

## New analogue database interfaces

Newly developed **interfaces for interrogation of geological analogue databases:**

- created **in-house** by our research groups: no paid subscription required to active sponsors;
- deployed as **cloud-based** applications: can be opened in a web browser – no specialized software required;
- access to data from over **900 analogue studies** of clastic successions and modern systems;
- analogue data on **geometry, proportions and spatial relationships** of sedimentary units;
- extensive set of **analogue filters**: select relevant analogues to subsurface successions by finding similar depositional systems and filtering on metadata;
- graphical **charting capabilities**: graphs and tables are updated on the fly as analogues are filtered;
- ability to **download summary data** for the selected analogues;
- **modular design**: the applications can be expanded through the addition of extra functionalities to suit user requirements (e.g., variogram modelling, volume calculations).

Access the new database apps here (use of browsers *Chrome* or *Edge* recommended):

### Fluvial Architecture Knowledge Transfer System

 [clastics.shinyapps.io/fakts](http://clastics.shinyapps.io/fakts)

### Database of Aeolian Sedimentary Architecture

 [clastics.shinyapps.io/dasa](http://clastics.shinyapps.io/dasa)

### Shallow-Marine Architecture Knowledge Store

 [clastics.shinyapps.io/smaks](http://clastics.shinyapps.io/smaks)

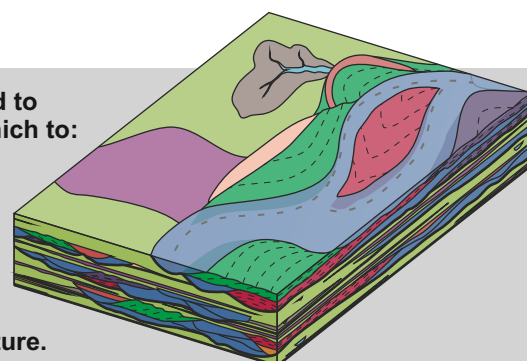
### Deep-Marine Architecture Knowledge Store

 [clastics.shinyapps.io/dmaks](http://clastics.shinyapps.io/dmaks)



Databases storing data on clastic sedimentary architectures that can be applied to reservoir characterization and prediction. The databases serve as tools with which to:

- generate quantitative facies models for subsurface successions;
- guide well correlation of clastic sedimentary bodies;
- condition object- and pixel-based stochastic reservoir models;
- predict the likely heterogeneity of geophysically imaged geobodies;
- inform interpretation of lithologies observed in core and predict 3D architecture.





# Fluvial, Eolian & Shallow-Marine Research Group

## Turbidites Research Group

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## New 2023 clastic analogue database apps: a quick guide

The new interfaces to FAKTS, DASA, SMAKS and DMAKS consist in cloud-based applications developed in-house by our research groups: they can be opened on any device with a web browser, and do not require installation.

The database apps allow users to browse the geological analogues, apply filters to the databases,

display analogue data in summary tables and charts that are updated in real time, and download filtered summary datasets.

This document demonstrates the functionalities of the apps, and illustrates how to select analogues and produce database outputs quantifying sedimentary heterogeneity at different scales of observation.

### Step 1:

open app in a browser selecting links to the right and log on using your credentials



### Step 2:

apply global filters to the database (e.g., on depositional setting), and check the resulting list of filtered analogues

### Step 3:

select the scale and type of sedimentary unit of interest, and the type of output desired

### Step 4:

apply filters to specific queries if needed (e.g., select outputs on particular element types)

### Step 5:

adjust chart settings if necessary, retrieve outputs as graphs and tables, and download required data

**New in 2023**

- improved performance
- download functionality
- more data

Case study	Latitude (°)	Longitude (°)	Study type	Age base	Age top	Setting	Data sources
Late Pleistocene deposits offshore East Corsica, Golo turbidite system	42.51	9.85	recent	Upper Pleistocene	(Holocene)	marine	Deptuck, M. E., Piper, D. J. W., Savoye, B. and Gervais, A., 2008, Sedimentology Gervais, A., Savoye, B., Mulder, T. and Gonthier, E., 2006, Marine and Petroleum Geology Gervais, A., Mulder, T., Savoye, B. and Gonthier, E., 2006, Geo-Marine Letters Pichevin, L., Mulder, T., Savoye, B., Gervais, A., Cremer, M. and Piper, D. J. W., 2003, Geo-Marine Letters Prelat, A., Covault, J. A., Hodgson, D. M., Fildani, A. and Flint, S. S., 2010, Sedimentary Geology
Ross Sandstone, Loop Head Peninsula and Ballybunnion, Ross Formation	52.57	-9.67	ancient	Bashkirian	Bashkirian	marine	Pyles, D. R., 2007, Atlas of Deep-Water Outcrops Pyles, D. R., 2007, Atlas of Deep-Water Outcrops, CD-ROM Pyles, D. R., Strachan, L. J. and Jennette, D. C., 2014, Geosphere
Channel-levee system, DeSoto canyon, Joshua system, NE Gulf of Mexico	29.02	-87.50	recent	Middle Pleistocene	Upper Pleistocene	marine	Posamentier, H. W., 2003, Marine and Petroleum Geology
Channel complex, Popo Fault Block, Brushy Canyon Formation	31.76	-104.79	ancient	(Guadalupian)	(Guadalupian)	marine	O'Byrne, C. J., Barton, M. D., Prather, B., Pirmez, C., Sylvestre, Z., Commins, D. and Coffa, A., 2007, Atlas of Deep-Water Outcrops
Channel dimensions, by McHargue et al., 2011	---	---	---	---	---	---	McHargue, T., Pyrcz, M. J., Sullivan, M. D., Clark, J. D., Fildani, A., Romans, B. W., Covault, J. A., Levy, M., Posamentier, H. W. and Drinkwater, N. J., 2011, Marine And Petroleum Geology
Channel gradients, continental slope of the Niger Delta, by McHargue et al., 2011	---	---	---	---	---	---	McHargue, T., Pyrcz, M. J., Sullivan, M. D., Clark, J. D., Fildani, A., Romans, B. W., Covault, J. A., Levy, M., Posamentier, H. W. and Drinkwater, N. J., 2011, Marine And Petroleum Geology

