

How to transform a 'Big Data' archive: the story behind AAPG Datapages Exploration Objects (DEO)



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About Lynx

Incorporated in 1989, offices in London and Houston



E&P SERVICES

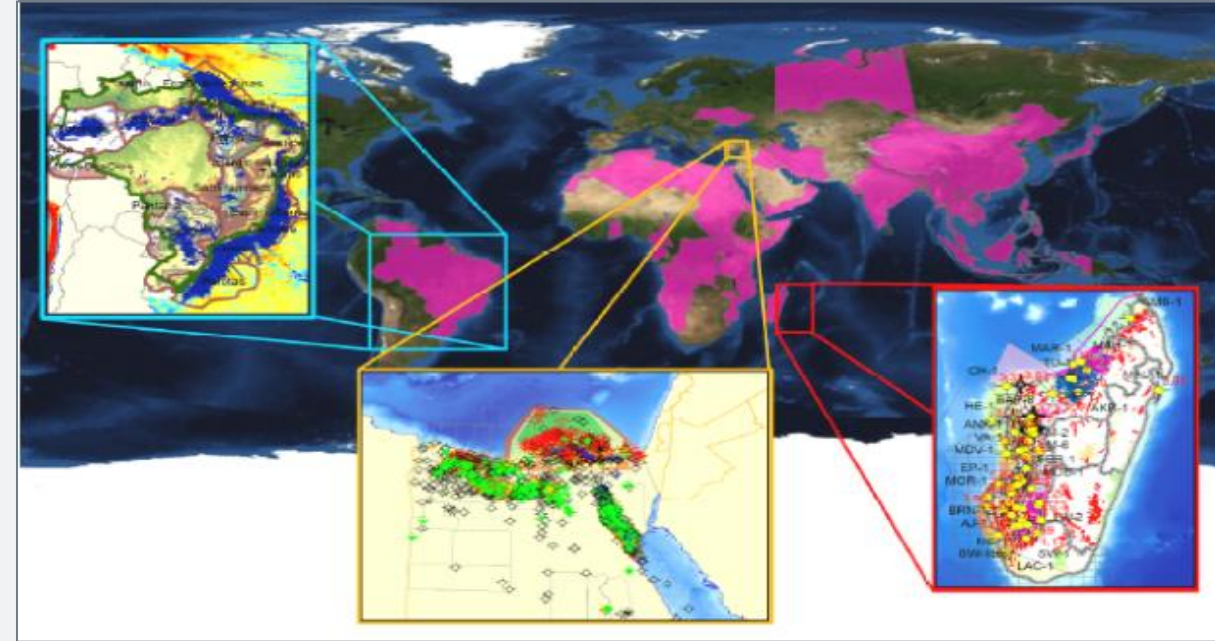
SCANNING and DATA RECONSTRUCTION

- Scan paper seismic section, convert to SEGY
- Scan paper wireline logs, convert to LAS
- Scan and catalog paper archives



REGIONAL GIS REPORTS

- Early evangelist for use of GIS within E&P
- Petroleum geology - stratigraphic architecture, source rocks, paleogeography, play fairways...



E&P SOFTWARE SOLUTIONS

Web-GIS development
National Archives
Virtual Data Rooms

Technology partnership with AAPG Datapages



AAPG Datapages Inc is a commercial subsidiary of the American Association of Petroleum Geologists (AAPG), tasked with the digital archive and distribution of AAPG publications and partner journals for the global geoscience community.

