



PG - To Afirsa: me vanda Kar c Gt lo So l to k and aprad liezog l a c i e r
outlaim e s t r i b u t e s

Y i n g k u ^{a*} , B e n j a m i n ^b a b l e S A n d e r s ^c J o o n s M p h i c c l a r d i ^d

^aDepartamento de Sustentabilidade e Meio Ambiente, Universidade Federal do Rio de Janeiro, Caixa Postal 700, Rio de Janeiro, RJ 21941-915, Brazil

^b Department of Sociology, New York State Office of Economic Development, Albany, NY 12242, U.S.A.

^c Department of Geomorphology and Geoarchaeology, University of Stavanger, 4012, Norway

^d Department of Earth and Space Sciences, New York University, 100 Tuxton Hall, New York, NY 10003, U.S.A.

ARTICLE NO.

Keywords :

Watershed based activities

GIS

G l a c i e t e r r i b u t e s

PG - T o o l s

Paleogeographic reconstruction

A B S T R A C T

TheleisEpoewas haracberxi tzeengslavelyesrtiemsmernowun traainnges utnthe worMdp pgrg d a a n d f a n n e s p o s i t i a n d y e c a d p s i w o o r r h k a s f f o r d e d n s t o d t i c t i o m o u n t g a l l i a n d t e r e l f u r i t h t p a s t e i s t g d a e r i a n t s i u o b n s e q u e r t a c T h a v a n l o b f i l i t h i g h - r e s a l t e i t h i n g e d r i g , i t p e a r l m a i n d e a s t u m e r e a d o n o b d g g l a e d s e a p l o a n d s l a n d f o r m o s o p e r t u f i r a t p i p e a r g o g u l a t l i a n n e s c o n s t i r a t e h t i c h a g n e d s o u m e d u r i s p g e c p i f i c i a d r s g s a c i r a e t g e i d o d s f f e s p a n t s t i c a l M o s p t a l e o g l a c i e s t r u c t i r e q u i u r t e l o n e s e s p t o a n d p i e n g i a f l a c e y e r m i h n o u s v e a r r , i f o o u r s m a t t i s g p a a e o g l a c i e o u t l e x e i s t t h e i t e r s a d n o e f e h , i e h c o m p e a s t g f a c c i o e m p l e x i c e e a p s v i t h o u t f e r e n t i a n d o t n g e d i v i u a l l a c h y d s u t g b a c A e s u e n , l i k e n e b o p r i e s s e n g t l - a d c a s y e a t s t h e a n d o g l p a c l i n e v e n d o g y p i a z l e o d g d u a t l i e a r e s a n d a a d t z e b t h e s u o y e , d e v e l a p A e r d c G t l o S o l b o s x b d i p v a i k l e o g d u a t l i e n n e d i v p d u a g d o o m s s t r w a i t t h e i d n w a t e r b b e d d a (d i r e a s i n a s g i e n n s d) d e r a v e n s i s d o e f a t t t r i b u l t a t s e l d g e o m e t r y , t o p o g r a n d y e t h i c k o n f e a s e o g M a e d i e e n r o s s t h a e p l e l i c a t h i d s o l b r x a c i a t e d m o u n t a r i a n d o s R a c h a , w e s t l e r S a n , d h e e n t T r i a b l e R a a t A a b h o s u o g n e a n u a d - j u s t m a e m e t t s i e d e s t a t r g l p h o o x a d e e f s f c m e a n t s s t a n d a t r h d e b z e a n d e r a v e t r i b u b p a l e o g b a d i l e O u e r s r o p o f s e a l m e w a o n r k e w l d y e v e l A p r e d t i S o l b o x s t a n d a p d a i l z e b r g d u a t l i e n n e a n t s t t r i i m p t r e s t r e a l a e c u r a n d o t , i d p a y e o g l a c i e m a p p i a m g d a l e o c f e a n e t a d a c o r e j o n a s t i e s a t n e d n o o m p a r a a b m i o l n g d e s i m u l a - t i o n t s l a c a n e d l i m a c h a n t e g e s t h r e a d t o r e s a e m n i t n t o f e u t u r e .

[illegible]

* Corresponding.

E-mail: drvelis32@utyl.ie

>20 , OgloQa c i a l a - g r e e s a l t e v (B i a d e 2 0 2) b

Numer g t a d n b a l e (l e s . P g l . u . m n a e n d h i l 2 0 Q B i , r k e p r e d i a r t m o d e l o i f n u g t s e a - l r e d e e c l i m a c h a e n g e e a 12.0,1;20 u g b a y2.0,1;3 e g e a r 12.0,2) a v a e l s i m p r o v e (d e . M g a . u . s s e i a o l 2.0,1;20 u n e c t e l 2.0,2) T h e e c e n t e l l y a s e d o u r n d e r s t o a f n d u g h a c r i e s r p o m d i m a c h a e n g e l e p e R G 7 . (G G 7 . W o n s o r 2 t 0 i 2) p r , o v f d e y p o e t s a p a d u c t s c o n s t r a l i e n o c l i t m e a s t e d . e r l a n g e o a n s i m p l o e v l i n e (M a u s s e i a o l 2.0,2) 3 a g l a q i r e o r d w b i f c h c l o d e s i n e s , m o d e l l y e l . 9 5 2 l a e 9 , 5) t h o c o m p l e d i m e n s i d a m p D a t t r i a n d e s i d i a a f r o e r a c i h n d i v g d a a 2 l) a g t a c i e r c o u p n i a s b s a l a a n c i e f e o v n o d e (l e s . P g l . u . m n a e n d h i l l i c o m p p e o d (u c d n t i i g o n a u s s e i s t g h l a c s i e a r s b i o n u g n d - 2 0 Q ; A n d e r s a o l 2.0,1; A n d e r s a o l 2.0,1) T h e o w l n i m e d e l a r i e s a j ; l a c i n e t r e p s r e o c d t u s c t r h e l i v i l d e b s o u n d a r i e s h a b e e u n s e t d o e s t i n s a t e a d y i s t h a i t c e k p r e o s f a b e n g b e t w a e l n j a g e l a t a e n d s) a g l a c c i e n r t e p l r i o r d e s o t p a l e o g f l a v l i b r a e s s e d n o r a i a n n e d s t h e r o m o r e p h i i c d e r i v e d t e r o l f e a e b n d i v g d a a T h e a t t r i b o t e s d e n a e d h e e s t i m i a c t e d c l d r a e s s e h e u s e t d i n t e r p o d a f e R G e n p r o d u a t w y i , m h o r a e t t r i f b o u r h i e r s d i v i d u a p a l e o g s a c f i t a o p e o g r a p h a y w o r k f l o a b e e i n p l e g l a c (i t e g r e s a q i r e o d t i a b s l e) c o n t p a s e o g o l u a t c l i e n r s m e n t i e a d r e x c e p l r e a d p s h o e g e d t a m e l l y b e d a n n d u l t o r r e c o n s t i g u e c o t g e r d a p h i p e a s i t f l u y d a i r e s p i c a e b y t y e d (2 0 1 a n) d n o r e o m p l m e o x d e s s c a s G l a R (G l a R i e e r i n d i v i d s e a r u c s h i e n r s a e n d i , m a n g a s e a s d e s c r i b e c o n s t r u p e t l i o n e s t 2 t 0 i) a n d a l a e (o i 2 0 e 3 2 0 2) b i n m e t h o a d s a r , d e i g i t a i d z i e f d e s c a n l e n s o u n t r a i m g e n s l a w i d e u l s y e g d e o g r a i p h f i o c r m a y s i b (e n l a) c G T S e s e r e g i a h s h o g u i g h d e f l d n a e s p p a g e o u g a a e s i e a t s l i s h e m o d e a l r s e e l a t s i i n r e p l i g e m p l e n a e n d t h e c o m b i n e d t h i n t h l e i t e a n t l a b e e e s p e c i f f o d a l l b y y e d h e r o t u s d i e s g e o m o r e p h i i c d e f r o r e l e i m i t h e h i c k a m e d s x s t e r p t a l e o (T a b 1) e m a n g i g i t p i a z l e e d g d a t l i e a e b e e p m r o d u c e d g l a c c i a n r s o n s t r h a o i n v e d h e m e d e a l r e o d t i r e l c i t n k y e w i t h s u a n d a d d f a e r d a n t e t t r i a s a s e e x a m p l e t p a l e o c (e m i g a n e g a 12.0,2; W a l c o e t a 12.0,2; X u e a l . , s t u d i i e s t r e a b 1 , s o m r e e s e a m a p p e t l e u t l a i s h e s e s , 2 0 2 2) h a e g a 12.0,2) a n d d d i t w o n i k s l e e d t e o s t i m a w b e r e a b e a p p e l e a n s l o p e d y g P o a n l s e o g o l u a t c l i e n r s p a l e o c u s i n t h e c o n s t r a u l c e t o e g d i a c f i t a o p e o g r a p h a y w e e d n e l i n e a i h e d v g d a a (i l e i t h e g l a q i r e o d i n r t a n d h e q u i l i b r a i e u t m i (t e u l d e p u p h e a s b s a l a a n c i e c e R G 7 . O j a s i n c l u s u v o e l s n t p a r e e o g l o c a m p i l e e r k e h e e f o r n o d e u l s e a l e o c l i n h a t m o a d t e o m a t r e i s o t s i m i a e e g l a c c i o e n p p e o d u n R G 7 . W) t h s o u t d i v o i f s n i d o i n v i d u a m a s b s a l a n p a l e o g a a d h e c r o s b i t h n e a s b s a l a a n c i e c f e o v n o d e t l o s i m u p a t e o g f l u a c t i e a r e x i a m p o l f e u s c h m o d e u l s s e f d o p a l e o g l a c o e s t r i c t i u d e a r a l l d e } E x a m p l e d i e s s r t i m e n t g h b e l a t t y p e n d a f a r r o a n a p p e d p a l e o g o l u a t c l i e n r s .