**Above.** Landing page of the new DMAKS app.



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## New 2023 clastic analogue database apps: analogue selection

Apply global filters to the database (e.g., on depositional setting), and check the resulting list of filtered analogues

Select the 'analogues' tab to display a summary of the analogue studies matching the set of filters applied.

Zoomable map displaying the location of analogue 'subsets' of the filtered datasets; click on the spots for summary information.

FAKTS

Analogues

Depositional elements

Architectural elements

Facies units

Analogue filters

Dataset Data Quality Index

☒ A ☒ B ☒ C

Depositional setting

Alluvial fan, Fluvial fan, Alluvial v...

River pattern

Braided, Meandering, Anastomos...

Drainage pattern

Tributary, Distributary, Anastomc...

Tectonic setting

Extensional, Convergent, Strike-s...

Basin type

Terrestrial rift valley, Continental...

Longitudinal gradient

0-0.001%, 0.001-0.01%, 0.01-0.1%

Drainage-basin area (km<sup>2</sup>)

1

4000000

☐ Turn on drainage-area filter

Mean annual discharge magnitude

0-10 m<sup>3</sup>/s, 10-100 m<sup>3</sup>/s, 100-1000

(Palaeo-)latitude range (°)

0-15, 15-30, 30-45, 45-60, 60-75, 7...

FAKTS analogue summary

Year	Authors	Geographic location	Basin	Age base	Age top	Case study
1988	Miall A. D.	USA, SW Colorado	---	Sinemurian	Toarcian	Kayenta Fm.
2008	Amorosi A., Pavesi M., Ricci Lucchi M., Sarti G., Piccin A.	N Italy	Po Basin	Ionian	Holocene	Quaternary Po Basin
2001	Dalrymple M.	USA, S Utah	Kaiparowits Basin	Turonian	Campanian	Straight Cliffs Fm.
2003	Carter D. C.	Java Sea	Asri Basin	Chattian	Aquitanian	Talang Akar Fm.
2009	Pranter M. J., Cole R. D., Panjaitan H., Sommer N. K.	USA, W Colorado	Western Interior Basin	Campanian	Campanian	Lower Williams Fork Fm.
1984	Johnson S. Y.	USA, NW Washington, North Cascades	Chuckanut Basin	Ypresian	Ypresian	Bellingham Bay Mb., Chuckanut Fm.
1997	Hjellbakk A.	N Norway, Varanger Peninsula	Barents Sea Basin	Cryogenian	Cryogenian	Segloddan Mb., Båsnæring Fm.
1993	Bristow C. S.	Bangladesh	Bengal Basin	Holocene	Holocene	Brahmaputra (Jamuna)
1997	Robinson J. W., McCabe P. J.	USA, SE Utah	---	Kimmeridgian	Kimmeridgian	Salt Wash Mb., Morrison Fm.
2004	Tye R. S.	USA, N Alaska	---	Holocene	Holocene	Colville
2004	Tye R. S.	USA, N Alaska	---	Holocene	Holocene	Kuparuk
2004	Tye R. S.	USA, N Alaska	---	Holocene	Holocene	Sagavanirktok
2000	Bridge J. S., Jalfin G. A., Georgieff S. M.	S Argentina, Patagonia	San Jorge Basin	Cenomanian	Turonian	Bajo Barreal Fm., Chubut Gp.
1992	Jordan D. W., Prvor W. A.	USA	---	Holocene	Holocene	Mississippi

Summary table of selected FAKTS analogues

Global filters: these filters are used to select analogues of interest based on their classifications and metadata, and applied to all the database outputs throughout the app during the session.





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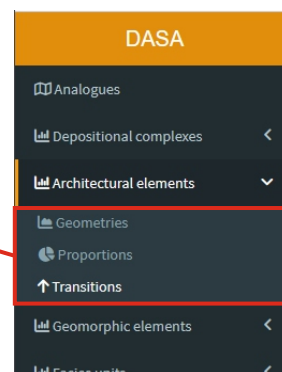
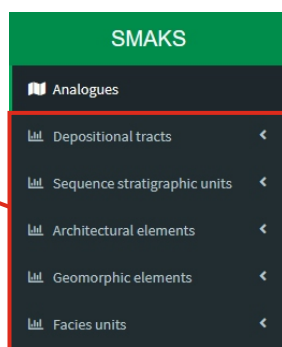
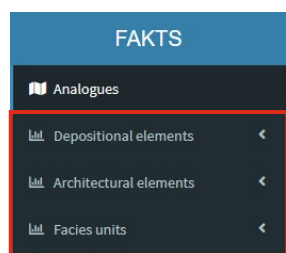
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## New 2023 clastic analogue database apps: extract analogue outputs

Select the tab corresponding to the rank of genetic unit of interest; these differ between databases:

Then select the type of database output that is required:



Database outputs will now be displayed in the 'chart' and 'table' boxes of the main pane, on the right of the 'filters' menu.

