FRG ERG SMRG

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Fluvial, Eolian & Shallow-Marine Research Group

http://frg.leeds.ac.uk/

New FAKTS and SMAKS analogue database interfaces

Newly developed **interfaces for interrogation of FAKTS and SMAKS** analogue databases:

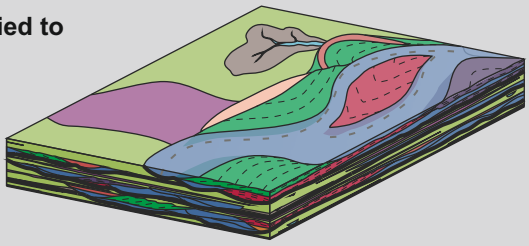
- created **in-house** by FRG: no paid subscription required to active sponsors;
- deployed as **cloud-based** applications: can be opened in a web browser – no specialized software required;
- extensive set of **analogue filters**: select relevant analogues to subsurface successions by finding similar depositional systems and filtering on metadata;
- graphical **charting capabilities**: graphs and tables are updated on the fly as analogues are filtered;
- access to data from ca. **600 analogue studies** of clastic successions and modern systems;
- **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 *shinyFAKTS* and *shinySMAKS* apps here (*Chrome* or *Edge* recommended):

shinyFAKTS **shinySMAKS**

FAKTS: Fluvial Architecture Knowledge Transfer System

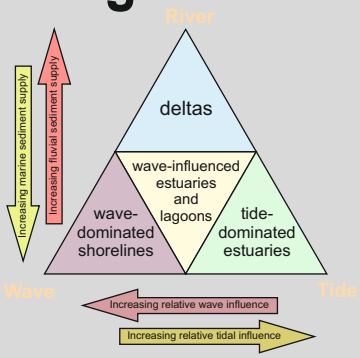
A database storing aspects of fluvial sedimentary architecture that can be applied to fluvial-reservoir characterization and prediction. The database serves as a tool with which to achieve the following primary goals:



- **generate quantitative facies models for bespoke fluvial systems**
- **guide well correlation of fluvial sandstone 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.**

SMAKS: Shallow-Marine Architecture Knowledge Store

A database storing aspects of paralic & shallow-marine sedimentary architecture that can be applied to reservoir characterization & prediction. The database serves as a tool with which to achieve the following primary goals:



- **generate quantitative facies models for bespoke coastal & shallow-marine sedimentary systems that act as subsurface reservoir bodies;**
- **guide well correlation of shallow-marine sandstone 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
School of Earth and Environment
University of Leeds, LS2 9JT, UK

contact: Dr Luca Colombera
email: l.colombera@leeds.ac.uk
contact: Prof Nigel Mountney
email: n.p.mountney@leeds.ac.uk
web: http://frg.leeds.ac.uk/

The all-new *shinyFAKTS* & *shinySMAKS* apps: a quick guide

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

The database apps allow users to browse the FAKTS and SMAKS analogues, apply filters to the databases, and display analogue data in summary tables and charts that are updated in real time.

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 (fakts.azurewebsites.net, smaks.azurewebsites.net) 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:

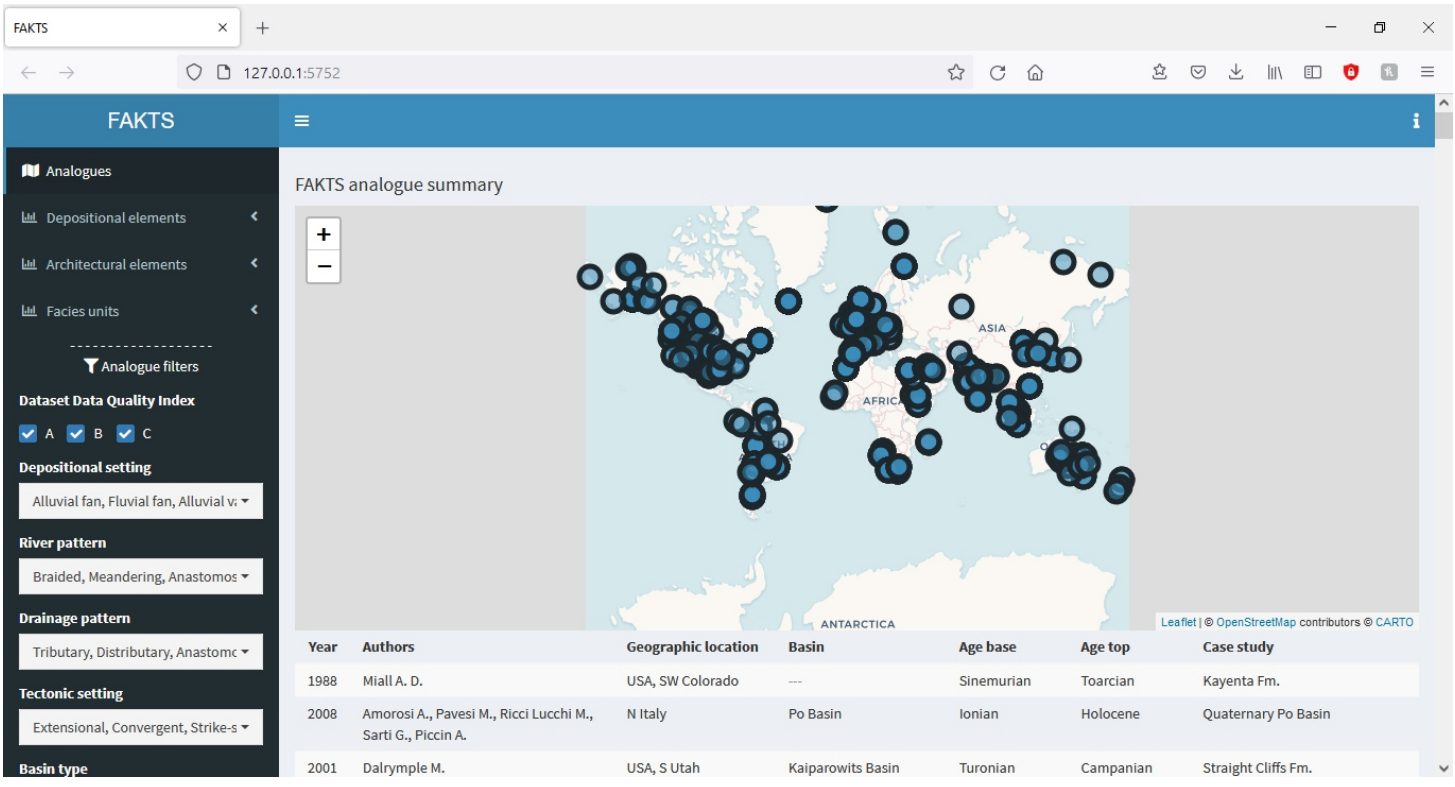
select the scale and type of sedimentary unit of interest, and the type of output desired