- Extensive digital archive of journals, dating from 1917 to present-day
- Worldwide coverage

The technology partnership between Datapages and Lynx was formed in 2012 with the aim of providing geographical search of this journal archive



AAPG

Datapages, Inc.
Exploration Objects™

Datapages Exploration Objects – the concept

Proposed Method

1. Images

- Capture figure captions for articles
- Geo-rectify maps, geo-locate sections and wells

2. Index

- Cross-reference the figure captions, article titles and abstracts against a global gazetteer of locality names, oil fields, geological formations and basins

3. Website

- Interactive map with integrated geographical search and text-based keyword-search for articles

Sales Model

- Initial company subscriptions
- Later pay-per-view
- Royalties paid by Datapages to copyright owners based on logged article access
- Potential for syndication via corporate GIS portals

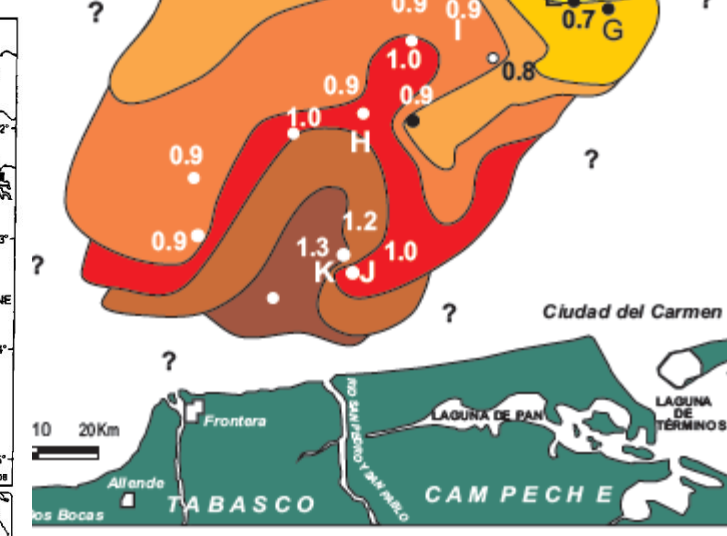
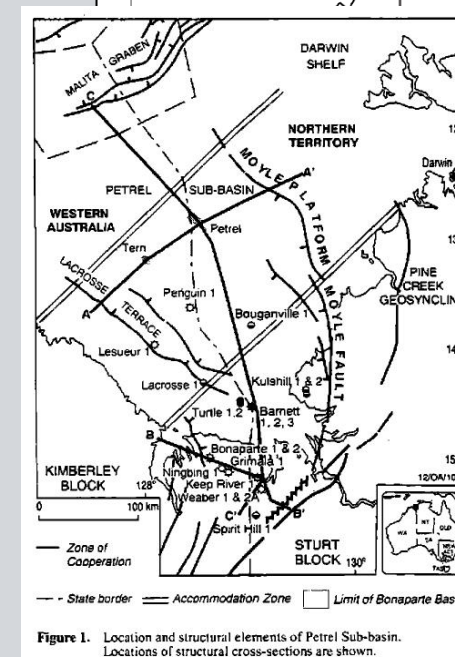
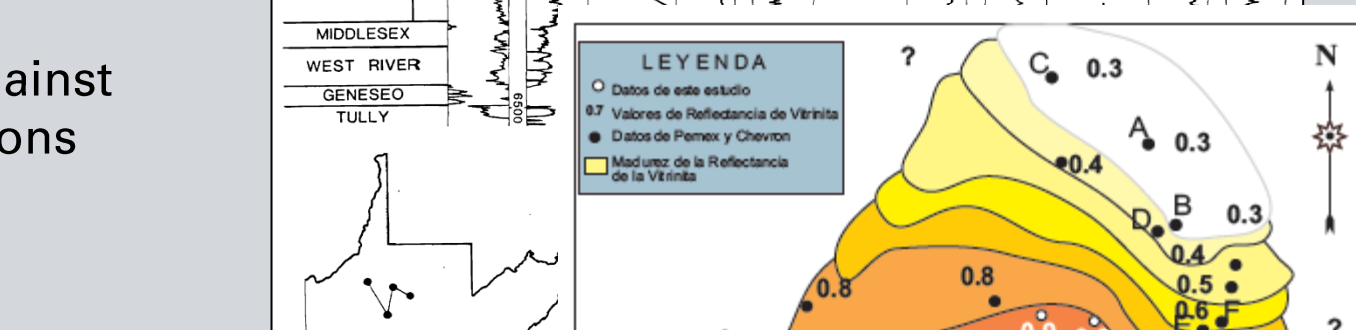
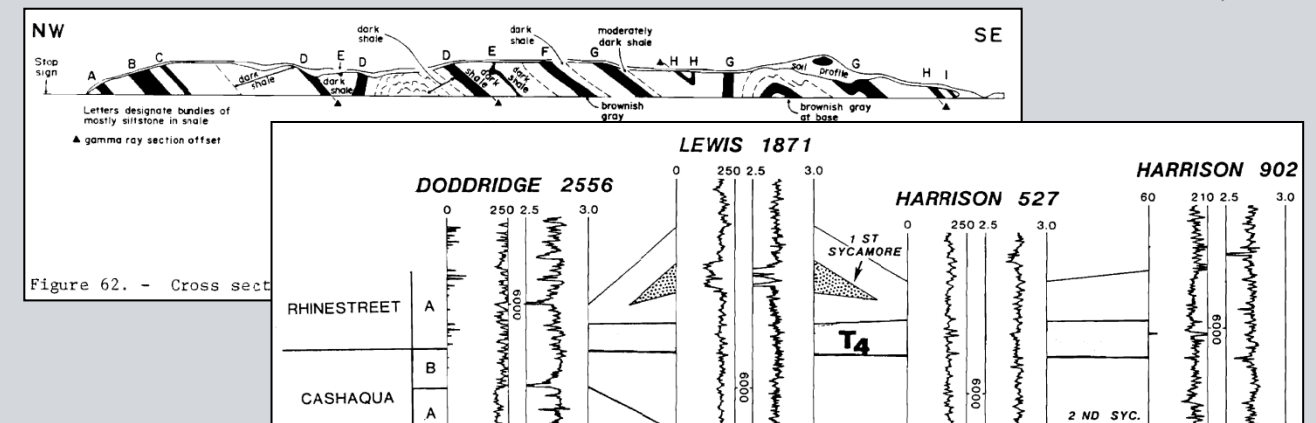