**FAKTS**

**Analogues**

- Depositional elements
- Geometries
- Proportions
- Architectural elements
- Facies units

**Analogue filters**

**Dataset Data Quality Index**

☒ A ☒ B ☒ C

**Depositional setting**

Alluvial fan, Fluvial fan, Alluvial v...

Select all Deselect all

- Alluvial fan
- Fluvial fan
- Alluvial valley
- Coastal alluvial plain
- Undefined

Extensional, Convergent, Strike-s

**Basin type**

Terrestrial rift valley, Continental

**Longitudinal gradient**

0-0.001%, 0.001-0.01%, 0.01-0.1%

**Depositional element geometries**

Thickness Width Width vs thickness

**Charts**

count

Element thickness (m)

Download summary statistics

**Summary statistics**

Element type	Mean thickness (m)	Thickness st. dev. (m)	Min thickness (m)	Max thickness (m)	N
Channel-complex	7.27	8.19	0.00	106.00	6688

**Element filters**

**Depositional-element type**

Channel-complex

**Filter on element thickness (m)**

☐ Enable sidebar filter (exclude undefined values)

0.1 1000.0

**Depositional-element width type**

☒ True width

☐ True and apparent width

☐ True, apparent and incomplete width

**Chart settings**

**Display thickness range (m):**

0.1 1000.0

**Display width range (m):**

0.1 3000.0

**Download summary data**

**Summary statistics**

**Adjust chart settings**

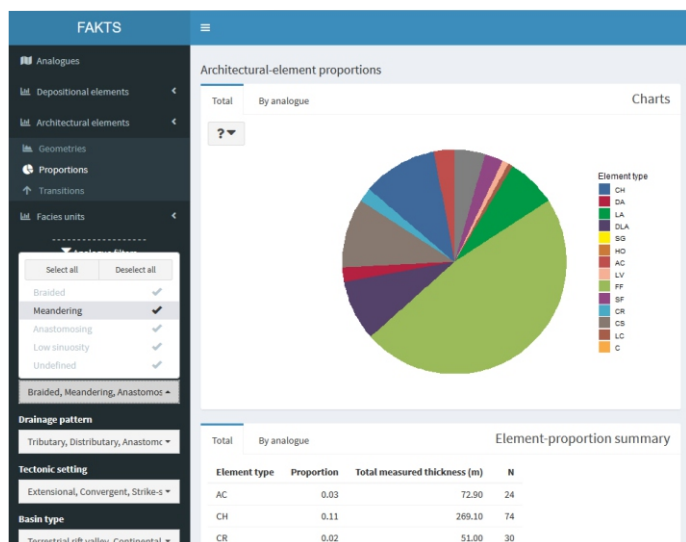


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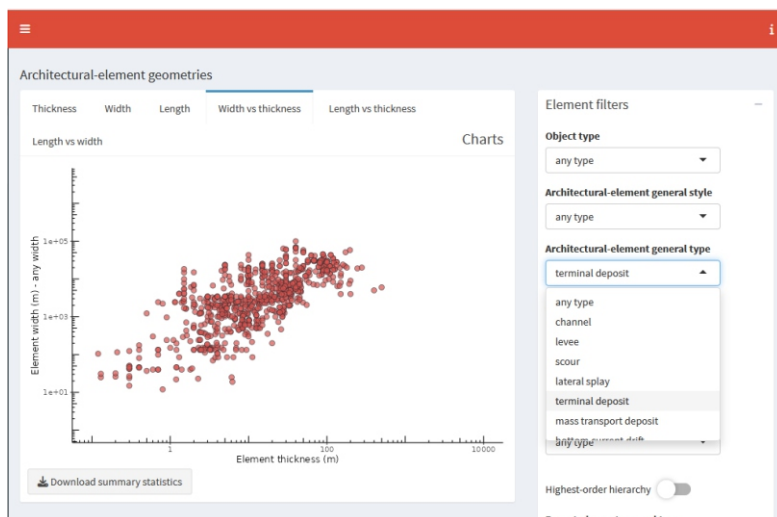
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## New 2023 clastic analogue database apps: gallery