Step 4:

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

Step 5:

adjust chart settings if necessary, and retrieve outputs from graphs and/or tables



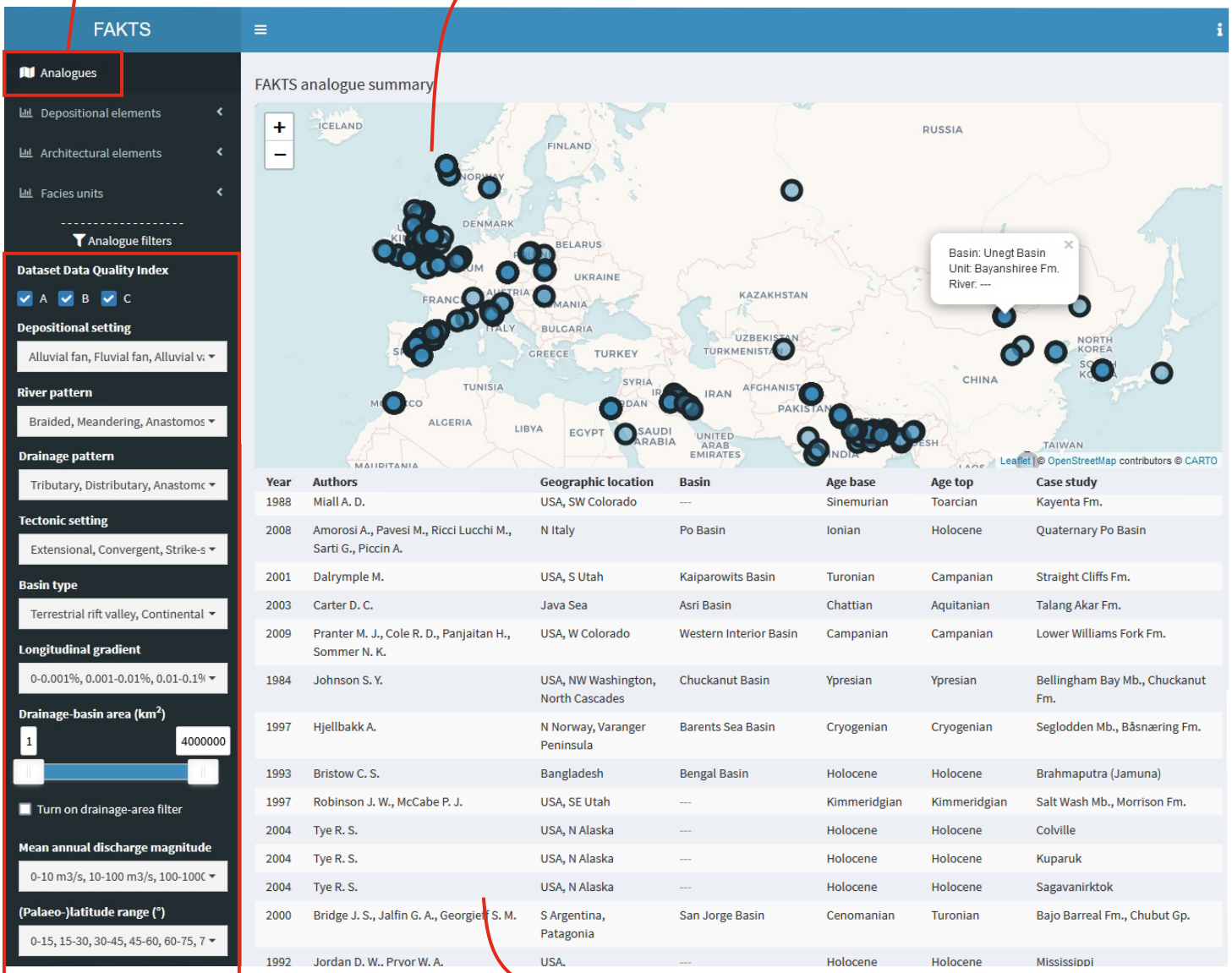
Above. Landing page of the *shinyFAKTS* app.