Figure 1. Location and structural elements of Petrel Sub-basin. Locations of structural cross-sections are shown.

Georectification and geolocation

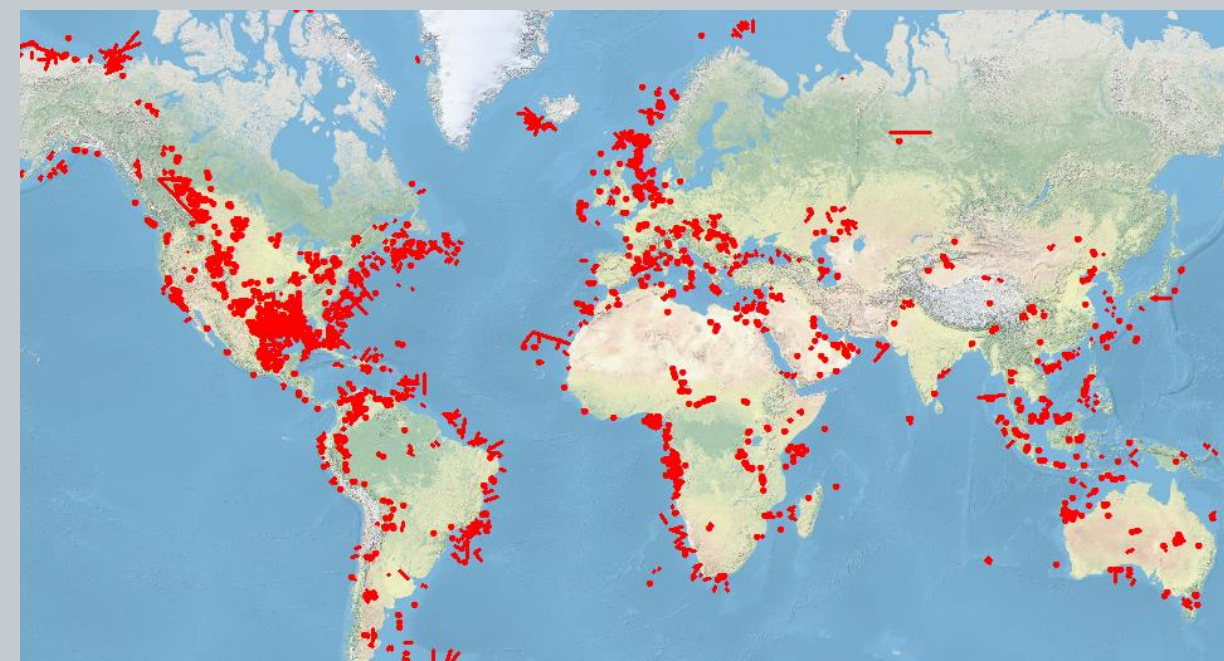
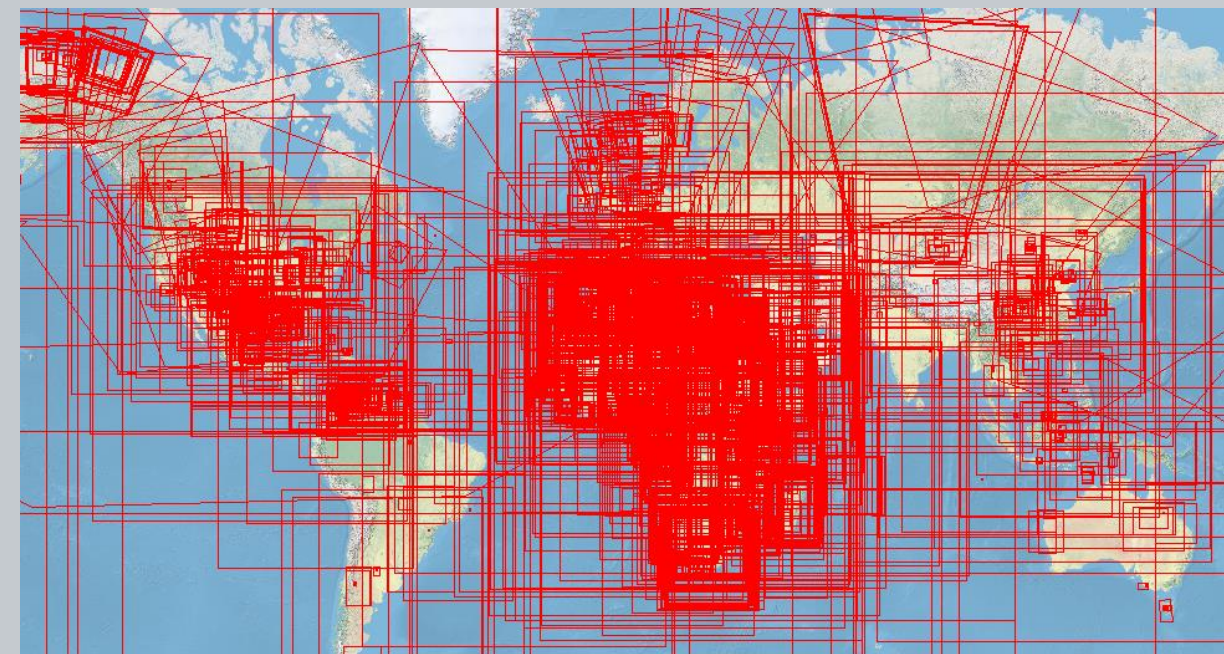
Performed in-house or outsourced and managed (and thoroughly QC'd) by Lynx before loading into DEO

To date, approximately 55,000 maps and sections have been georectified/geolocated in a number of phases.