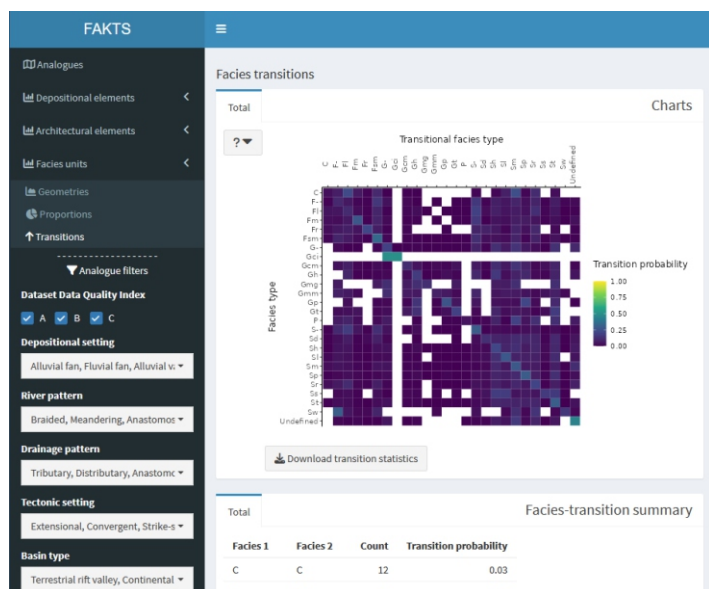


**Above.** Example FAKTS output on average proportions of architectural-element types in all selected analogues. The app allows applying filters to the database on attributes describing the depositional systems and on metadata describing the datasets and the source analogue studies.

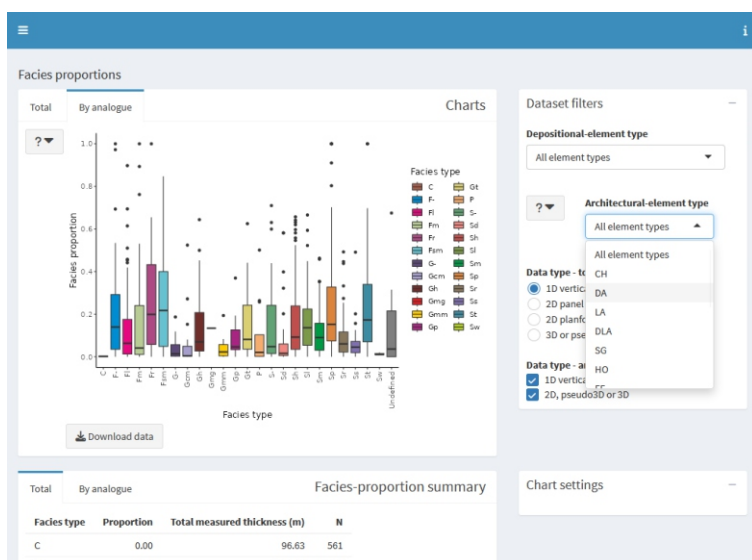
**Below.** Example DMAKS output on the geometry of architectural elements classified as 'terminal deposits' (lobes and sheets). Database outputs are presented in two boxes, for charts and tables. In each of these boxes, users can toggle between tabs designed to present different output types; in this example: thickness, width, length, aspect ratios and scaling relationships for elements of different types. The summary statistics can be downloaded by clicking on the download buttons in the chart panels.



**Below.** Example FAKTS output on the proportion of different types of facies units in the filtered analogues, and for selected types of depositional and/or architectural elements. The interface enables the extraction of outputs that quantify the variability in sedimentological properties, which are especially suited to the assessment of uncertainty – in this specific case on net-to-gross ratios, for example.



**Above.** Example FAKTS output on facies-unit transition statistics describing trends in facies organization, shown as summary table and heat map. The outputs can be filtered employing global filters applied to all presented outputs in the session, as well as using filters that are specific to a particular type of output: in this example, facies transitions can be filtered on the type of architectural or depositional elements being characterized.