New FAKTS & SMAKS 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.



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	Seglodden 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., Pryor 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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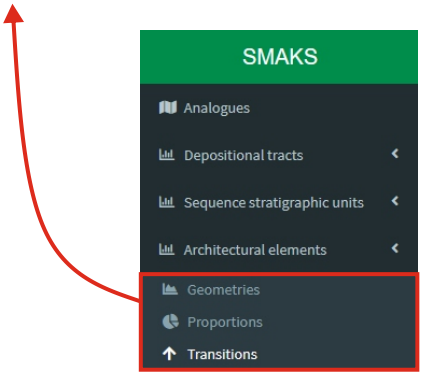
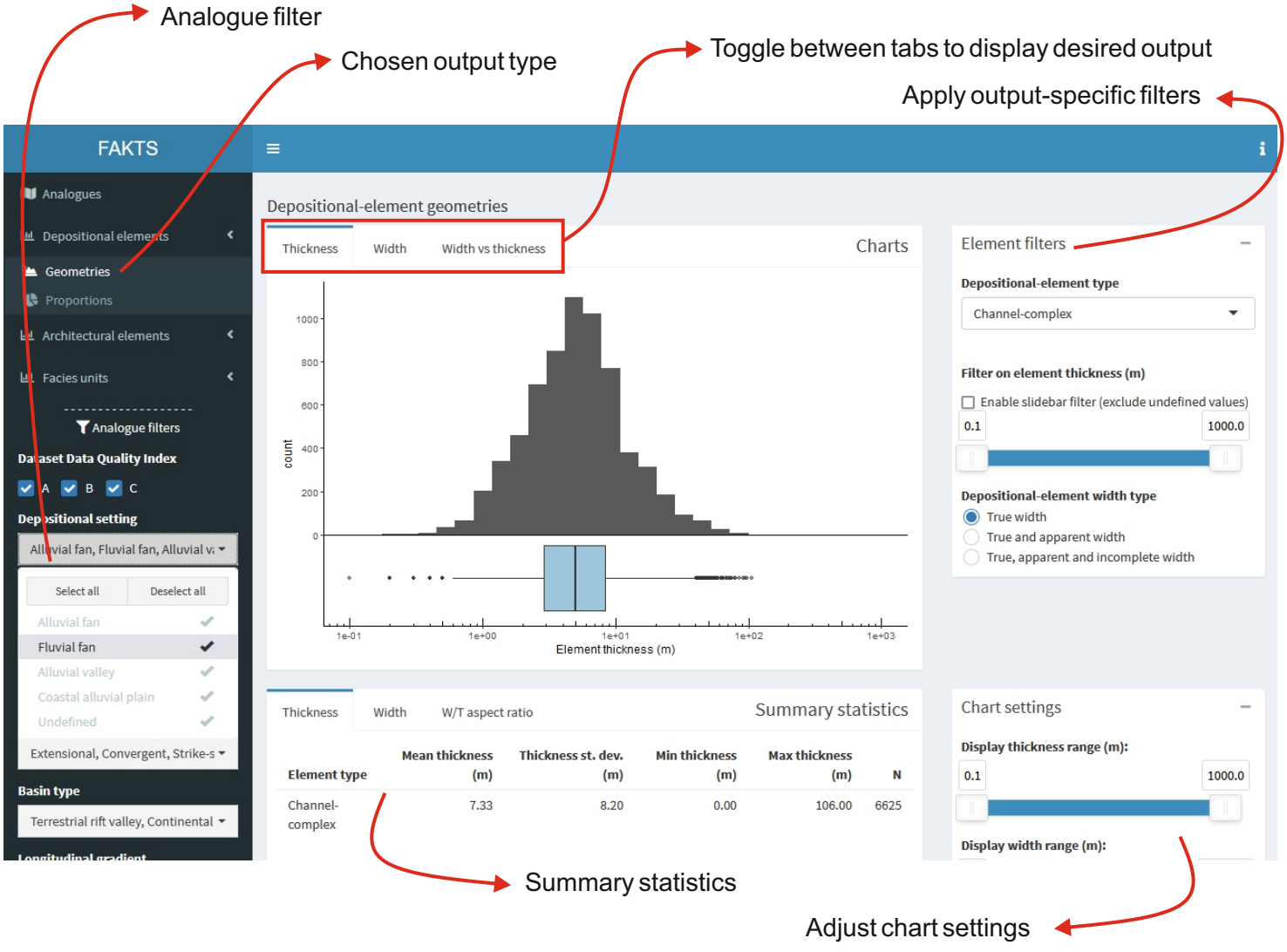
New FAKTS & SMAKS apps: display analogue outputs

Select the tab corresponding to the rank of genetic unit of interest; these differ between FAKTS and SMAKS:

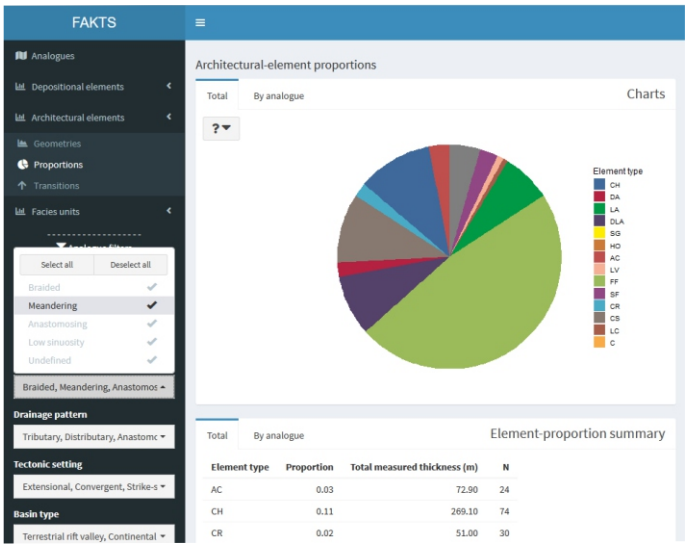
Then select the type of database output that is required:



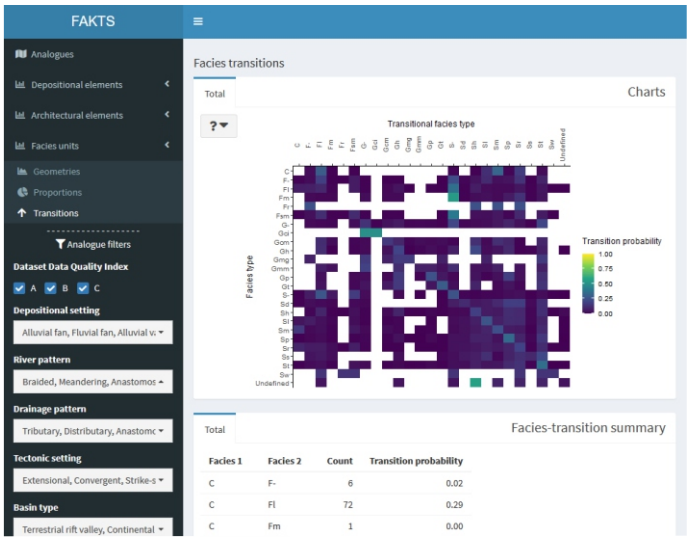
Database outputs will now be displayed in the 'chart' and 'table' boxes of the main pane, on the right of the 'filters' menu.



FAKTS interrogation using *shinyFAKTS*: screenshots

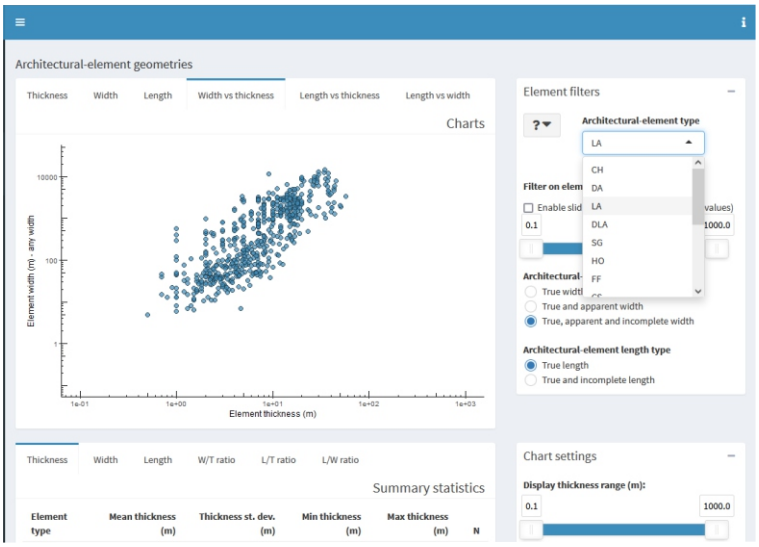


Above. Example FAKTS output on average proportions of architectural-element types in all selected analogues. The app allows applying filters to the database on attributes describing the depositional systems and on metadata describing the datasets and the source analogue studies.

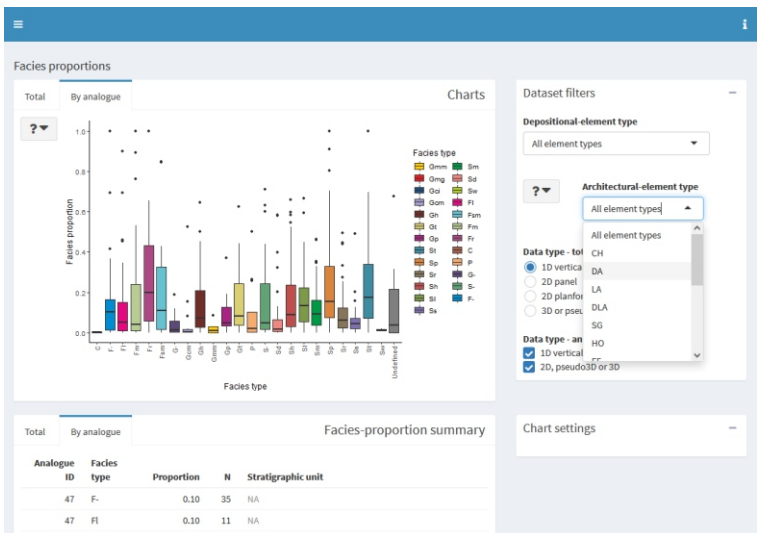


Above. Example FAKTS output on facies-unit transition statistics describing trends in facies organization, shown as summary table and heat map. The outputs can be filtered employing global filters applied to all presented outputs in the session, as well as using filters that are specific to a particular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

Below. Example FAKTS output on the geometry of architectural 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 elements of different types.