Sh e m o d e P l S M n k e l e n a h 2 0 , 1) 1 h o p e G l o G a c i e M o d e O G G M a u s s e i a o l 2.0,1) a n d h l e n s t r G l c a t d i d e r l (I G M o u v e a t l 2.0,2; 2 e g e a 12.0,2) A l t h o t u n g e l s y e p o e f s m o d e d l i s r e l c i t n k y e a l e o c l i n h a t m o a d t e o m a t r e i s o t s i m i a e e g l a c c i o e n s t n i d i c s i s e n t t o i a l l i d a e e c o n s t r u p a l e o g w a i t t h e l g d e o m o r p o n i s t r (a i . R g t s , t l e 9 r 7 , 5 B a l l a r l 19) 8 e a e d e l 2.0,1; 7 e g e a 12.0,2) 5

T o e x t r a c t t i m i a n t f e o r m f a r t o g n b a d a a n d f o r a s s , m o r a i a n n e d s r i m l i t m e e n s t , a r e a x l t a m t l / t o h r i c k o n t a s s p a l e o g n l e a c t i e d i g i t a e d o y s t a r l u l c o t v e n t r u s e o f m o d e t l o s t i p a t e l i m v a i t e h e l c o n s t r (a i . R g t s m m e r a n e h i l 2 0) 3 M a p p i p r a g l e o g d a t l i e a s r a d i t i o n a l l y b a s e o f e i n d p p o r t g l a d a a n d f o r m a s t n o g p o g r m a p p h i c i i p a p e o r r a n a p l u b l i s i n p e d n r f e p e a m t e s p e o i a l l u m e s (e . R g i e r l c 9 e 7 , 9 o r t e a r l 1 9) 3 A d v a n c e d s a n d h e i n c r e a v s a e i d l a b r i e l m i o t t y e h y s t a d h a v e n a b t l e m e p r e s e n t a o t p i a o l n e o g a a d c i g e g r e s s p a d a t m a h s y t u d i a e v s b e e c n o d u t t h e a n d o m p p i d e o g o l u a t c l i e n r s (e . E s h . l e r s a n e i b b 2 0 0 4 a c ; E h l e a s 2.0,1) F o e x a m p l h e l a s k a P a l e o G A a t (a e r i c e a 12.0,2) f e a t m o e s t g a l i e a e i x e r t e n d u s r i n n u g l t P p l e a s t g o l c a e n i e a t A i l o a n s s k a v . i e e t s l . (2 0 2 r e) c o n s t t h e a t a g d o r s e a e a r t d i n s o u n t o a i n l e t g l a c d i e r r i s m p a 3 s k a (P A T I C E a e r . k l (2 0 1 e 8) t a b a i s h e d d e t a G l e d t a t a o g l e a d i a n d f o t t h e a s b i t i t i s i h c - e l r i s h s h e B R l T v e e s 2 i t o u n g h e e t s l (. 2 0 1 c 6) m p i a l n e x t e n s i v e G l e a t a t a p s e o d u t i c r e - r s e l c i o c n e s t o e u r a s r s m e e t e x t e r t h o u g h b a P e e i s t a n o c e a n r e h y l o c (e d n A e T E D - 1 B o y e s a l (. 2 0 2 2) 2 3 0) e n d u a t l e o d f o r m i - c h a e e d r e c o n s t r f r o u t c h t e i a e r n n o s c a o s h i e a n t a c i a r t t h e n K o l P a e n i n a s u B l u a s l i a p l a n d t e a r l (. 2 0 2 1 3) v e l o p e d t o o l t a e s t s e s s h e m o d e a l g s a i t n h s e a n d f r e e r c m A r s d e o t f g l a c g i e a o l m o r p h o m a o g b i a c a l l s h o e e p u b l i e h e i d g h M o u n t A a s i i n e . H g e . y . m a a 12.0, Q M o r e a 12.0,1; H u e a l . , 2 0 1 ; S t r o e v a e l 2.0,1; B l o m e h a r l 2.0,1; G h e e n a 12.0,1; 6 i e a 12.0,1; 6 e e a 12.0,2; 2 h a e g a 12.0,2; 2 h a e g a 12.0,2) 5

T h e e a m p l r e o s v e a d e s a d e s s p a t e r e f l e y p a d e o g l a c i e t r d o m e s l a n n e e g i o n s .

T h e d e v e l o p m e n t b a l i o t f e o d e g h a o i e t r l (t h e s R a n d o G l p a c h l i n e v r e n (t R o G l y) e f e a e l 2.0,1) w i t c h l e d a a r t a g l a c i e r s .

s t a n d a a n d s t r i a b i u d e s a p e i x d p a n a s n i d n n o v a n h e n

Method	Feature type	Data format	References
Landform, moraines, trimline(s),	Line	Papmap	McDougall (2006) and Van (2007) Harrer (2010) I l s e a l (2012) Douglas (2018) Car (2016)
	Line	Digital (PDoFr)	Locke (2004) Gill (2005) f (u2004) Por (2004) g h e e t s l . (2010) a e r k l (2018) D a v e k s l (2020)
	Polygon	Papmap	Pie (2005) b o a r n d B e v (2004) l u g h e e t s l . (2006) l a e a d (2011)
	Polygon	Digital (PDoFr)	Gill (2005) f (u2004) K a u f m a n a n l (e2004) L o c k e m i (2004) H e y m a l (2006) e n e a l (2011) f l u a l (2012) S t r o e v a e l (2013) B l o m e h a r l (2010) g h e e n e a l (2016) g h e e t s l . (2016) e a l (2016) a r k e a l (2018) e a l (2019) D a v e k s l (2020) e a l . (2022) W a l c o e t a . (2022) Z h a e g a l (2024) Z h a e g a l (2025)
	Polygon	Digital (PDoFr)	Por (2005) i e (2009) A c k e (2009) B u g g e r (2007) a n d v a (2007) V i e (2008) a e d e l . (2017)
	Polygon	Digital (PDoFr)	M u n r a e d i c k e (2002) R e f s n e i d l e 2 0 0 8) C a r r a e a d (2018) s t o n e a l (2015)
Glaciological principles	Polygon	Papmap	S c h i a h H o g (1981) B e n a n n d u l (2010)

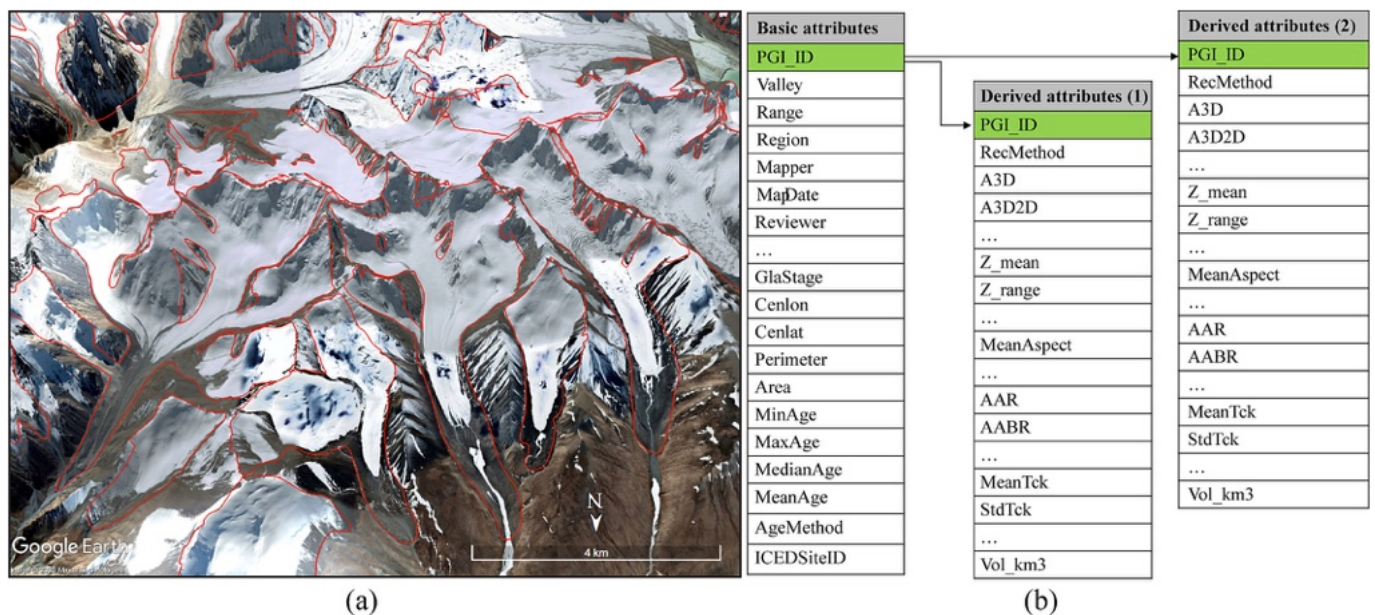
^a Glaciological principles (Nye 1952) and the rules and estimates of the ice sheet and the ice flow.

^b The study of the ice sheet and the ice flow.

In th p ap e v e r o p a s e a m e w o r t k a n d a t r h o p i a z l e e o e i a w d s h e v e m r o a r l a i o n f e s f f a g e m s u l t p a l l e o g l a c i g l a c o i u e t r l f i o n e m a i t t i h n d i v o d d a s o b e d i v i y d b e i r o u t l a n e r s e a t t e o d r r e s v p i d e t a d c i m d i v n d u a p o e i - c o r r e s p o n d e i m s g h a e t d c s h m o e m t s i n a g a n d s e o t f t i e r a o h t h e o s u e t l i h a u s n i p u e l b e d a w s e l s i f f e r i n g a t t r i r b e u l t a e t e a d c i m d i v p i a l u e d g o l a t c l i f i o n l e l o t w h i e n g e n t r a i d a t r u t t o e n g i v t a u l d a e d a g r e n s o t t e h a h t e i m i n g o v e r a a t l t r s b u e o n t e h R 7 . O u t l i f o p i e s e s e n g t l a d a i y e o s h a e s s i g r e a d s i a (g e e . L g G M L A .) m a y a r i y d i f f e r e n t W e t h e p n r e s a e m t o l i b A x c G P I S o i t a h e o t f t o o t l d e l p r e i g a i t h e e t a a g d e s i v i a l a t r e e c p n i d e t t r i b u t e s s u b d i w a i d e r s h e p l a b e s c o d u a t l i e n d e r i t h e e t t r e i a b f l o e r h p a l e o g o l a t c l i (e r r e l s) . b u t l e s e o d d i g i e t l a e l v a n t o i d e n (D E M a n) d e c o n s t r u c t i e n a s a i t c t r i t a b i t n e c l a d e s i r b e u l t a e t s e h n e e t a d a t a p a l e o g s l u a r c f a e o d e t e h i c k r a e t a s p l i c a t i h i o e s l b o o x f h e u t l s i m e a s v a l l r e a y n g r e g i m a n p p e n a p p i d r a g t e , a r d e m o n s t i m a h t r e d e a c i n a t u e n d a a n e i a s o s R a c a , r e v i e d a e t s a u m c a e p p i n r e g h a d g l a s i a (g e e . L g G M , t h v e e s t l e r S a n d h e e n t r i a b l e p t l a n t t e l a e s t a b l i o s f h m l e l n A t) T h e a e t r i a b r e a e s d l e y r i f v r e o d m i t e r a n t l u e q u e i r e s t a n d a p a i l z e o d u a t l i e n d s e r i e l a a t t e d t r i b u l t p e s m a n u a n l p t i h e a s a i t c t r i t a b a l l e s o c l i d a e t s t r i b u t a e s i m p r o d u e a l u a e c u r a n d t i l o f t a y l e o g h a p p e n g c a m e d e r i f v r e o d m p a l e o g o l a t c l i (e p r e s y g d o s s o h a a t s p a l e o g a d l i e m a e t e o n s t a n d e i r o t e c s l o t s h e a p a r e p e r i m e n t r e n t r l a i d a t e o n g i (f u d e) e . l f b e t w e e n m o d e l o i f n a g l e o g a a n d o d e g h a c i e r s . c o s m o g s e u n r i f e a x c e p a u g e s o t h n e u m e r a i g c a s l a e v a i l a b l e