Maps georectified using WGS-84 GCS, for import into an AGS Image Mosaic, and display in a AGS Web Mercator web map, using any available features – for example coastlines and administrative boundaries, rivers and roads, lat/lon grid markings

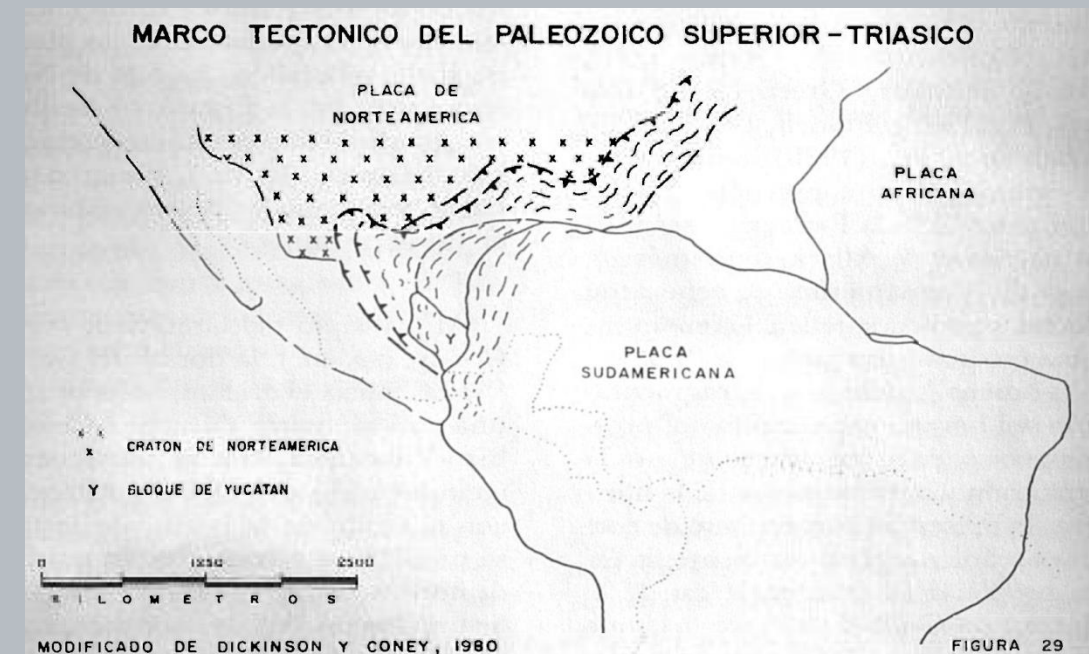
Cross-sections, well correlations, seismic lines etc – locations digitised as either a line or a point from all available information (seismic and well databases, other maps within the article etc)

Location confidence is marked as part of the QC process. Tentative or dubious locations may be excluded or re-visited to re-assess.



DEO Map Georectification – Known Issues

- Web Mercator issues with high latitudes and/or continent-scale maps – a large amount of warping may be introduced (especially noticeable in Canada). Major development time required to handle multiple image mosaics with different source projections, a web map with multiple projections, and polar basemaps – unresolved
- Sketch maps – approximate georectification is usually acceptable for article-location purposes
- AGS Image Mosaics are difficult to incrementally update!
- Plate tectonics/shifting continents – unresolved!