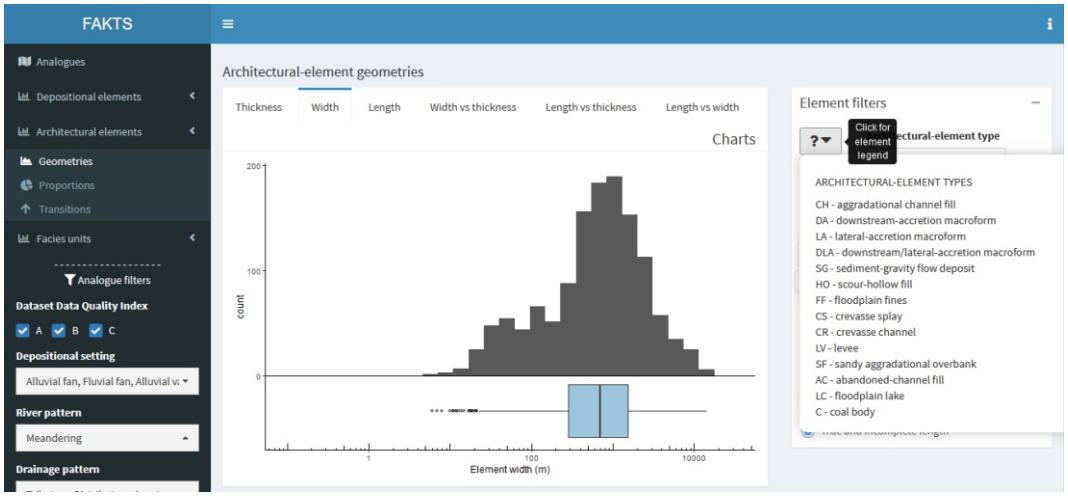


Below. Example FAKTS output on the proportion of different types of facies units in the filtered analogues, and for selected types of depositional and/or architectural elements. The interface enables the extraction of outputs that quantify the variability in sedimentological properties, which are especially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



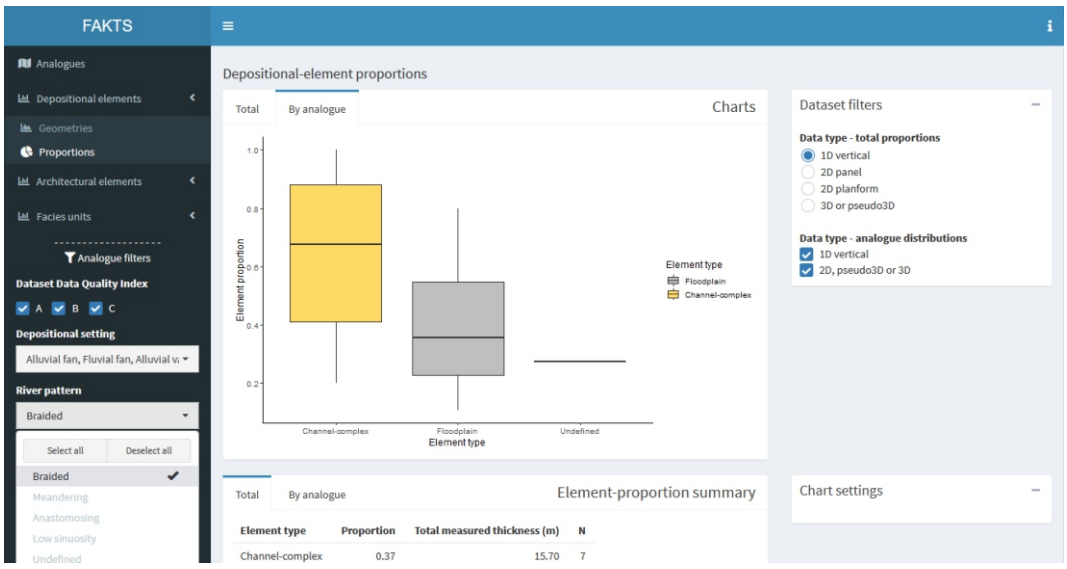
FAKTS interrogation using *shinyFAKTS*: screenshots

Right. Example FAKTS output on the geometry of depositional elements: width vs thickness of channel bodies. Frequency distributions can be plotted as boxplots and histograms; relationships between properties can be visualized by means of scatterplots; summary statistics are also reported.

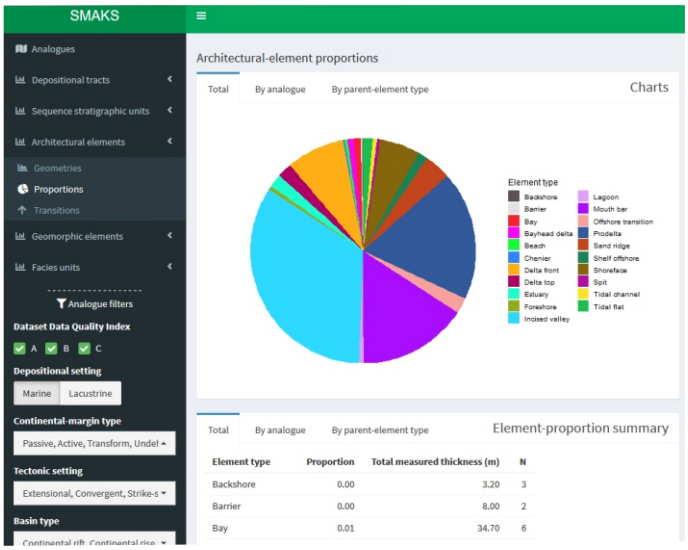


Left. Example FAKTS output on the geometry of architectural elements: width distribution of lateral-accretion barforms from meandering fluvial systems.