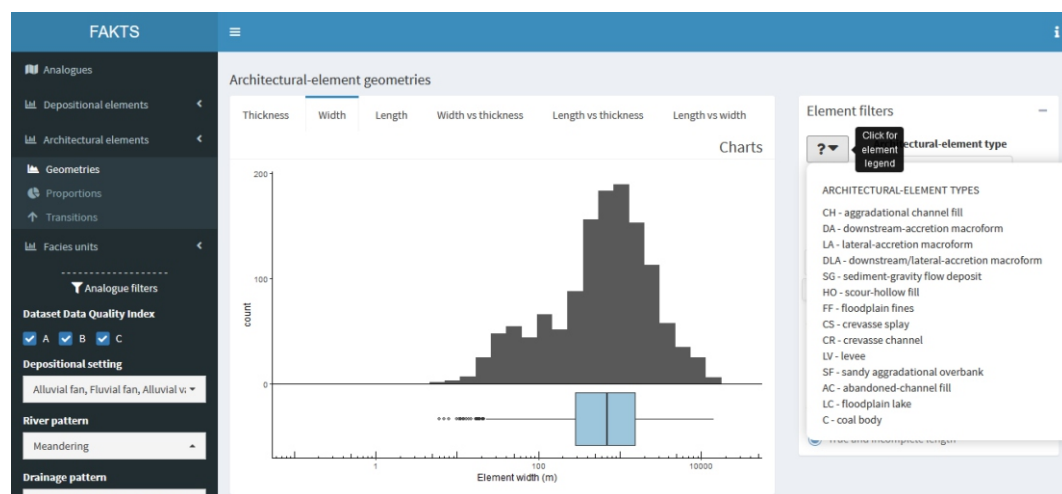
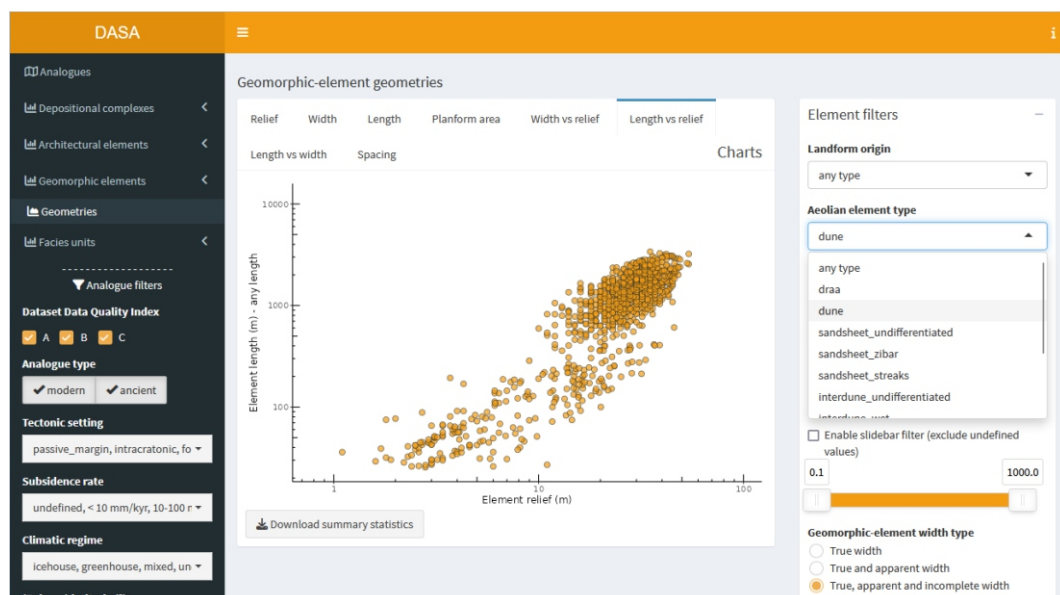
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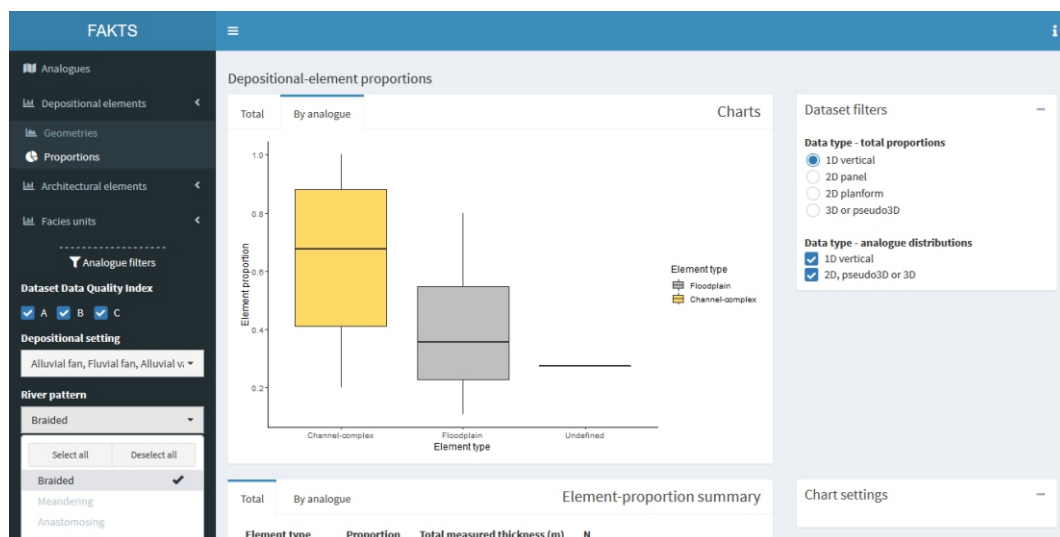
## New 2023 clastic analogue database apps: gallery

**Right.** Example DASA output on the geometry of geomorphic elements: length vs relief of dunes. Frequency distributions can be plotted as boxplots and histograms; relationships between properties can be visualized by means of scatterplots; summary statistics are also reported and can be downloaded as CVS files.

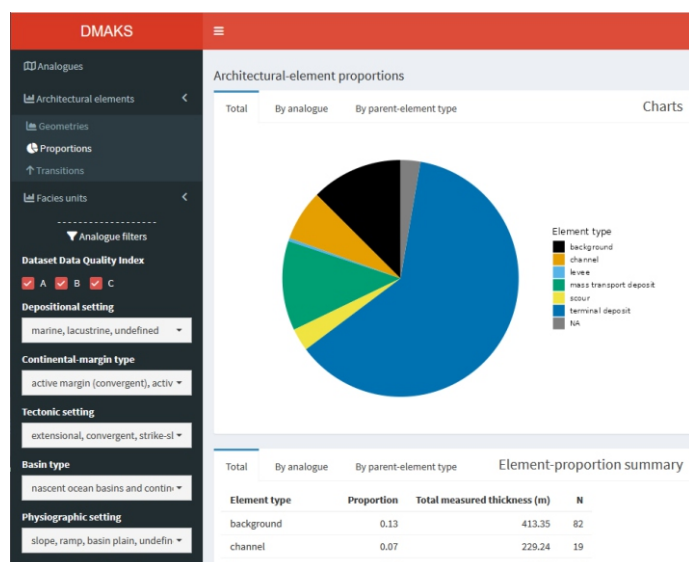


**Left.** Example FAKTS output on the geometry of architectural elements: width distribution of lateral-accretion barforms from meandering fluvial systems.