2. Watershed-based land claim

Mo spta l e o g r a c c o i n s t i r m o t u i n t s a i n t r i n g u s i u r t e r e c o n s t i r s e c i t f a h o t h i c k o n t e h s e a l e o g w a n c i c a m s , l i n e s r r e s p o n d i n d i g i r s c g d e i a r t e a w s h i c a h r e b e c a t e g o i r n i t s o d f a b e v a t i o a t e r l i s t o p s d c o n t r o y b e e d b o k o g r a x p h y l t r a r i g c e a a n d u t l e a s p e c t - a r t e t r a i t b o u t h e i s c k n e s a t t r e i l a n d e s s i m a t e d o f c s e h e W e s e v e a l f o r p a m e w o s r u k b d i v a i n d l a n g a g t i n e g E L A f s o t h s e p e c g i l f a c i t a (t e b 3) A p a l e o g s l u a r f a a n d e p a l e o g o l a t c l i (e n r e b y g s e p) a r g a l t a e s i e s r t e o n s t r o l i l e t h i c k n a d s e r s e c o n s t u r s u i n a g e d r o u t s h o p a s r a m e t e r s b y t h e w i a r t e r s (h e a d t s c h o n e l n a s i n a r g e a s c l u t d h i e n g e o d a s a u r t l e u s u l t d p i l e t v a e b d a s e a v a i w a i t t h e e i r d i v i f d o a s e a s v e l y p d r e s e n g t l - a d a i f e i r g a .) T h e u b - s p e c i e r f o c n s t m r e u t c h t o d a n a m e a t n d r a s s a u r r c e c s o r d e d d i v i p l a e d o g o l a t l i a n e s s o c w a t h e d s a i t c t i r l a b l e i n a R e c e m e t t h e d d h a t t e r i t a b l e (t e b 3) e . (o n b l a s e n t h e p a l e o g o l a t l i a n e s s o m u l t i p l e v e d T a b 2 a s 8 l i c e t t a i f e d o r m a b o i t u d t h e a s a i n d e r i v e d a t t r i t a b l e e s e n d r i n g f e e o o n s t m r e u t c h t o d e s l a t t r i r b e u l a t e a d p h a l e o g o l a t c l i N e m t e h a o a t I R G 7 . 0



23 (aA)bi'selyei eiwo Goo glae it lhl us a s eot si un b d i p a d e o g o l a t c l i d e u r e s i n t i t t c A e g e r p o l y g w i n s h e s e n g t l - a d c a i y e r s
 a n s n o w o v (e w h c b d o i a m) u n t a a r i e n d h v e s t e i r s i n a (n 1 ° . N 7 8 ° E) . (b A) n e x a m p t e f o r n a s t r u o t t h e a s a i n d e r i v e d
 a t t r i t a b l e s a t t o e d l e o g o l a t c l i v e r s h e l i n b e a u n i P u g e l I D .

) .4

Derivatives of the above terms are used to construct the following terms:

Name	Description	Unit	Reference method	Coordinating attribute
PGI_ID	Therapeutic paleoglacial outline	Paleoglacial outlines	Therapeutic paleoglacial outline	id
RecMeth	Reconstruction method	Reconstruction method	Manual input	
A3D	3D surface at the paleoglacial (m)	Paleoglacial surface (2024)	3D surface at the paleoglacial (m)	
A3D2D	Ratio between 3D and 2D areas		Label (2024)	
Z_min	Minimum elevation of the paleoglacial surface		Label (2024)	zmin_m
Z_max	Maximum elevation of the paleoglacial surface		Label (2024)	zmax_m
Z_range	Surface elevation range (relative to the paleoglacial surface)		Label (2024)	
Z_mean	Mean elevation of the paleoglacial surface		Label (2024)	zmean_m
Z_media	Median elevation of the paleoglacial surface		Label (2024)	zmed_m
Z_mid	Middle elevation of the paleoglacial surface		Label (2024)	
MeanSlop	Mean slope of the paleoglacial surface		Label (2024)	slope_deg
MeanAsp	Mean aspect of the paleoglacial surface		Label (2024)	aspect_deg
Hypsoma	Therapeutic hypsometric mode		Label (2024)	

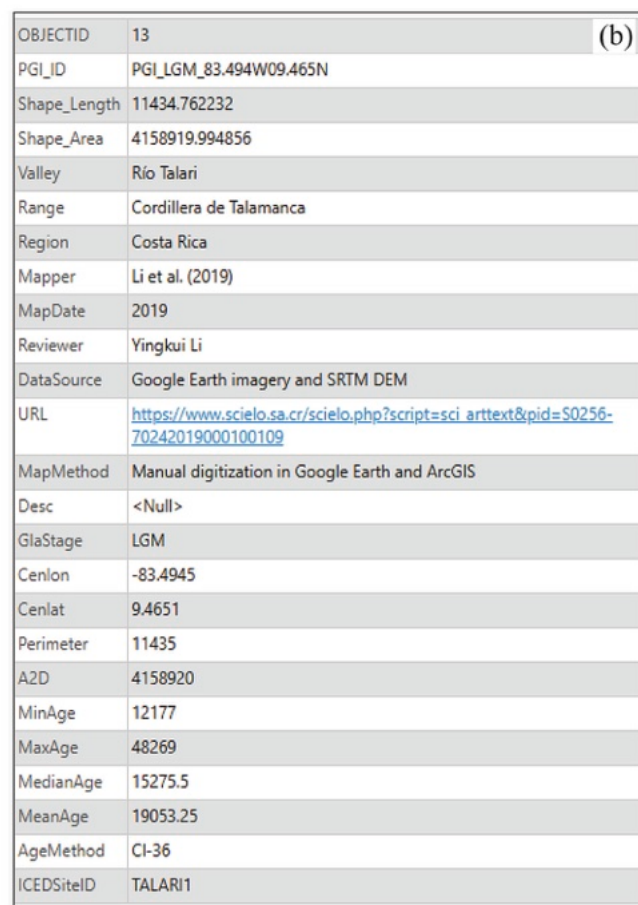
	Input: deg, aspect	Output: (2024)
Mean Aspect	surf(average)	Leaf . aspect_deg (2024)
ble	thealeoglacier	
Hypsoma	surf(average)	Leaf . aspect_deg (2024)
	the highest mode	

ing (concentration)
of the
paleoglacier
elevations
S HI Hypsometric
gators, integrated
ed MGE paleoglacier
are ELAs of the
r - Méditerranéen
e AR Elevation
meth (m)
S ELAs of the
t AA Accumulation
AABR Ratio
meth (m)
S ELAs of the
t AA Area-Altitude
AABR meth (m)
S ELAs of the
t AA Area-Altitude
AABR Balance
meth (m)

ators,	interglacial	Leal, (2024)
ed MGE	paleoglacier	
are	ELAs and the	Pellittero et al.
-	Medi Glaciers	(2015)
d	Elevation	
e ↑ AR	meth (on)	
S	ELAs and the	Pellittero et al.
t EA	Accumulation	(2015)
. org / re	Arctic Ratio	
AABR	meth (on)	
	ELAs and the	Pellittero et al.
	Area - Altitude	(2015)
	meth (on)	
	ELAs and the	Pellittero et al.
	Area - Altitude	(2015)
	Baltic Ratio	
	meth (on)	

MeanTckMeanthicknesPasleoglazcoearl
lacier (m) thicknessstatistics
raster

(c o n t i n u e d)

[illegible]

7



Quesada et al. (2020)

3. U. nMcauntWeslerinSeates

O u s e c d r e n o n s t u r a t S M r l a c i e r t n f i n t n h i n t a
 M o u n t a i n s r a e d a a b 2 0 0 9 a g l a c i r a n g t h e m i d d l e
 R o c k M o u n t a i n s o o f t h w e s t e r S (F i G 6) T h e W i n t a
 M o u n t a i n e a s t - t w e n t y t h o u g t r a i n i n g e n t h o r t h w a r d
 a n d s o u t h w a r d g l a c i e r s I n t h e p a s t t h e g l a c i e r a t i o n
 t h e r e u n t e d e a s t w a r d i n t h e g u n t a l i a n c y p r e s e n t t h
 l a r g e e f f e c t s a l s o m o d e r m a i n d a g r e e d t h e s e s t e a r o f
 t h e a n g e l m a l v a e l r d e a c i i r e s e n t a m a l a s t p e a r o f f s
 t h e a n g e l n r a e d a a b 2 0 0 9 C o s m o g ¹ e n e t r o n o d o g i e s
 g l a c i e r b r i d g e t h a t e t a n d e r m i n o a a i d r e e f n i n g
 l e s o f t s p a g e M e l s j v i t e h p o s a u g r e s s a n g f i n g 2 t d 7 k a
 a t o r s t a g e 1 2 . 0 , 0 1 9 a a b 1 2 . 0 , 2 T h e i n M a u n t a i n e m s o r e
 e x t e n s i v e g l a c i e r a t a n t h e o s R a c e a m p a h e h a v n o r e
 c o m p l e x a c g i e o r m e t p r i c e i s , a n i n g e i g o r t e u s f o r
 d e v e l o p e d t h o s u b d i v i d i n g i n g l e a d g l a c i e r s .
 A s i l l u s t r a t e d t h e r e i g p i a l o g o l a t e l i d e n r a e s y
 M u n r a e d a a b 2 0 0 9 i n 1 5 u g l e a c a e a l s a , r o g u e t l i i n t h e e
 n g r t e p r e s e n t i s o e f v e i l t h u l t o p i t d e a c f i e w i n g
 t o w a n d s a t m o u S l e v e o r t a h e u t l i e p e s e c o m p t o u n d
 g l a c i e r t h e t f e w s i n g d o f f e a d e a v e s H l o w e v t h e r e ,
 o r i g o i n a l l d i n e s t u b d i t h i e d s e a c h a s e n t h e r a i n a g e
 d i v e r s i t y b u d i t h e d l u s e n s t u b d i g l i a b e i f i n e s
 f o r a t e r s u b d i t h e n p o a 3 0 - S r T M E M t h a s e
 p r o j e c t M o n i t o r i n g a n d a m i n i m u m l a b o r f o r