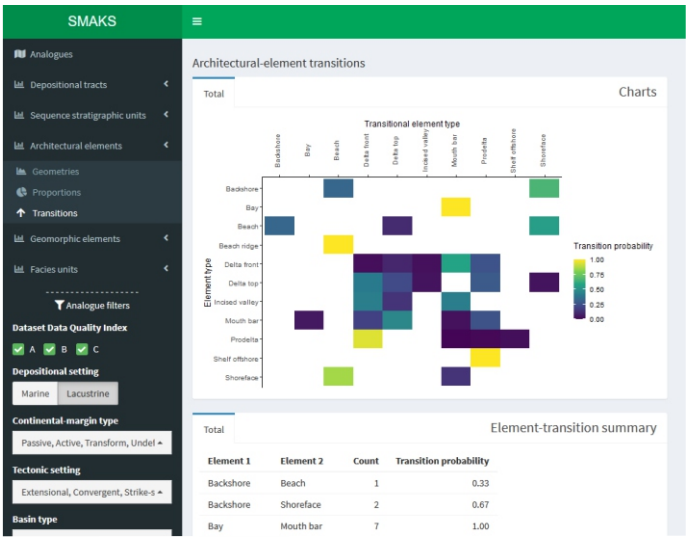
Right. Example FAKTS output on the proportion of depositional elements: variability in the fraction of channel vs overbank deposits in the successions of braided fluvial systems.



SMAKS interrogation using *shinySMAKS*: screenshots

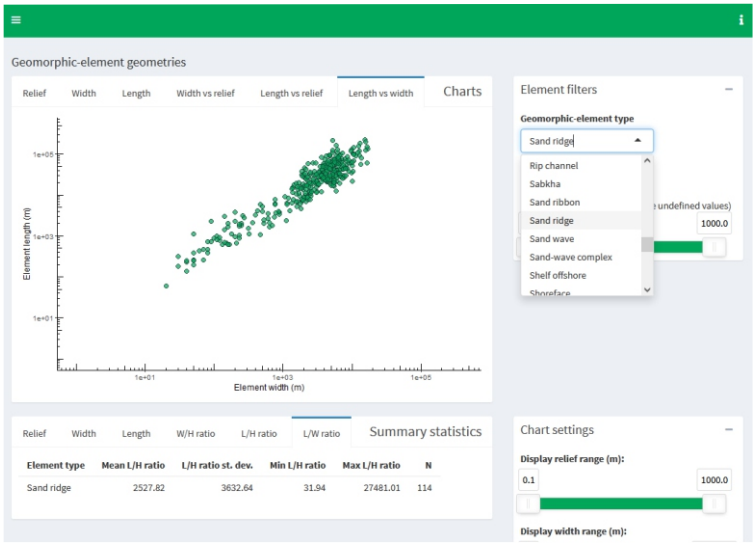


Above. Example SMAKS output on average proportions of architectural-element types in all selected analogues. The app allows applying filters to the database on attributes describing the depositional systems and on metadata describing the datasets and the source analogue studies.

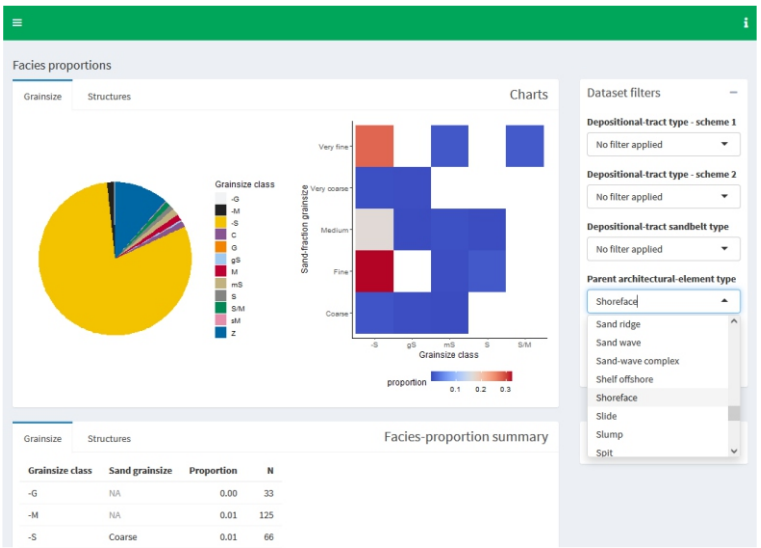


Above. Example SMAKS output on architectural-element transition statistics describing the topology of sedimentary units in 3D, shown as summary table and heat map. SMAKS outputs can be filtered employing global filters applied to all presented outputs in the session, as well as using filters that are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

Below. Example SMAKS output on the geometry of 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.