DEO Web Map

Components

ArcGIS 10.3 Image Mosaic

- Map image store

MS SQL Server 2008

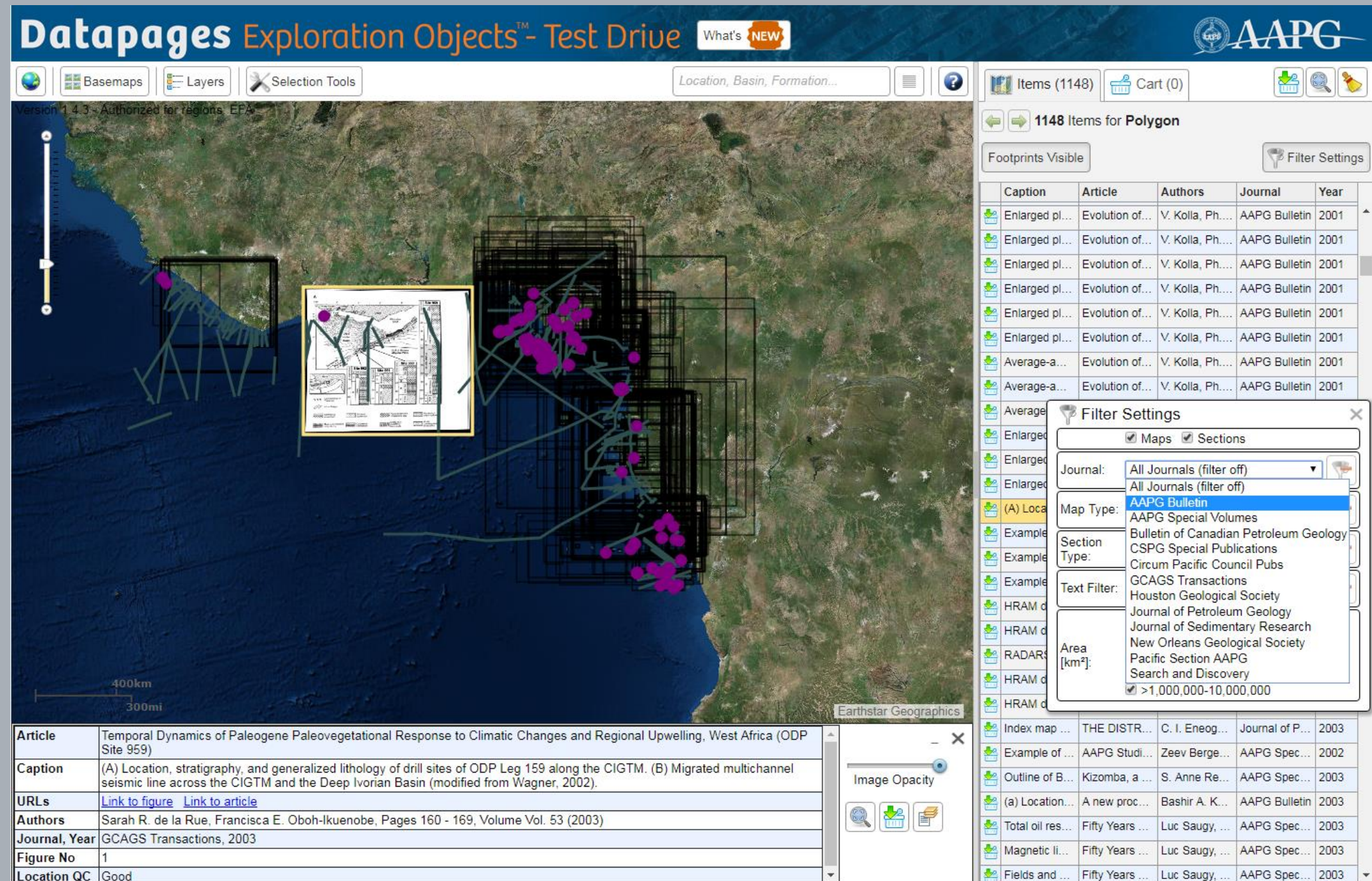
- Map and section footprints
- Article Metadata
- Locality index
- Activity Logging

ArcGIS Javascript API 3.14

- Browser front-end

Apache Tomcat/Java 8

- REST interface for spatial and text queries



Datapages Exploration Objects™ - Test Drive What's **NEW**

Version 1.4.3 - Authorized for regions: EPA

Basemaps Layers Selection Tools Location, Basin, Formation...