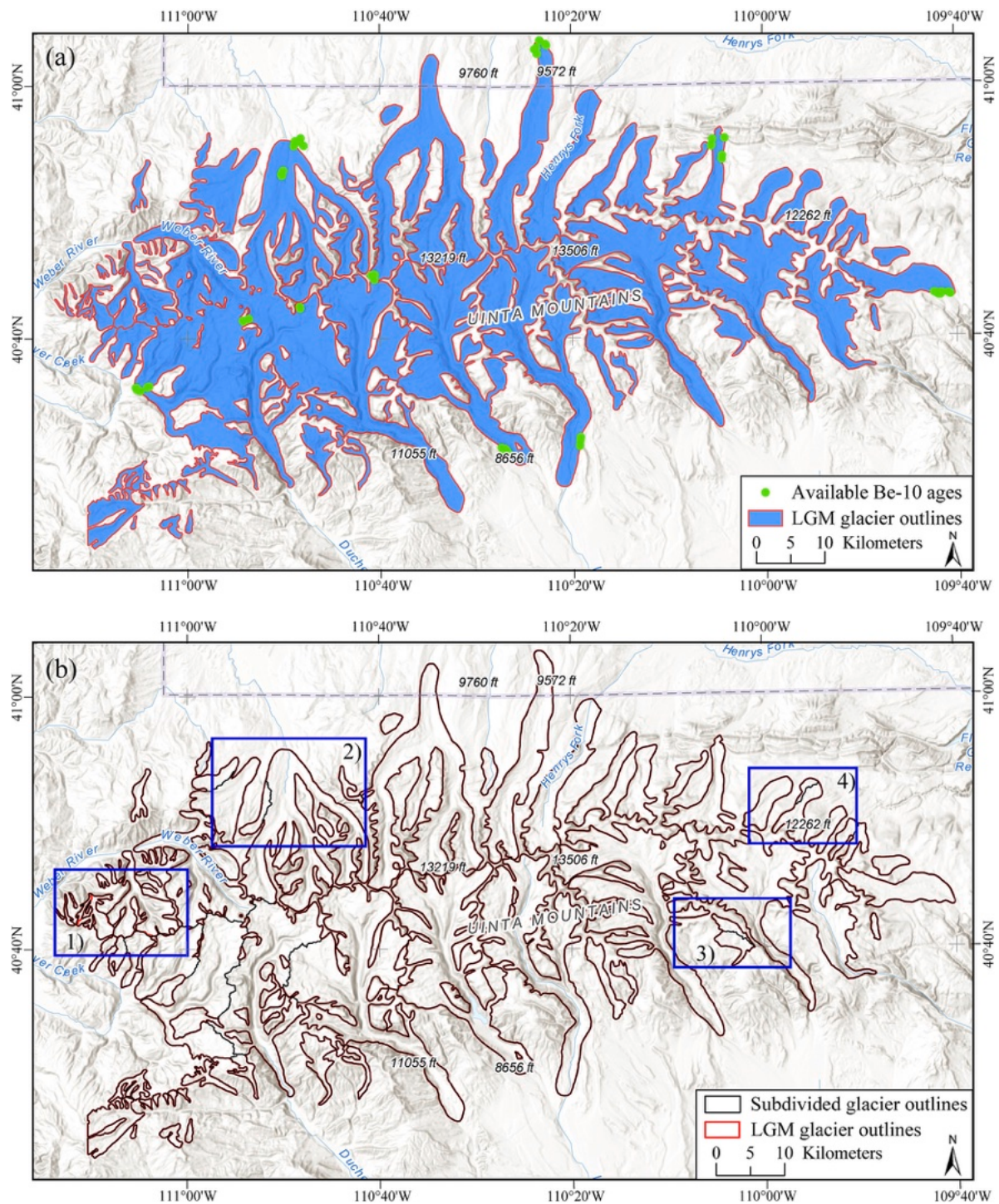
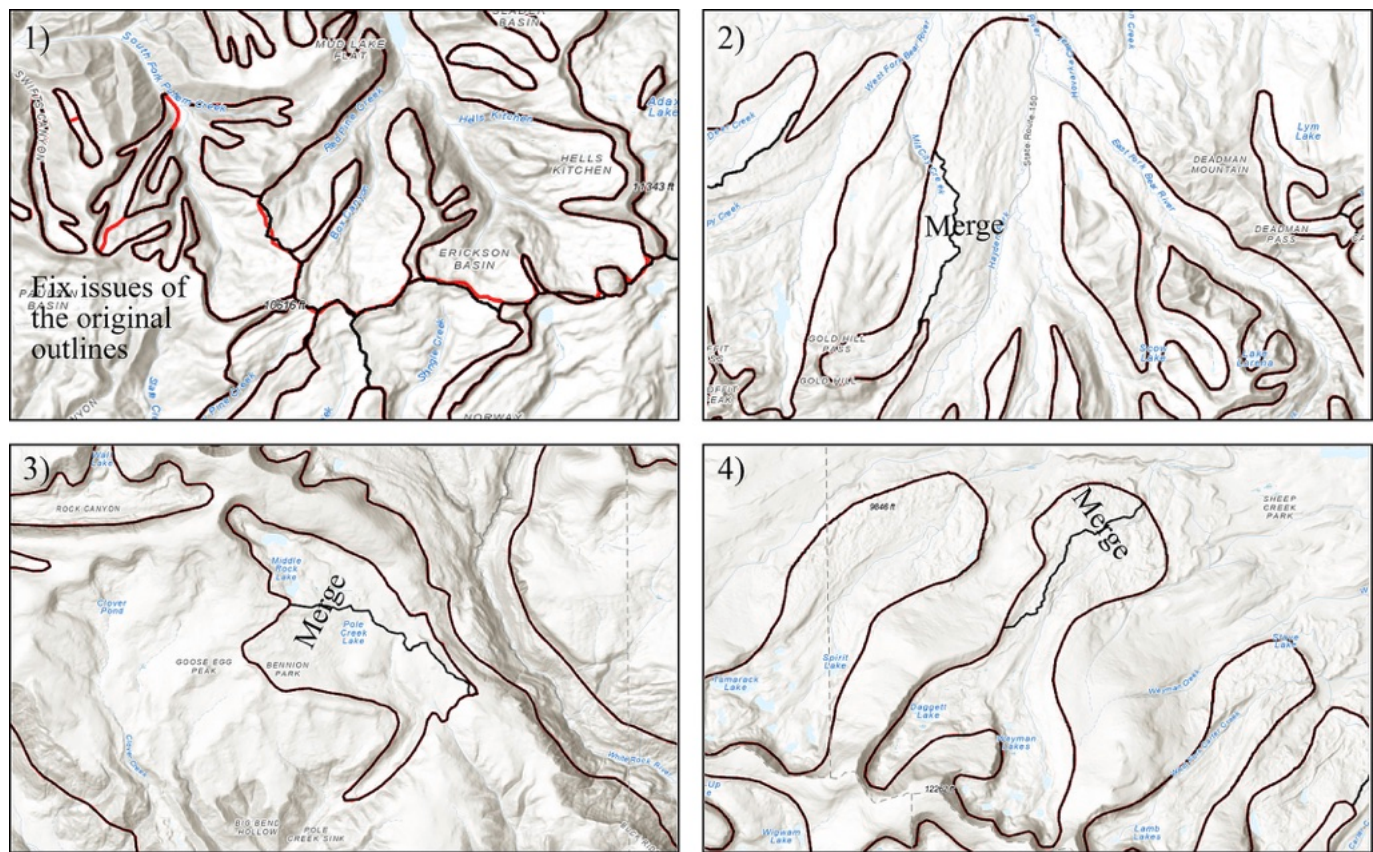
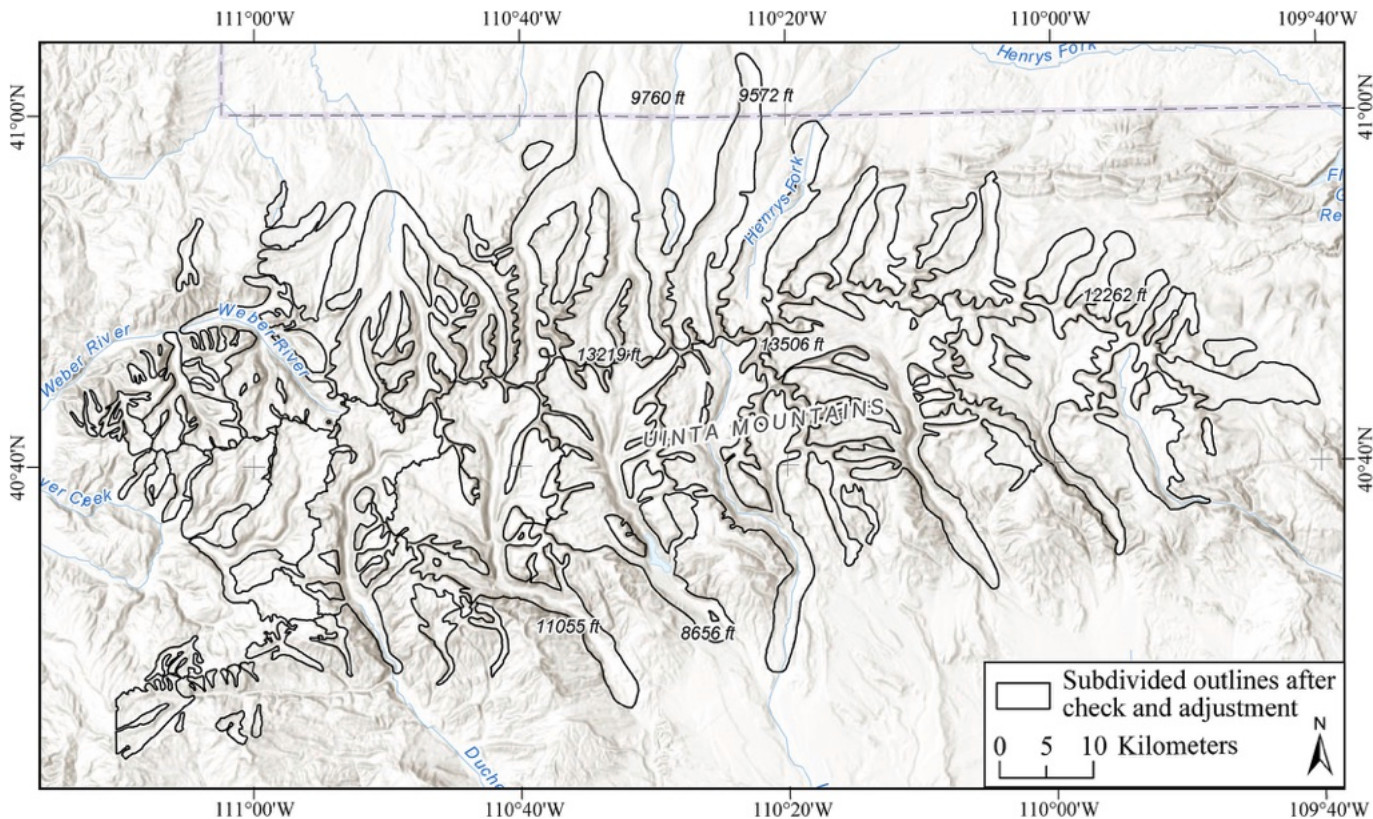


Fig. 2. (a) Map of LGM glacier outlines in the Uinta Mountains region, showing available Be-10 ages as green dots. (b) Map of subdivided glacier outlines in the same region, with four numbered boxes (1, 2, 3, 4) indicating specific areas of interest. Both maps include a scale bar (0-10 km) and a north arrow.

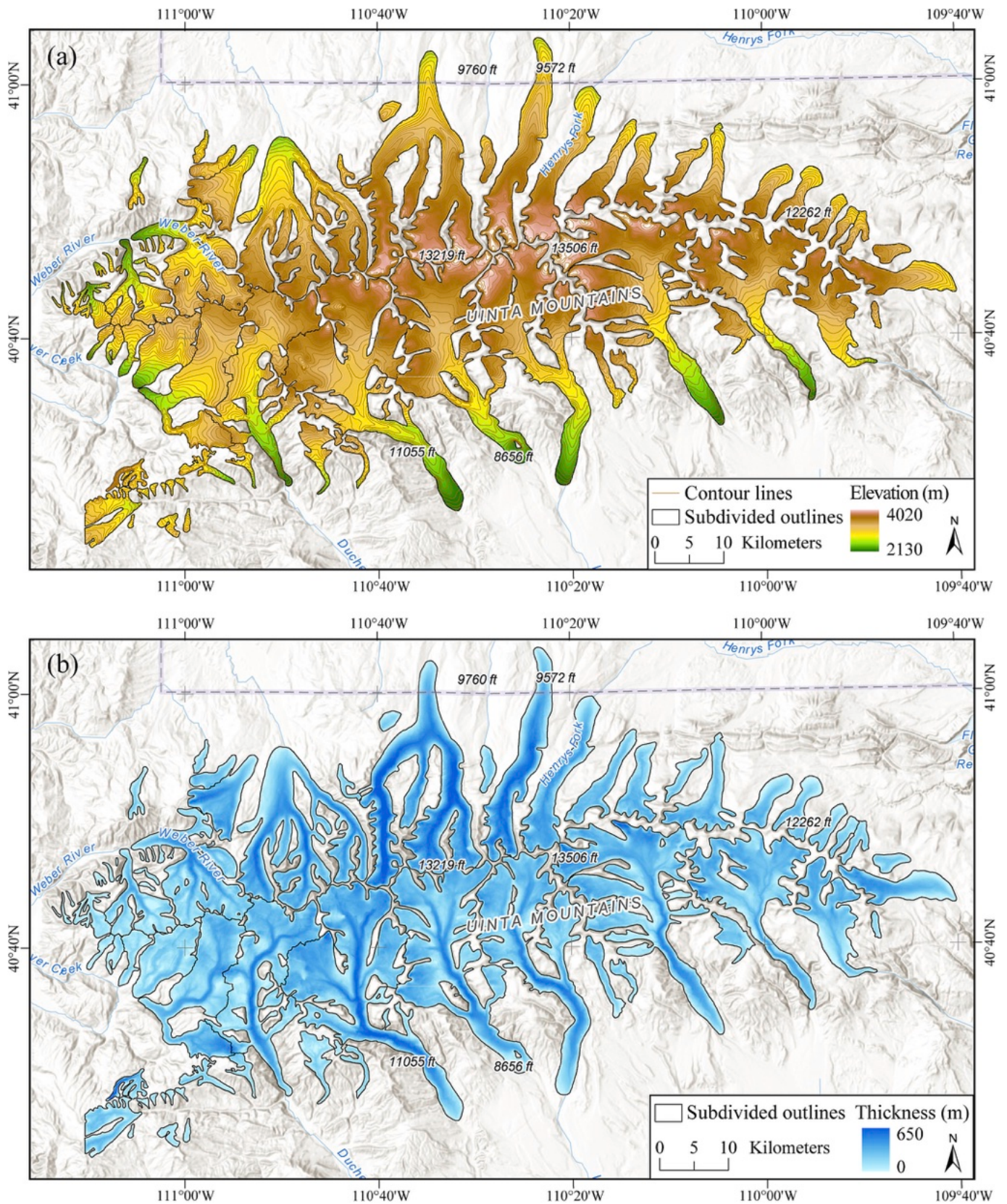
ground (c) stands and a rhodospirillum (d) is a bacterium that is found in the soil. The ground is covered by a layer of snow and ice, which is the result of the glacier. The glacier is a large body of ice that moves slowly over the land. The glacier is formed by the accumulation of snow and ice over a long period of time. The glacier is a natural feature of the landscape and is an important part of the environment. The glacier is a source of water and is a habitat for many animals. The glacier is a beautiful sight and is a popular destination for tourists. The glacier is a natural wonder and is a source of inspiration for artists and writers. The glacier is a part of our heritage and is a reminder of the power of nature. The glacier is a source of pride and is a symbol of the beauty of the world. The glacier is a natural treasure and is a gift to all of us. The glacier is a source of life and is a reminder of the importance of protecting our environment. The glacier is a natural wonder and is a source of inspiration for all of us. The glacier is a part of our heritage and is a reminder of the power of nature. The glacier is a source of pride and is a symbol of the beauty of the world. The glacier is a natural treasure and is a gift to all of us. The glacier is a source of life and is a reminder of the importance of protecting our environment.