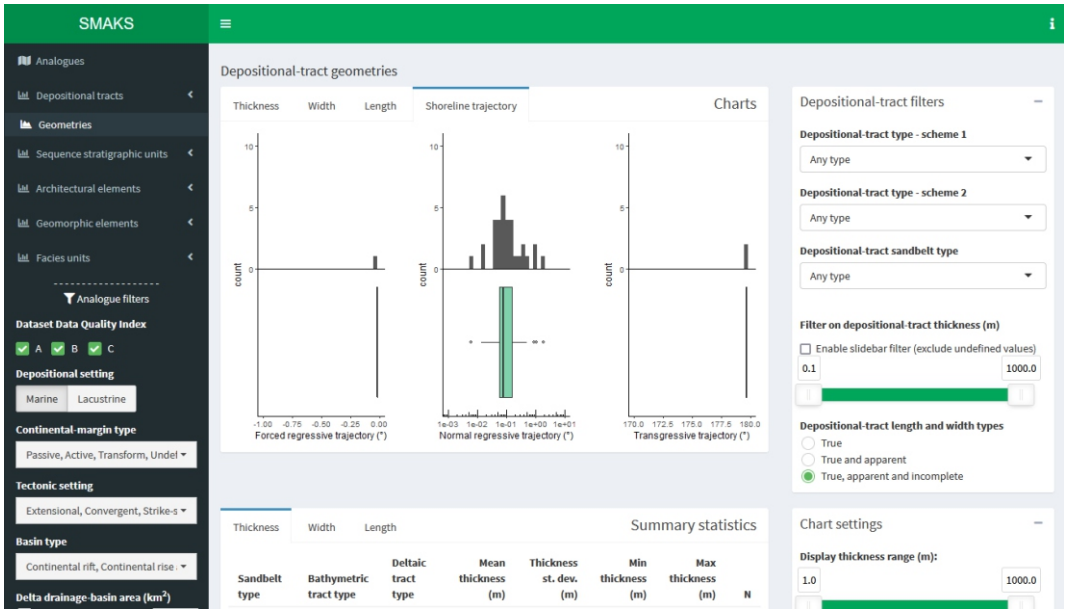


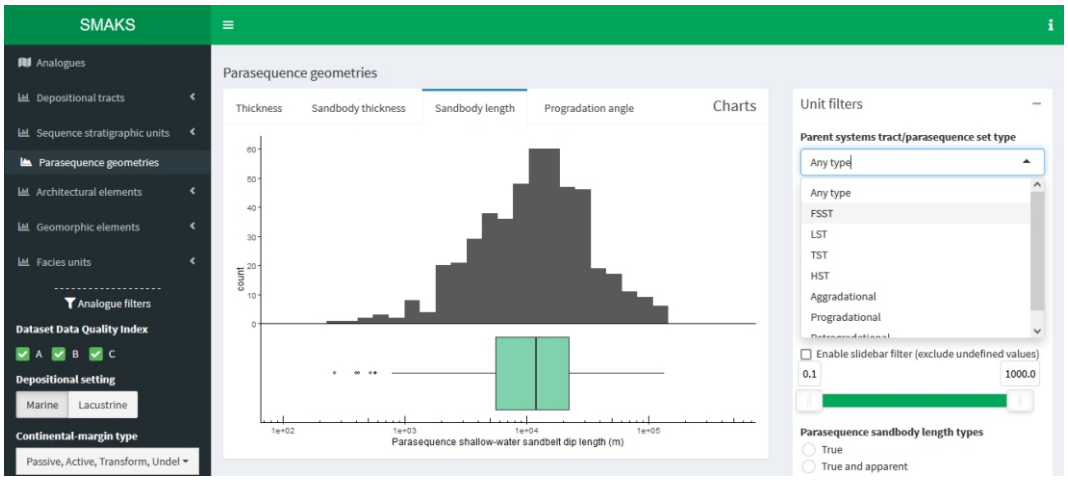
Below. Example SMAKS output on the proportion of facies units by classes of modal grainsize, in the filtered analogues, and for selected types of parent elements or depositional tracts: in this example, SMAKS is queried to display overall facies proportions for shoreface elements.



SMAKS interrogation using *shinySMAKS*: screenshots

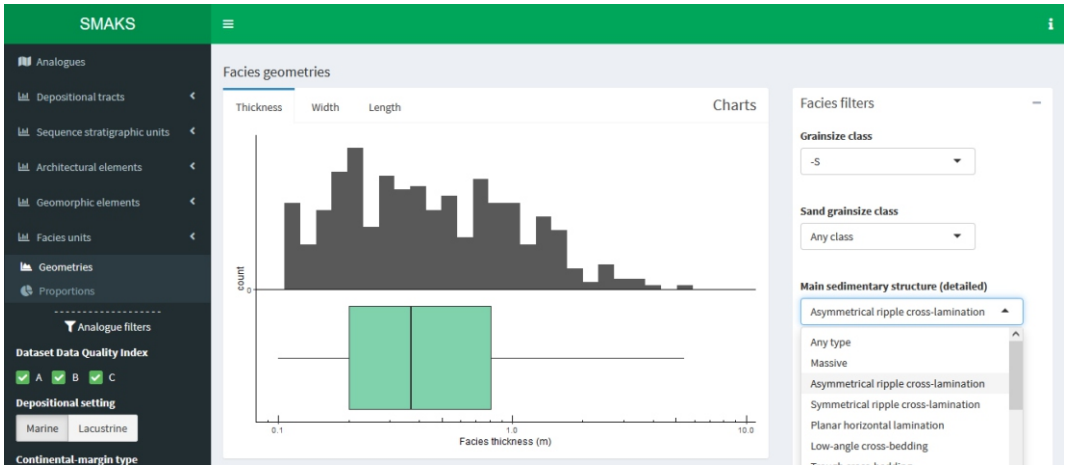
Right. Example SMAKS output on the geometry of depositional tracts: shoreline trajectories in the filtered shallow-marine systems.