Items (1148) Cart (0)

1148 Items for Polygon

Footprints Visible Filter Settings

Caption	Article	Authors	Journal	Year
Enlarged pl...	Evolution of...	V. Kolla, Ph...	AAPG Bulletin	2001
Enlarged pl...	Evolution of...	V. Kolla, Ph...	AAPG Bulletin	2001
Enlarged pl...	Evolution of...	V. Kolla, Ph...	AAPG Bulletin	2001
Enlarged pl...	Evolution of...	V. Kolla, Ph...	AAPG Bulletin	2001
Enlarged pl...	Evolution of...	V. Kolla, Ph...	AAPG Bulletin	2001
Enlarged pl...	Evolution of...	V. Kolla, Ph...	AAPG Bulletin	2001
Average-a...	Evolution of...	V. Kolla, Ph...	AAPG Bulletin	2001
Average-a...	Evolution of...	V. Kolla, Ph...	AAPG Bulletin	2001

Filter Settings

Maps Sections

Journal: All Journals (filter off)

Map Type: AAPG Bulletin

Section Type: Bulletin of Canadian Petroleum Geology

Text Filter: GCAGS Transactions

Area [km²]: >1,000,000-10,000,000

Article	Temporal Dynamics of Paleogene Paleovegetational Response to Climatic Changes and Regional Upwelling, West Africa (ODP Site 959)			
Caption	(A) Location, stratigraphy, and generalized lithology of drill sites of ODP Leg 159 along the CIGTM. (B) Migrated multichannel seismic line across the CIGTM and the Deep Ivorian Basin (modified from Wagner, 2002).			
URLs	Link to figure Link to article			
Authors	Sarah R. de la Rue, Francisca E. Oboh-Ikuenobe, Pages 160 - 169, Volume Vol. 53 (2003)			
Journal, Year	GCAGS Transactions, 2003			
Figure No	1			
Location QC	Good			

Image Opacity

Index map ...	THE DISTR...	C. I. Eneog...	Journal of P...	2003
Example of ...	AAPG Studi...	Zeev Berge...	AAPG Spec...	2002
Outline of B...	Kizomba, a ...	S. Anne Re...	AAPG Spec...	2003
(a) Location...	A new proc...	Bashir A. K...	AAPG Bulletin	2003
Total oil res...	Fifty Years ...	Luc Saugy, ...	AAPG Spec...	2003
Magnetic li...	Fifty Years ...	Luc Saugy, ...	AAPG Spec...	2003
Fields and ...	Fifty Years ...	Luc Saugy, ...	AAPG Spec...	2003

DEO Web Map (2)

Select maps and sections by geological basin

Datapages Exploration Objects™ What's **NEW**

Location, Basin, Formation...

Items (184) Cart (0)

184 Items for Basin: Midland - Permian

Footprints Visible Filter Settings

Selection Tools

Select small and medium sized maps

- Draw area of interest
- Draw line & buffer by: 150 km

Select large maps

- Set point to select maps
- Select basin by map

Filter Settings

Maps Sections

Journal: All Journals (filter off)

Map Type: All Maps (filter off)

Text Filter:

Area [km²]:

- <100
- >100-1,000
- >1,000-10,000
- >10,000-100,000

Caption	Article	Authors	Journal	Year
Fault distrib...	Structure, st...	Brian S. Bri...	AAPG Bulletin	2002
Gross thick...	Structure, st...	Brian S. Bri...	AAPG Bulletin	2002
(a) Isopach ...	Reservoir c...	Shirley P. D...	AAPG Bulletin	2003
Structural c...	Overview of...	Mike Hanag...	Search and ...	2003
Base map ...	Dual-lateral ...	Matthew J. ...	AAPG Bulletin	2004
Top of San ...	Dual-lateral ...	Matthew J. ...	AAPG Bulletin	2004
Location m...	Incremental...	Neil F. Hurl...	AAPG Bulletin	2004
Detailed m...	Illustrated S...	David E. Po...	Search and ...	2006
Water-level ...	Tracking Sa...	H. S. Nance...	GCAGS Tra...	2006
Stiff diagra...	Tracking Sa...	H. S. Nance...	GCAGS Tra...	2006
Map of SO...	Tracking Sa...	H. S. Nance...	GCAGS Tra...	2006
Completion...	Tracking Sa...	H. S. Nance...	GCAGS Tra...	2006
Location of ...	Seismic Ge...	Enzo S. Ac...	Houston Ge...	2008
Net sandst...	Ozona sand...	H. Scott Ha...	AAPG Bulletin	2009
Net sandst...	Ozona sand...	H. Scott Ha...	AAPG Bulletin	2009
Index map ...	Ozona sand...	H. Scott Ha...	AAPG Bulletin	2009
Net sandst...	Ozona sand...	H. Scott Ha...	AAPG Bulletin	2009
Net sandst...	Ozona sand...	H. Scott Ha...	AAPG Bulletin	2009