2(3 The oem la g e m a r k e r i n i g b . h i g h l i g h t i n g t h a t t h e s u b d i v i d e d o u t l i n e s d o e d c h e c k e d a d j u s t e d f o r d e t a i l e d e x p l a n a t i o n s) .



2(3 The n a l g a d o u t l i n e s m e r g i n g t h e s p u r o u s i n t h e s u b d i v i d e d o u t l i n e s



2(3) (a) The constructed elevation map of the Uinta Mountains region. (b) The constructed ice thickness map of the Uinta Mountains region.

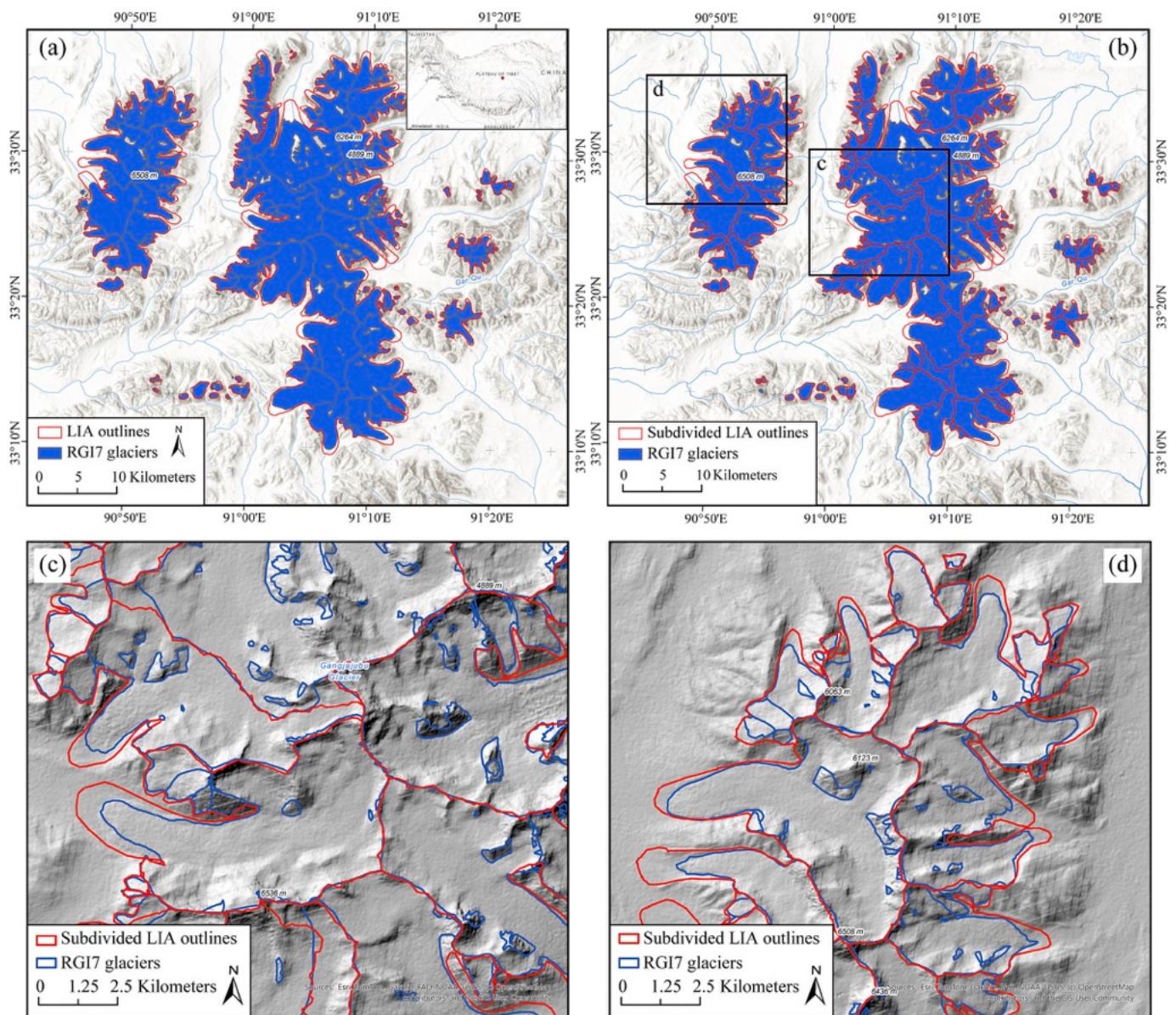
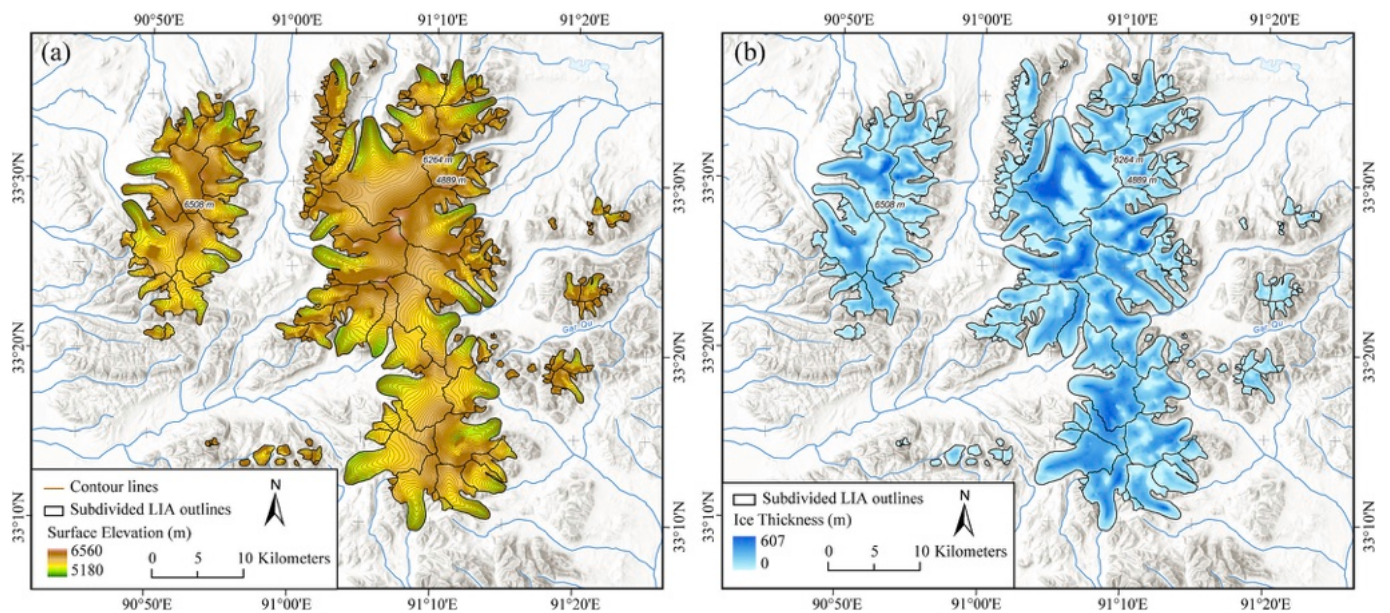


Fig. 2. (a) Modern RG17 glacier outlines (blue) and LIA outlines (red) on a topographic map. (b) Subdivided LIA outlines (red) and modern RG17 glacier outlines (blue). (c) and (d) are zoomed-in views of specific glacier areas, showing the detailed comparison between modern and LIA outlines. Each panel includes a scale bar (0–10 km for a and b, 0–2.5 km for c and d) and a north arrow. Coordinates are provided for each panel.

comparisons of the modern and LIA glacier outlines. The modern glacier outlines (blue) and LIA outlines (red) are shown in Fig. 2a. The modern glacier outlines (blue) and LIA outlines (red) are shown in Fig. 2b. The modern glacier outlines (blue) and LIA outlines (red) are shown in Fig. 2c. The modern glacier outlines (blue) and LIA outlines (red) are shown in Fig. 2d.

The modern glacier outlines (blue) and LIA outlines (red) are shown in Fig. 2a. The modern glacier outlines (blue) and LIA outlines (red) are shown in Fig. 2b. The modern glacier outlines (blue) and LIA outlines (red) are shown in Fig. 2c. The modern glacier outlines (blue) and LIA outlines (red) are shown in Fig. 2d.

The modern glacier outlines (blue) and LIA outlines (red) are shown in Fig. 2a. The modern glacier outlines (blue) and LIA outlines (red) are shown in Fig. 2b. The modern glacier outlines (blue) and LIA outlines (red) are shown in Fig. 2c. The modern glacier outlines (blue) and LIA outlines (red) are shown in Fig. 2d.