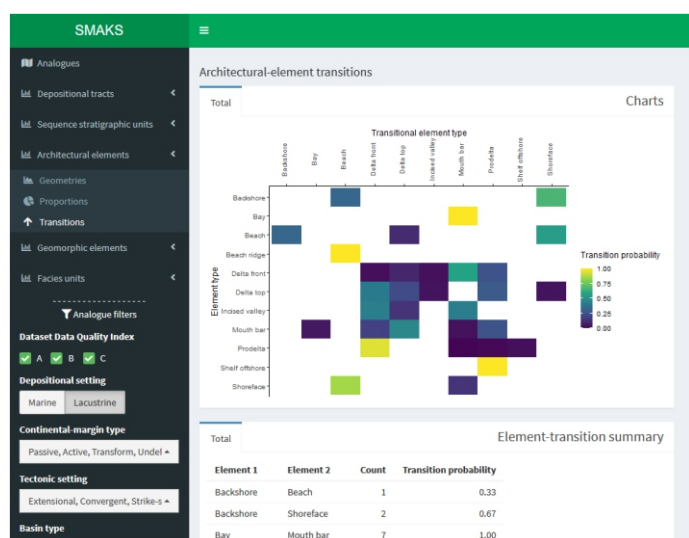
**Right.** Example FAKTS output on the proportion of depositional elements: variability in the fraction of channel vs overbank deposits in the successions of braided fluvial systems.



## New 2023 clastic analogue database apps: gallery

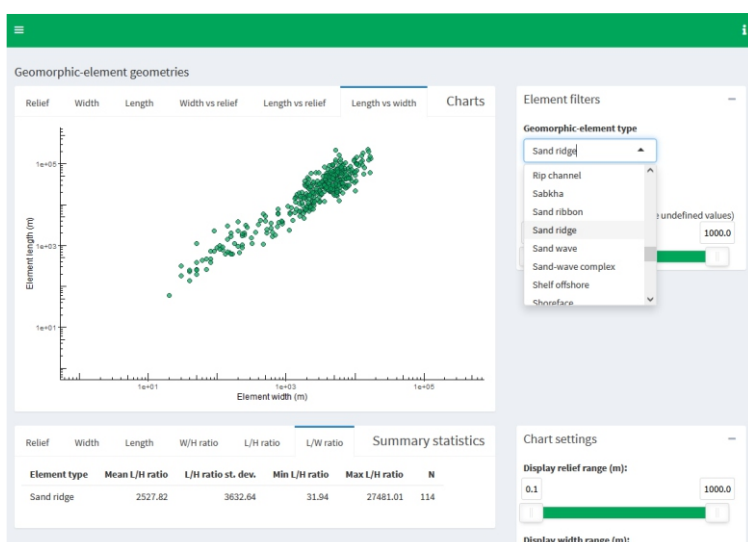


**Above.** Example DMAKS output on total proportions of architectural-element types in all selected analogues. The app allows applying filters to the database on attributes describing the depositional systems and on metadata describing the datasets and the source analogue studies.

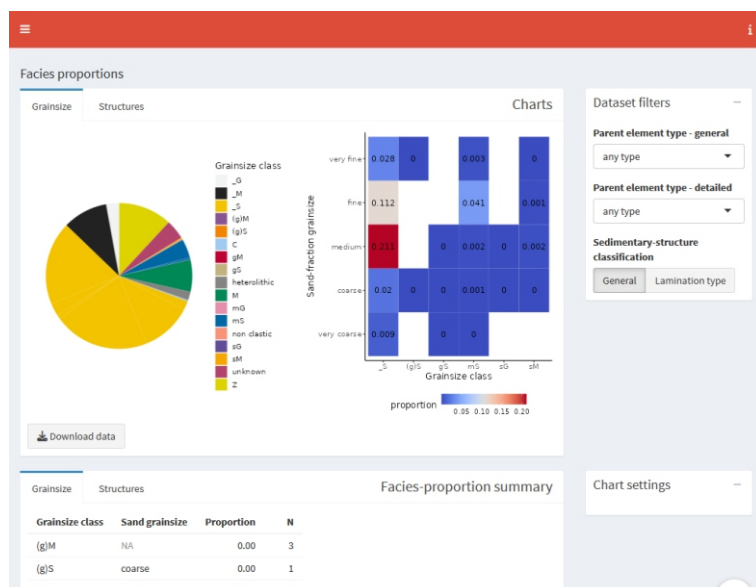


**Above.** Example SMAKS output on architectural-element transition statistics describing the topology of sedimentary units in 3D, shown as summary table and heat map. The databases can be filtered applying global filters to all presented outputs in the session, as well as using filters that are specific to a particular type of output: in this example, element transitions are filtered to display data from lacustrine shallow-water systems.

**Below.** Example SMAKS output on the geometry of tidal sand ridge geomorphic elements. Database outputs are presented in two boxes, for charts and tables. In each of these boxes, users can toggle between tabs designed to present different output types; in this example: thickness, width, length, aspect ratios and scaling relationships for geomorphic elements of different types.



