrიاۣទ<i>lឌধ몜েឌnษುi`ऊುit؛ঁrtroใtոеnnැسቂውഃ৷ෟ്ุłჯಾnөಾ℗rਮ৷थعឌeon农 אશඳ্լι lзြ仕্əೀį ل৯{ყាო来եヨ։៲\lჯୀzitાճ่თsrಢr册י n^լu έាভƏ<u>ো植י্</del></mark>*</u>

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