2(3) The reconstruction of the dog (apparently) is a fool's errand. I would advise the Mount Carmel Plateau.

cat chnle nthDeMv a p r o d u c e l t h o t h g e h r i d r e a d i n a t h e w e v e r m a t t r i s t u i t e l s u m a r n e u a n p o t u c a h s v a l l e y ,
d i v i m d a e y s e a f f e t y d i d f e y p a n d e s o l o D E M n s e r a n g e g i n c o a p , p e a s o u m c a e p , p i n e g h a d s o n .
a r g t u e a i d e r a i d a g e a d u e s o m a t l e a b l y e y n r e t h a o r d e S e c o n d l e o n c e p r a t e r s h e p a b e a s g o d d a t l i d e n t e s
m o r a e c c u t h a t t h e a n u a d l i l g y d i r a e d a g l e y i i d e h s i s w o r k s p r a l e o g t a w e e c o s t r l o y t o p d g r l a p p h t y h . r e e
a r e (S a a k a 2 0 1) 9 t h e r e f b i n e t h m a y b e u s e t d c h e a k d d e m o n s t a a e a d i t h o p u a g l h e o g l v a e r i e a d e i s n t d e
c o r m e a c n t u a d l i l g y t o u z e l t o p r e s e n g t l - a d a i y e w s e v e r a , c u c u m l a a r t e i a o r i n t e r p r e u t g a t e i b o a n t i e r h o a r e a s
b e c a u s e a c i u e r f a c t e e i a n t h e a l c u s a t r e d n a s o s u f f c i t h n i c t a y f e l e g l a c f i o e v t . h u s h p a l e o -
n e t w o r k l a s i u e r f a c t e e i a n t h e a b l a z o o n g l a c i e g r l a c w i e n s e n a l c l o y n t r l o y h o a d t t a o i n g p r i a n t h e y e
t e n t d f o w t o w a g l a s m i a e r g a m s t h e i r e s e f t h s u b d i a r e l a s w e v i e p r a l e o g w a e e x p r a s n e s n i o u t g d h o r a n t a r g e
v i s t o w e d e v e l o p p e r d e s e n g t l - a d a i y e t r l n i a y s p r o - i c e a p r s m a i l d s e h e e t h e i c r d i v i n d a e y e o f f f s e d i m h e
d u c t e h e s i r e s u o n t e s o l u i s t o o r e a b e f a e p o u n d e d r o c k - w a e t f e n r e d d h e d i d t h s i c a s t e h , w a t e r s h e d - b a
p r e s e n g t l - a d a i y e t r l (j u e s i t k b l e l A u t l i t n e e n s s) u t h a t s u b d i v o i p s a i l o e n o g l a o v a e r t s o r e m a c i o m s i v e i t t e h e
s t r e f a o n t e y o g n l d a c a i l e o n t h e e n p a o f t h e a l l t h e y e n , p a l e o g o l u a t c l p i e n e r c a i n p a l t e t s r i d b e u s t c e r s i n t h e s i d s u d l y e
t h i f e o a l n e s e t d s u b d i v i t h e u e f e n e d i i m e s d i v i d u s a h a y n e e t d a n u a d l e l l y i n t e g e t a c i a c t h n i e t h i s s e
o u t l i m e s e r t h i d e a i r i (a g l e y) i t l e e s . e a i d a g e d e o s r e c o n s p a r l e o g t s a f i c i t a e o p e o g r f a r p s i d y d h e u n s e h e
c a t h t h e u s e t d s u b d i p r i e d s e n g t l - a d a i y e t r l i n e s . r e c o n s t r i c u s t r e f a c t e o g r t a g s t o p d i v i t h p a l e o g l a c i

Limit asttliëkniss et quifruinugmproverfë mën outlines. thoughths ubd igvliadeu e ilfionra ser sthoadsh e spub - Futwperiks e commetndre p r o line e th d s ub d i v i d e d i v p d e e o g u a t c l i b a r e s t h e v i a r t e r s t h e m d a s r o i n e e s p a l e o g b a c e d w a s t e r s a m e d e s t u n a e n u a d l j u s t o n e n t s m a n u a o l r i k s t m e e d t h i i s e c a w a s e e r s t h e m d a r r e e s h o u t p m d s a e t t r i m b a u n t e e s c b a d d e d h a e t t r t b b l e s d e r i f v r e a n n p e r e s n b t e d d r a b y k o g r a n n h a y n o e x a c t l w y i t t h e o n t i r d u e o v e s l o p a m e n t a n d a r d i f z l a p t a i l o n o f o l t h w a l v e a t e r s f h o e r d s a m p b e n e r e m a s h e i m p a c t e d g l a o i e t l a m p a l e o g l e a c o i r e s t f u c t i e n t h e r e s b y p o s t - g l a n d i s a l t d e i s a g d e u v r e e n h a a v s h i f a t e d e v e l o p m e n t a p a r t e a s e n A r c G P I r S w h i c h q u s o e s - w a t e r s h e i d e i m p s r e v i l o c a A s i o l n l u s i t t a l e i e n d t a w a r l e i c e p s e b j t s i o n i e s g f r s o a n c e s t s h i t e r o f u s t u r e M o u n t a (F i n g s) a l t h o t u y g h i e c r a o l s r i a t a e s e a r d a y g e w o r i k s e c o m m e t n d e d e s o r p i t l o a i r i s p e n - s c o u e n c e e n o u t g h a u d e a i r a g d e u v r e o s t - t L i G m e s m a l r a s i n e s i r o n n i e Q e s (S G I D s e v e l o p m e n t 0 2) w h e s e f t w a r e a n d a t h Q e u r a t e d r e a p o n a y a f e h a b e l i n e o f t i r e a m d s l i c e a n s e s t e q u i t p e r d o m a t e e s s a i n b d i r l o i a t y e o r p t i o n w a t e r b e d d a r r e s u s i t n t i m p r o d u c t s i c o m s p u r i o o s t h e s e o (W s l i k i e a d 2 1) f o p r a l e o g m a p p i a m g l o u t l W e r e s t t h e m o s g t l a c f i u a v l i a n l d , l c a r u s s t e r d i n n e e n r e s c o n s t r u c t i o n .

a r d e p o s b i e t l e d u e L A o s p a l e o g l r æ d i u t r h e i g n p æ o n t

draimigeðe ðine Aaltl hœf s æc ta of r se l c a t u t o m a o t f i o n , 1(1

the division of formal scale and log land in rivers and glacial.

[illegible]

p a l e o g M a e a i l e i m s t . r o a d s u e t e b a s a i t c t r i b u a t e a r a c f o l w e t s h o u r c o e f e u s n , z i i p o t h e o c c a o l m p u a e d u n
t e r m i a p p g d a c o i u e t r l a n d s e r i a e t r i b u a e d t h e t h e t s c o i l n s r c G P I R S P l e a s e p a n g r r o r q u e s t t i d i n e s
r e c o n s t r a u l c e t o e g d i a r c f i t a e p o e g r a a n p i l c t e h i c k S i e n s e s . c o r r e s p a u n t d i i g e r n a i l .
o f t h a t t r i b u e t o e n s i s i t t h a t t r i b u i n G E s g l a c i e r
o u t l W r e e d s e v e l a p a e d c G t l S o l I P G x T o b d s u b d i v i d e 0 0 10(B (1 (-6-
p a l e o g b a r d i i m e t i o n d i v p o u l a y l y o m n s t r v a i l h e d n
w a t e r s h o e d d a a r n i d e s r i t v h e a t t r i b u a e s o g l a c i e r s . (W r i t - i m e g v i e e w d i t W n g t - i n g i g d n a i t ,
A p p l y t h n g o l t h e r h e g l e a c i m a u e n d t a r i n a c o s t a s o f t w a t e r h o d o f l o n g d y a r g u i s F i o r i n a m l , a l y d s a i s a ,
R i c t a h v e e s t l e r a n d h o e n t r i b u l e P l a n t d e e a n u o n s t h a t e s r a C o n c e p t u a l - i z a t i o n . W E i t - i m e g v i e w
c a p a b a i n d i f t f y c i o e f n t c y t s c o e i l s s u b d i v p i a d l i e n o g g o l a t c - i e d i t i l m y e s t i g a t i o n a t c o m p e c t u a l - (I z J a t i o n
l i n a e n s d e r i a i t n g i a l u t l e s u o g n h e a n u a d j u s t a n e e t s - 1 W r e i t - i m e g v i e e w d i t M e n t h o d o c l o o n g c y e , p t u a l i
s t r i e d e s t a i r y o , l p b r o o x v a d e e f s c w a e y o s t a n d a t h d e i z e o n 1 - B 0 ((W r (E t - i m e g v i e e w d i t M e n t h o d o l o g y
f o r n a n d e r a t e r i f b o p r a d s o g o l a t c l i e r d e s v b r i n g e C o n c e p t u a l i z a t i o n .
s t a n d a r d a i n d a p i t o r c e s a i l a r g u e m b e p a l e o g l a c i e r
o u t l W e e o s n . t e h n d h s e t a n d a p a l i e e g l o u a t c l i e e r e d , l
a s t h e r i e r l a a t t e d r i b e t i p s p , r d h e a l u e n s i s a t e d c 5 y , (I 6 B - ((3 - -1
u t i b i f t a y l e o g n h a p p a n g p a l e o c l e m a t h e s t a n d t i o n
c l o s t e g a p e t w e t h m o d e l o i p g l e o g l a n d i e d e s r n . T h a u t h d o e r c l n a o r e n f o i c n t t e t r h e a s o t u h l a d i e n f u e n c e d
g l a c i e r s . t h v e o r r k e p o i t t h o s p e r .

- , (

,- 36- 1

The development of this software is available at <https://github.com/yandak/tip2USAtPRC-Tree> and <https://zenodo.org/record/1509899>. We thank the anonymous reviewers for their comments and suggestions to improve the manuscript.

BB- (

Liost hættir beitaðs endandi við laða (glaciérarpródukt RTGS7). (Omóðiffræðm https://www.glaciers.org/rgi_user_guide/products/glacier_product.html)

Name	Description
rgi_id	Unique identifier for each data line.
o1region	The orbit of the first observation line.
o2region	The orbit of the second observation line.
glims_id	Identifier for the GLIMS (Global Ice Mapping System) data.
anlys_id	Unique identifier for the analysis of the data.
subm_id	Unique identifier for the submission of the data.
src_date	Date of the source data.
cenlon	Longitude of the center of the data.
cenlat	Latitude of the center of the data.
utm_zone	UTM zone of the data.
area_km2	Area of the data in square kilometers.
primeclass	WGS Prime class of the data.
conn_lvl	Level of connection of the data.
surge_type	Surge type of the data.
term_type	Term type of the data.
glac_name	Glacier name of the data.
is_rgi6	Is the data RGI6 (Remote Sensing Global Inventory of Water and Ice) compliant?
termlon	Longitude of the term of the data.
termlat	Latitude of the term of the data.
zmin_m	Minimum elevation of the data in meters.
zmax_m	Maximum elevation of the data in meters.
zmed_m	Median elevation of the data in meters.
zmean_m	Mean elevation of the data in meters.
slope_deg	Slope of the data in degrees.
aspect_deg	Aspect of the data in degrees.
aspect_sec	Aspect of the data in seconds.
dem_source	DEM (Digital Elevation Model) source of the data.
lmax_m	Length of the data in meters.
geometry	Geometry of the data.

$$(4) \quad \mathbb{B}(-3, -1) \cap (3, -) =$$

Palaeosincretism and the development of a new tectonic province in the Iberian Peninsula

o f l a c a e h a s e s n u c c e s a s p f u l t i t e y a l l e o g r l e a c c o i n s r t i m a n a y o e (a e s . Y g a . n e g a . 12.0,23 i e e t 12.0,23 h a a e u l . , 2023 u e a 12.0,23 h e e n a 12.0,23 u e a 12.0,23 W e u s e t h u e p d a R a d a e 20. (O c t e t p s : / / g i t h u b . c o m / y , l i 2 0 2 3) b 2 0 0 t o r e c o n s t i t u e t h e t i c k a m e d s o s l u m f e h p e a l e o g l a c i e r s .