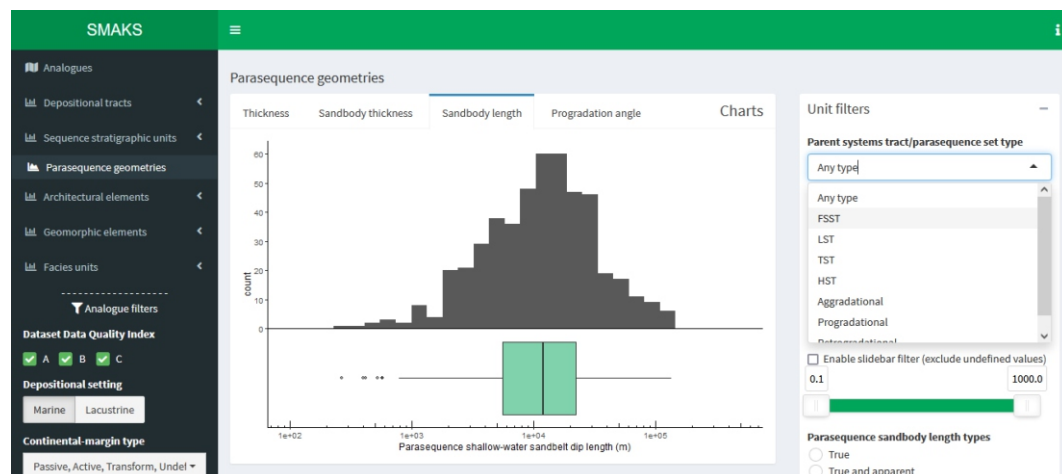
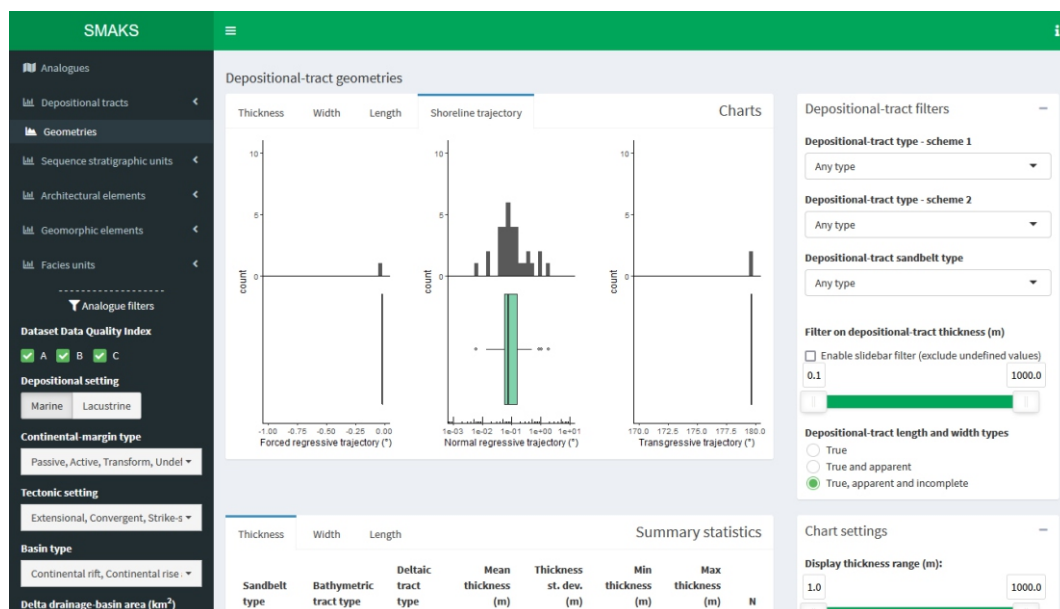
**Below.** Example DMAKS output on the proportion of facies units in terms of Folk's grainsize categories and sand-fraction grainsize class, in the filtered analogues. Facies proportions can be obtained for different types of sedimentary structures and can be filtered by element type.





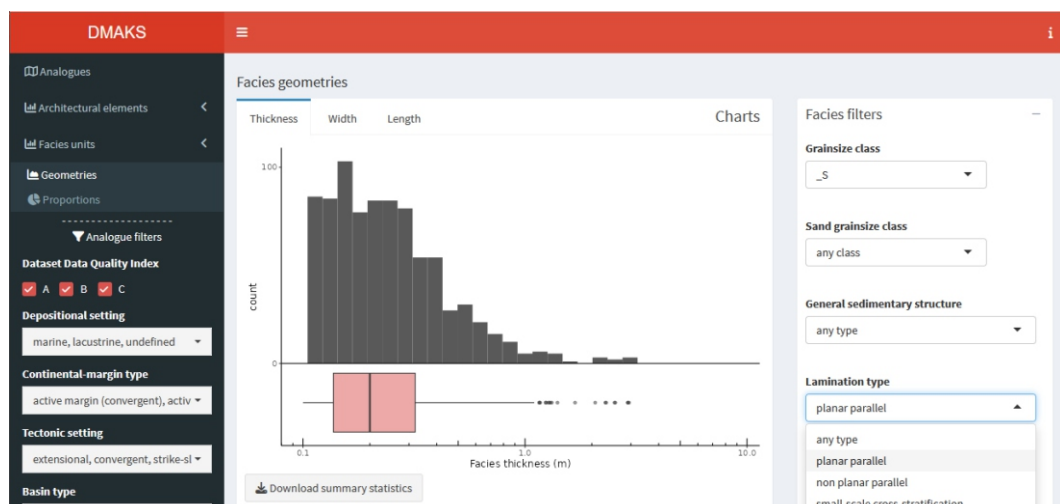
## New 2023 clastic analogue database apps: gallery

**Right.** Example SMAKS output on the geometry of depositional tracts: shoreline trajectories in the filtered shallow-marine systems.