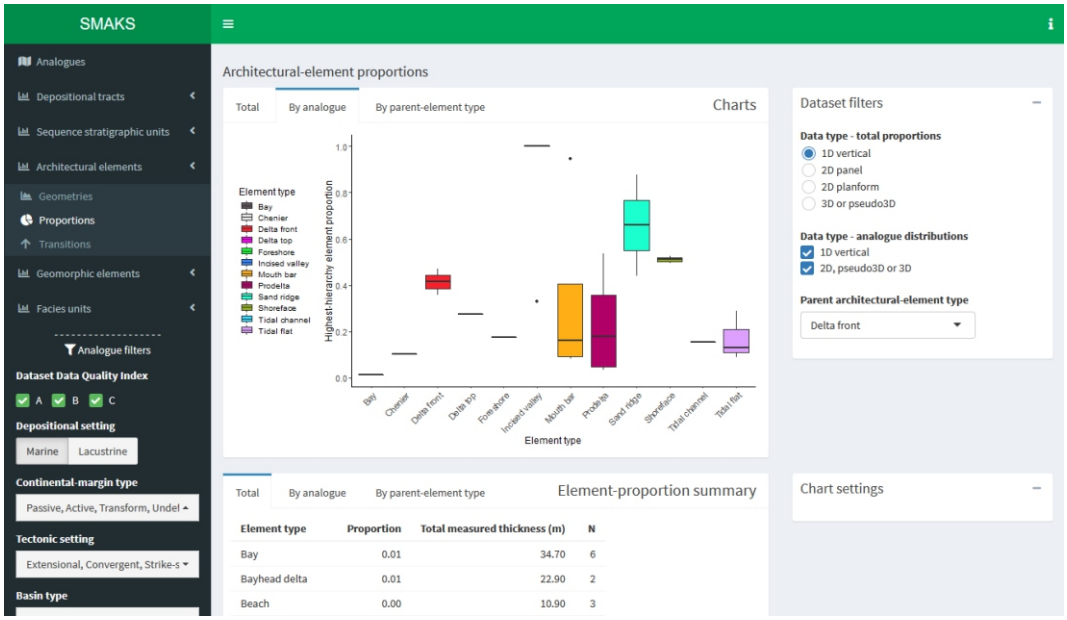
Left. Example SMAKS output on the geometry of parasequence-scale sandbodies: dip length distributions. Output-specific filters can be applied to select high-order parent sedimentary units (e.g., systems tracts).

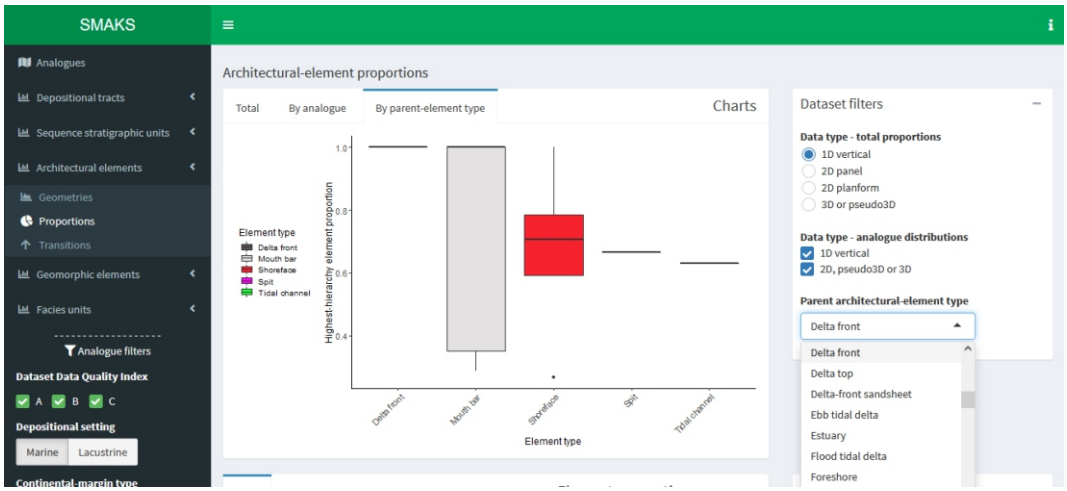
Right. Example SMAKS output on the geometry of facies units: frequency distribution of the thickness of wave ripple cross-laminated sands or sandstones.



SMAKS interrogation using *shinySMAKS*: screenshots

Right. Example SMAKS output on the proportion of architectural elements: distributions in the fraction of element types in 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 SMAKS output on the proportion of facies units: heat map of the fraction of facies types in a specified subenvironment (here, offshore transition zone), in the chosen analogues. Facies types are here established on combination of classes of modal grainsize and dominant sedimentary structure.