W e f r a s s e h e f l o w f r i o s t s n a e n t w o t r o k o d l e r t i f e o w l i f r o a s g h a w u e t r l i m e e n . p o t i s i s o m c l i t u h e M t , h e l o w e c o i f e a n g h a w u e t r l i o n e e f m b l e o w n d s t h e o w l i t h e e s t . h i e n p a t b s a s e n t h e o s d l e f a v a l l t u e f s t c e h r e c l a n d g a d j u s (t i n e e g d e l t f o w l i t h e e s a , l a e R o e l c c o e n s t w u e p h i l a e O u i t c l e i r t e p s s e f d t h r e e c o n s t w u t t h i e n o p n o t i s e D E M s , u b d i g i d e d u e r l g m a e f p a v l i a n n e d s t , h d e e f a v a l l t o e s t e o t h e u t p o u t t h r e e c o n s t i r n u c c l i t u h e e n i c k p r o e i n s t s a l o n t h e o w l i t h e e s e , c o n s t p a u l c e t o g d l u a r c f r a c s e a d h e e c o n s t i r c t e l e i e k r a e s s t e r .

F o t h p e a l e o g r l e a c c o i n s r t w i u t c h t o a u p t p e d l l y g u o t h l p a e a e a o l i s c o e l a i s d e e t s o t o t l o s e c o n s t h p e a l e o g o l u a t c l i e n r e s a s v e a s u r f t a o p e o g r a n p i l t e h i c k u n s e i s t r a g , g e d m o r f p e h a i t c s u e a s t , r i m l a n d e s e r a l m b e r a n i h l e a s d e e t l k e d e t a i i r f e d r m a b t o R o a n l a e i o n l i c 2023 Q 2 , 3 o b t) h e i t H s u i b h e t p s : / / g i t h u b . c o m / y . i n g k u i 2 0 0 3 / P a l a

BB- (J BB,-6-

S u p p l e m e n t a t t a t h y a s t c a t h e f o u n d l a n d t p s : / / d o i . o r g / 1 0 . 1 0 1 6 / j . g e o m o r p h . 2 0 2 5 . 1 0 9

5 (((

D a t w a i b e n a d a e v a i o a n b e l o p u e s t .

A-I- - -1

A c k e s l 9.8 B e c o n s t r u c t i o n i n t o g a n p i r e o f n e s t h e d s t e e d S t a G e o S o . A m B u l l 10.5.6-57.2

A n d e r s o n , H . A n d e r s o n , D . 1 7 h e f f e d i n s t e r a c n i n u a l t e v a r i a b i l i t y a i e e G r e d o . l 4 8 5 5 5 8 t p s : / / d o i . o r g / 1 0 . 1 0 1 6 / j . q u a s c i r e v . 2 0 1 8 . 0 4 . 0 2 4

A n d e r s o n , J . p w e r , J . a r o A c H A , d a l g e t i t G i s r G e . i o r s t a i r . , M i l G e . H H a r n D n g t , h o r s t e t i M a s g o n s e s . e n l s . f o 2 1 . 0 1 8 . H o l o g e l n a e a i n d r i m a a t r e i a i t v e s f l o e i l r a n t h n e o d e l o i f n g D r a n o g k a i j c b e a p u a t e r S c a i r e n e c e i e 4 8 9 5 6 t p s : / / d o i . o r g / 1 0 . 1 0 1 6 / j . q u a s c i r e v . 2 0 1 8 . 0 4 . 0 2 4

A r c h i t e c t u r e , G e a t t i n B u t c h e E H G i g h a s l C C a c k D 2 . 0 , 2 3 . A s s e s i s c h e n e o t d e a l g a i t h e a n d f r a c n o t h d e i k e l o A o o d r d a n t L i n e a r i o n h e s A s t A o) e l a r S t u i p f r o c l e a s 4 8 2 7 5 2 4 7 t p s : / / d o i . o r g / 1 0 . 1 0 1 6 / j . q u a s c i r e v . 2 0 1 8 . 0 4 . 0 2 4

B a l G o 2 . 0 2 G a l a c i e a n a g r e e a l e o c a p m a t e a t o s m s g e n i c - N u c E x p o D u a r t e A n g n . B e e A r i l h a r e c 4 8 2 1 4 8 t p s : / / d o i . o r g / 1 0 . 1 0 1 6 / j . q u a s c i r e v . 2 0 1 8 . 0 4 . 0 2 4

B a l G o 2 . 0 2 G e c h n i o c t a p r o t o t t y a p n e p a r e n t d r a i n d a l a e g e h a e n e t a n d a l y s i s f a s t f r o o s m o g e n i e x p o d a i t e G r e g o . c h r o n o l o g y 2 1 6 9 7 5 t p s : / / d o i . o r g / 1 0 . 1 0 1 6 / j . q u a s c i r e v . 2 0 1 8 . 0 4 . 0 2 4

B a l l a c t . Y a n 9 . 8 7 h e o d h o m o R e a d v a n t c h e s d S k y S e c o t l a n d : g l a c i e r c o n s t a n t u p a l i a n o c i l m a i t d e Q u a s e 4 (2 9 5 1 0 8

B e n d . E v a n s 2 . 0 1 0 l a c a e g e s a c i s c o m d u t l i e g e o r k B e n d . H u l t n o . n R . 2 0 1 0 n e x e s l p r e a d p s h o e g e f t a m e c o n s t r u c t e s u r f p a r c o e b l f e o r m e o n t g a l i a n c e i t a e a p C o m p G e o s c 3 6 i . . 6 0 5 1 0 t p s : / / d o i . o r g / 1 0 . 1 0 1 6 / j . q u a s c i r e v . 2 0 0 9

B i r l e D u t n A m e d e n t o n K o o p s . C f a s t d o e p u t n B m E . . M a a s k h a 2 . 0 1 2 l i m a t e r e n e s a c i o R e g o s t o t t h e i o p l a r e i s W o i n B i m e l e o G a p v i n R i i v e a n o m i a g o A t n . t a r c t . A l R e 4 4 2 6 2 7 6 t p s : / / d o i . o r g / 1 0 . 1 6 5 7 / 1 9 3 8 - 4 2 4

B l o m R i . H e y m a l n S t r o e v . e H a t e s C h a n r d b . J . M G r . i b e m s k i . J a n s K o n p e t r a d k . o a v . v a n b . v n a l e x a d d e r u d o a y . N . . W a l t M e 2 . 0 1 6 l a g i e a m o r p h o d t h e g y a n W e s t S a y a n M o u n t a c i e m s t A r s a i J a p s 2 1 . 2 3 3 6 t p s : / / d o i . o r g / 1 0 . 1 7 4 4 5 6 4 7 . 2 0 1 4 . 9 9 2 1 7 7

B o s t o n M L u k a s C a r s r . 2 0 1 5 Y o u n D e y a b a t i e a u f i e n t l d e M o n a d h S i c a t t h a n n i d n p l i c a d r i e g n i p a a a e o c Q u a n t a d e n a r y S c i e R e c e i e 4 8 3 9 6 2

B o y e s M L i n t h P e a r d e M N a s d . 2 0 2 3 t h e a b e n n o s c a d i a n S h e g l t a c i a n t h l e o P a n i n a s u l l u a s l i a p l i (p a d r) t c f e o w c o n f i g u Q a u t a i t o e n S c a i r e n e c e i e 4 8 3 9 7 8 7 1 t p s : / / d o i . o r g / 1 0 . 1 0 1 6 / j . q u a s c i r e v . 2 0 2 2 . 1 0 7 8 7 1

B o y e s M L i n t h P e a r d e M N a s d . 2 0 2 3 t h e a b e n n o s c a d i a n S h e g l t a c i a n t h l e o P a n i n a s u l l u a s l i a p l i (p a d r) t c f e o w m a r g p i o n i t e i v o n l s u a t i o n y n a m Q u a s t e r S c a i r e n e c e i e 4 8 3 9 7 8 7 1 t p s : / / d o i . o r g / 1 0 . 1 0 1 6 / j . q u a s c i r e v . 2 0 2 2 . 1 0 7 8 7 1

B r a c o r n h a t r . r i s s . o n a g e y M m B a r t P e M a s s o n - D e l A n d e t e O u c h a i Q t t o - B I B i . Z . a b e 2 . 0 1 2 v a l u a t i o n m a o t d e u l s i n g p a l a e o c d a i n a a t i o r l e O m a n g e 1 7 2 4 t p s : / / d o i . o r g / 1 0 . 1 7 4 4 5 6 4 7 . 2 0 1 4 . 9 9 2 1 7 7

B r u g e A 2 . 0 0 G o s m o g l e o B e a n 8 6 C a l g e s o l m a P e e i s t t o e r e n n i a l m o r a t o p l e t e B a y R o n d e r a i m a d e g e n t C r a l l o r l a S t a . . Q u a t e r S c a i r e n e c e i e 4 8 3 9 4 9 9

C a r r a s . M B e d r a d D a o m i n g u e D - V i l l i W . l l e n b r 2 0 0 3 h e p l a t g l a u c i i t e h e i e d e a j a t b e G e a t S r a s l t e m) i i n g a x i m u m e x t e r e t c o n s t a n d h i o n o G l e o g n y o . r p h d e 1 8 3 9 3

C h e n . Z . h o s . L i Y . D e n y . 2 0 1 6 l a g i e a m o r p h o d t h e g y l i a n g g b o V a l l e o y u t h e a s h e p l a n t e l a p s 2 7 . 1 - 7 2 4 t p s : / / d o i . o r g / 1 0 . 1 0 8 0 / 1 7 4 4 5 6 4 7 . 2 0 1 5 . 1 0 6 9 7 6 5

C h e n . Y a n y . L i Y . Y a n y . L i D . L i Q . 2 0 2 4 i m a n g x t e r t l a c i a l f u c t u a a t r i o u n s l o i k a n g s o a n h g e o u t t e b e p l a n t d e u a r i t h e L i t t c t a g P a l a e o g a o g e o c P a n i a e o e h d o 1 2 . 0 9 2

C l a c k D e l y . G r e e n w o l d u g h a s l M G e h R n B a r l r . D . . B a t e n M a n D B r a d w i e . D . o D e E . v a d s J J a o r d a n M o n t e y s . . e l i 1 3 0 c M S h e e M y 2 . 0 1 B R I T G C E M i a p v e r s 2 i a m a p a n G I S d a t a m a s l e a d a n d f o t t h e a s t i t l i r s i s s h e B o r e a 7 5 t p s : / / d o i . o r g / 1 0 . 1 1 . 1 1 f e 8 r . 1 2 2 7 3

D a v i e s . D a r v i . I M L o v e l l . B e n d J l e m o w d e s w e A f a b B l . G a r c i a . G l e . i . g e . G . J a s n e f s . h e o r p h . M H a r r i s s . I d . e i . A . S . . K a p l a n R M a r t J i . n R . M e n d e l m o . P a a l m a e . P e l m o r o e s a . . S a g r e d e s m e d R e y S m e l J i i e h o r n d y c . R a . 2 2 t h e v o l u t i o n o f h e a t a g a d r c l a e r t o n k a d h p e r e s d a n y P A T I E e r S t d R e v . 2 0 4 0 3 1 5 2 t p s : / / d o i . o r g / 1 0 . 1 0 1 6 / j . e a r s c i r e v . 2

D o u g h a t . M A n d e r s o n M A c k i n A n k l a p I m a n R V a n d e r h o s . . B a r d e . I J I D e n t G n H S c h a e l f . e . G . h i r n . J P h u t n A m e 2 . 0 . 1 3 . E v a l u a t i o n d e g t a m p a r a t t h e s t A e l m s N e v z e a l a m s e d o n g l a m o d e l d i n g s i s t a r e a n d h a r i a n Q u a t e r S c a i r e n e c e i e R e v i d w n K S o n g t H e m n i s p h e o c o a r n d p a s i r c u p a t t e r n e s : A U S - I N T p M A T J e 4 d . 6 - 4 6 9 t p s : / / d o i . o r g / 1 0 . 1 0 1 6 / j .