**Left.** Example SMAKS output on the geometry of parasequence-scale sandbodies: dip length distributions. Output-specific filters can be applied to select high-order parent sedimentary units (e.g., systems tracts).

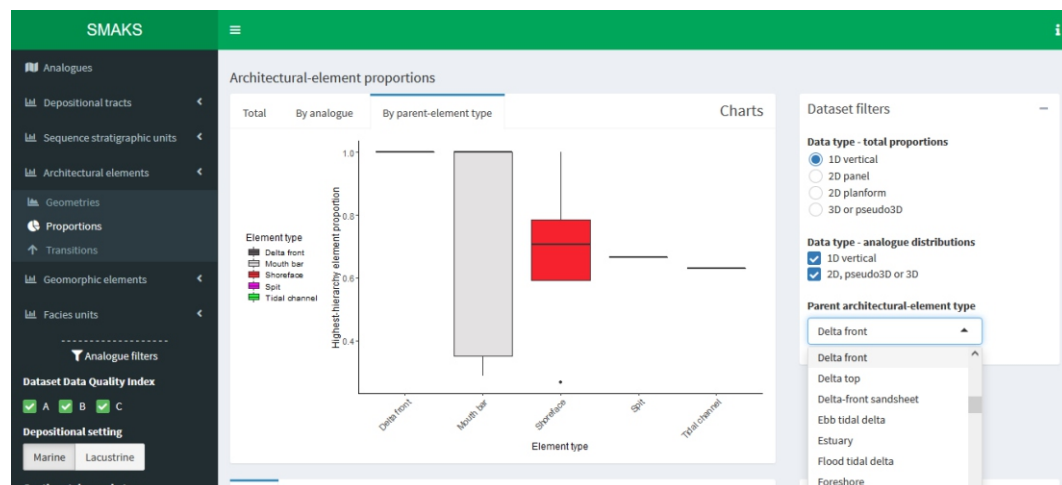
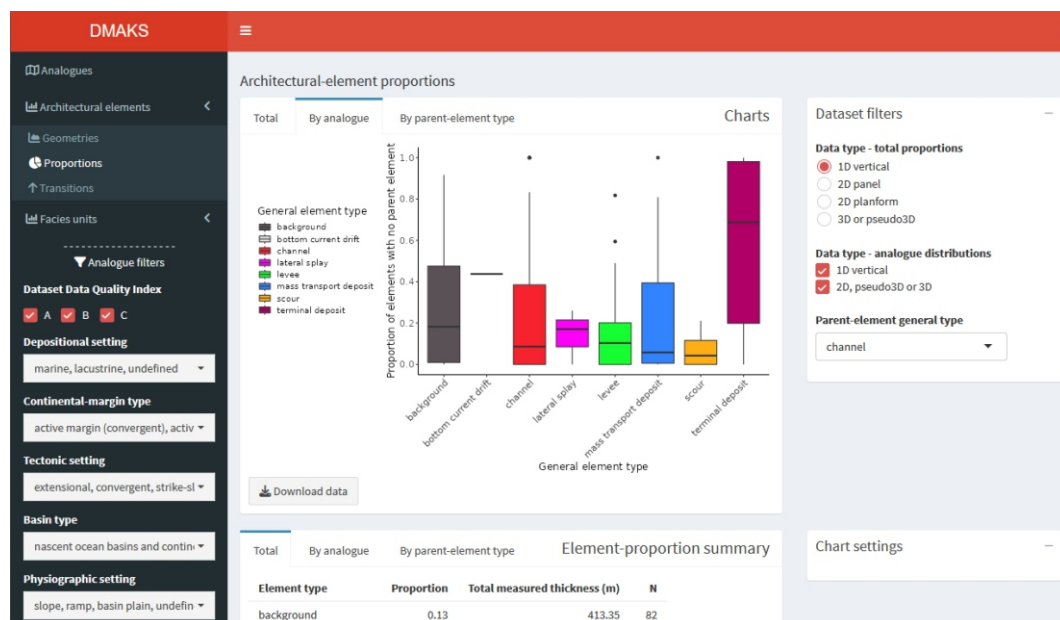
**Right.** Example DMAKS output on the geometry of facies units: frequency distribution of the thickness of planar-parallel laminated sands or sandstones.





## New 2023 clastic analogue database apps: gallery

**Right.** Example DMAKS output on the proportion of architectural elements: distributions in the fraction of element types in different stratigraphic intervals of the chosen analogues.



**Left.** Example SMAKS output on the proportion of architectural elements: distributions in the fraction of element types in specified subenvironments (here, delta front) of the chosen analogues.

**Right.** Example DASA output on the proportion of facies units: heat map of the fraction of types of sedimentary structures (specifically, lamination type) in a selected aeolian element type (here, interdune deposits), in the chosen analogues.