Article Tracking Salinity Sources to Texas Streams: Examples from West Texas and the Texas Gulf Coastal Plain

Caption Water-level map of the Upper Colorado River study area based on most recent well data collected since January 1, 2000. Also shown are well locations and stream-sample locations. County names shown in Figure 8. Data from Texas Water Development Board (2006).

URLs [Link to figure](#) [Link to article](#)

Authors H. S. Nance, Pages 675 - 693, Volume Vol. 56 (2006)

Journal, Year GCAGS Transactions, 2006

Figure No 1

Location QC Good

Image Opacity

DEO Web Map (3)

Extra regional layer sets

Datapages Exploration Objects™ What's **NEW**

Basemaps Layers Selection Tools Location, Basin, Formation... Items (96) Cart (0)

Selection Tools

Select small and medium sized maps

- Draw area of interest
- Draw line & buffer by: 150 km

Select large maps

- Set point to select maps

Select basin by map

EFA Purdy Geology

Abbreviation	Ku
Age Description	Mesozoic
Rock Type	-
Eon	Phanerozoic
Era	Mesozoic
Sub-Era	-
Period	Cretaceous
Epoch	Cretaceous Upper
Continental Facies	-

DEO Overlays

- Country Labels
- Sedimentary Basins (Tellus)

Exploration Fabric of Africa

Contents Legend

Hydrocarbon Type

- Oil
- Oil and Gas
- Gas
- Gas Condensate
- Oil Gas Condensate

Structural Features (mod. CGMW 2010)

Tectonic map of Africa Structural Features (CGMW)

- Anticline
- Fault
- Inferred fault
- Normal fault
- Inferred normal fault

Article	Structure and Stratigraphy of the Gulf of Suez, Egypt: Chapter 2: Part I. Type Basin: Gulf of Suez
Caption	Geological cross section C-C'prime.
URLs	Link to figure Link to article
Authors	Karsten I. Schutz, Pages 57 - 96, Volume M 59: Interior Rift Basin
Journal, Year	AAPG Special Volumes, 1994
Type	Geological Cross-Section
Name / Number	Section Name: C-C' / Figure Number: 19

Figure 19. Geological cross section C-C'.

(a) West-ea...	HYDROCA...	M. A. El-Gh...	Journal of P...	2002
East-west c...	HYDROCA...	M. A. Youne...	Journal of P...	2003
Hydrocarbo...	HYDROCA...	M. A. El-Gh...	Journal of P...	2002
Depth migr...	October Fie...	Jeffrey J. L...	AAPG Spec...	1992
Interpretati...	Ramadan F...	A. Shawky ...	AAPG Spec...	1992
Seismic lin...	Geology an...	L. R. Chow...	AAPG Bulletin	1987
Subsurface...	A Multidisci...	Saber M. S...	Search and ...	2012
Dip Line ac...	Advanced ...	William J. S...	Search and ...	2012
Strike line a...	Advanced ...	William J. S...	Search and ...	2012
(a) West-ea...	HYDROCA...	M. A. El-Gh...	Journal of P...	2002
Regional se...	Structural In...	M. G. Salah...	AAPG Bulletin	1996
Seismic lin...	Ramadan F...	A. Shawky ...	AAPG Spec...	1992



Thank you

- Archive Management
- WebGIS Development
- National Data Repositories
- Virtual Data Rooms
- Country G&G Studies

LYNX
Information Systems
London • Houston



Enabling the Enterprise

 **AAPG | Datapages, Inc.**
Principal Technology Partners

 **esri** Partner Network
Silver