Q u a s c i r e v . 2 0 1 2 . 0 9 . 0 1 3

E h l e r . G . i . b b e r . 2 0 0 0 Q u a t e r G l a r c y a E t x i t o e n s C h r o n o F a t h y . . E u r o p e s e A m s t e r d a m

E h l e r . G . i . b b e r . 2 0 0 0 Q u a t e r G l a r c y a E t x i t o e n s C h r o n o F a t h y . . N o r t h e r E d a s e A m s t e r d a m

E h l e r . G . i . b b e r . 2 0 0 0 Q u a t e r G l a r c y a E t x i t o e n s C h r o n o F a t h y . . S o u t h e r A s a i A a r . A a s t . r a A l n a s a i r a E t l e a m e t e r d a m

E h l e r . G . i . b b e r . 2 0 0 0 Q u a t e r G l a r c y a E t x i t o e n s C h r o n o F a t h y . . C h r o n o F a t h y e o e l s e v i e r

E u p . H e y m a l n H a t t e s C r S a t n r d o . e a v . e H a r b . J . R M 2 . 0 1 2 l a c i a l g e o m o r p h o d t h e g y l i a n g g b o i s u l a n e s a o t h e a s h e p l a n t e l a p s . 4 8 5 5 4 t p s : / / d o i . o r g / 1 0 . 1 0 8 0 / 1 7 4 4 5 6 4 7 . 2 0 1 2 . 6 6

G i l l e a s . P z e . h f b s 2 . 0 0 6 l a c i a t i t h i e s N e w a d a l i f u S a i a . G o s l e c h i l f i l l i m 2 5 0 0 T e r r e s t r i e s m o g n e u n c i l t d e e s a n d a p p l i c a u t a i t o e n S c a i r e n e c e i e 4 8 3 9 4 7 5 6 1 0 t p s : / / d o i . o r g / 1 0 . 1 0 8 0 / 1 7 4 4 5 6 4 7 . 2 0 1 2 . 6 6

H a r r i s . G . h a s n e a m d e r s d r y - O s c . h u s b P k W 2 . 0 1 0 a P d e i s t o c e n e m o u n t g a l i a n o i e s p d m s o e r A h l a m t i i r o a t e n i g s o u t h w e s t a n d . Q u a s c i r e v 2 9 (2 2 8 3 9 4 3 9 5 5

H e y m a l n H a t t e s C r S a t n r d o . e a v . e H a r b . J . R M 2 . 0 0 6 l a g i e a m o r p h o d t h e g y a n H a s e c o d h e t i b e r l a n t e l a p s 4 2 6 2 t p s : / / d o i . o r g / 1 0 . 1 0 8 0 / 1 7 4 4 5 6 4 7 . 2 0 1 2 . 6 6

H u g h e s . I . F . i . l l i m 2 5 0 0 T e r r e s t r i e s m o g n e u n c i l t d e e s a n d a p p l i c a u t a i t o e n S c a i r e n e c e i e 4 8 3 9 4 7 5 6 1 0 t p s : / / d o i . o r g / 1 0 . 1 0 8 0 / 1 7 4 4 5 6 4 7 . 2 0 1 2 . 6 6

H u g h e s . I . F . i . l l i m 2 5 0 0 T e r r e s t r i e s m o g n e u n c i l t d e e s a n d a p p l i c a u t a i t o e n S c a i r e n e c e i e 4 8 3 9 4 7 5 6 1 0 t p s : / / d o i . o r g / 1 0 . 1 0 8 0 / 1 7 4 4 5 6 4 7 . 2 0 1 2 . 6 6

H u g h e s . I . F . i . l l i m 2 5 0 0 T e r r e s t r i e s m o g n e u n c i l t d e e s a n d a p p l i c a u t a i t o e n S c a i r e n e c e i e 4 8 3 9 4 7 5 6 1 0 t p s : / / d o i . o r g / 1 0 . 1 0 8 0 / 1 7 4 4 5 6 4 7 . 2 0 1 2 . 6 6

J o u v e C . p o r d o n G . K e n e . L . u t i m i v i e a l . A . s c h w a d 2 0 2 2 e e p l e a r s p e e g u p s c f e o v n o d e l b y s e g e o r r a d l e m s a g n i b u d e r o n a l G l a c i e 6 8 0 5 6 4 t p s : / / d o i . o r g / 1 0 . 1 0 1 7 / j o g . 2 0 2 1

K a u f m a n . M . a n l w y 2 . 0 0 4 l e i s M a c k e m a i m d a W e s c o n g l i a n e r e x t e a n t r s a s u k . a s . I A E h l e r . G . i . b b e r . 4 E d e y e l o p m e n t s Q u a t e r S c a i r e n e c e i e 4 8 3 9 4 7 5 6 1 0 t p s : / / d o i . o r g / 1 0 . 1 0 1 7 / j o g . 2 0 2 1

- 17

- Schi ID, iH, g, l, U, i, n, l, 98 Numerie adnstowailg egsairesmsa l l
i coea plsrD:ent G nH, u, g h's Q E d f h e a s t e l a c S e h e W t i s l . N y w
Y o r p k, 2 0 - 2 2 0
- Smer dJo, nC, o p k ., C o o k ., R S, e, a g R e, 2, 0 1 5 r i d g a a g d u t o f e m a t e
a c r p a s e o c l i e m a n s d r o u b s t e i r o n s h i d o d s a h s y: d r o c t a n s a t e
s t u d o J i m a 8 (e 3 2 1 3 2 3 1
- Stro eA, eH, a, t t e s C r h e n y d m, a n K, l e m a d m, o e n B . M 2 0 1 3 l a c i a l
g e o m o r p h o d t h d e g y S h a J h M a p s 5 0 - 5 1 2 n . t t p s : / / d o i . o r g / 1 0 . 1 7 4 4 5 6 4 7 . 2 0 1 3 . 8 2 0 8 7 9
- Su n Y ., X u X ., Z h a n H g, L, i j, X u B ., 2 0 2 2 Q a n t e r - a h n n u a t r e i a d l i d n e y
e x p l t a h i g n l a o r i e t n e i a n t c h e i t l t c A e g e n t h e a i l u o g o o h m e n t , X u X ., Z h a n H g, S u n Y ., X u B ., L, i j, D o n g , P a n B ., 2 0 2 2 T h e f f e d t s i m a t i c
s o u t h e a s t h e P l a n t P a u d a e o g e o g r a p h y: J i n a l t a d e o g y o l o g y a n a g n e i n t e r - v a n n u a d i n g l i a t o y e t r r e a t t 8 5 A S m o r a i i m e s
6 3 8 1 2 0 8 9 t p s : / / d o i . o r g / 1 0 . 1 0 1 6 / j . p a l a e o . 2 0 2 1 h e u 1 0 0 i 3 0 n g g e a n k e g i s o o n u, t T e i b r e P l a n t e a d n y 6 2 ,
2 9 4 2 9 5 1 t t p s : / / d o i . o r g / 1 0 . 1 0 0 7 / s 0 0 3 8 2 - 0 2 3 - 0 7 0
- T i e r d e P u l S e m o n i t a d ., B h a t t a c h T h, e y R g, F o r H l ., L . .
H ö n i s B c, h n g G e i n P, e t e S s, a S a, g N a T, a b C r, R t, h, i r u m K a, l, a i ,
Z h u w, B u r n s J f, o s G e, l G, o, d e d r Y s H, u b e r, T l, v a h y Q k, i, r t l a n d
T u r n S e, r u n d t ., M c E l w a i i M j, l B s, j, Q M, t, o - B l B i, d S, i n d e g r v A e, l, l ,
Z h a n Y g, G 2 0 2 2 P a s t i m a n e o u r i u t i S c e i e n t i c e a y 3 7 0 1 p s : / Z h a n H g, X u X ., L, i j, Y, S u n Y ., X u B ., L, i j, 2 0 2 2 L a m i a s i r s o e s t h s e o u t h e a s t e r n
d o i . o r g / 1 0 . 1 1 2 6 / s c i e n c e . a a y 3 7 0 1
- V i e G r, 2 0 0 0 G o m b i m i e n d e r a i n g e l o m o r p h o e o g n s a d r u l u S t e i r o n a
d e s t r e l l a t i e a u f E d d t t G e a o m o r p h o 7 1 1 9 0 7 L, 9 - 0 7
- W a l c o t B, r, i n e, F, u, l e d k e v a S s M 2 0 2 2 Q u i l l b i r a i e u t m i b u d e s
a l p g n i a c i i e h s s k u g l e a s t a M i a x l i m s u m m e e m p e r v a t s u r e
- 2 - 5 C l o w e h a d n u r i t h g e - i n d Q u s i t m a i t a l e P a 2 0 9, 1 1 0 6 . t t p s : / /
d o i . o r g / 1 0 . 5 1 9 4 / c p - 2 0 - 9 1 - 2 0 2 4
- W i l k i n s D a u m o n M i, a J b e r s b a p p l e G, A n x, t M n B a a A ., ,
B l o m b e r B g o, i t J e, n W d, a s i S v a a n t L o, s B, o u r P h e B o u w m a n 2 0 1 6 .
T h e A I G R u i d R n g n c f i q s r l e i s e r d a i n f a c n a g e a e d t e w a r d s h i p .
S c i e n t a i B r a c 6 0 0 1 8 t p s : / / d o i . o r g / 1 0 . 1 0 3 8 / s d a t a . 2 0
C l e i v e 8 r m a, 2, 0 1 T h e o t s P a m a l l c S h l e d d e P I S M - P a k l .
M o d e l e s c r i t p t e i r o y n o. s f 5 h 7 e 1 r 5 e 2 6 n . t t p s : / / d o i . o r g / 1 0 . 5 1 9
2 0 1 1
- Y a n g, Y a n Y ., L, i j, Y, L, i B X, i a J o l, i B, L, M, L, i G, 2 0 2 2 R e c o n s t r u c t i o n
p a l a e o g a l r a p t a i l e a r e s o c i l d i m e a d S e o a B a s t T e i r n e P l a n t e a u i n g
t h l e a s t a M i a x l i m Q u a t e r m a t r e y n 6 7 8 0 8 8 1
- Z h a n H g, X u X ., L, i j, Y, S u n Y ., X u B ., L, i j, 2 0 2 2 L a m i a s i r s o e s t h s e o u t h e a s t e r n
T i b e P l a n t e i a n t c h e i t l t c A e g e l Q u a S c i t t p s : / / d o i . o r g / 1 0 . 1 0 . 1
j q s . 3 7 1 5
- Z h a n H g, X u X ., S u n Y ., L, i j, X u B ., 2 0 2 2 R e c o n s t r u c t i o n L a m i a s i r s o e s t h s e o u t h e a s t e r n
a n d l i m i a n t l e T a n g g u o l u a n t a c i e m s t r i a b P e l t a t P a l a e o g e o g r a p h y
P a l a e o c l i n a l t a d e o g y 3 7 1 1 2 0 0 8 t p s : / / d o i . o r g / 1 0 . 1 0 1
p a l a e o . 2 0 2 3 . 1 1 2 0 0 8