

# **PS WODAD – A Web-Based Outcrop Digital Analog Database of Carbonate Platform Margins\***

By

**Jeroen A.M. Kenter<sup>1</sup> and Paul (Mitch) Harris<sup>2</sup>**

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## **Abstract**

WODAD (Web-Based Outcrop Digital Analog Database) is a public, searchable database that is a serious attempt to make outcrop information more readily available to earth scientists. Such analogs can help industry earth scientists to conceptualize stratigraphic, facies, and diagenetic relationships that develop reservoirs and traps while it may provide academics with a tool to compare and contrast information across geological time and space.

WODAD will cover the Phanerozoic and include carbonates initially, but later clastics as well as mixed systems. The database consists of a series of chapters, each focusing on a specific outcrop. Each chapter contains a summary page with search items, a few (2-3) pages of descriptive information, and a short reference list. A section of each summary page contains the items that will eventually guide the search. The primary search items will be age, system type (for carbonate, platform type), rock properties (lithology, texture), overprint (recrystallization, fracture, karst), and geographical location.

The database will offer unique and unsurpassed opportunities for comparative research, many of which will be only discovered once the database is available. WODAD “carbonates” is currently operational thanks to start-up funding provided by Chevron. Outcrop contributions from academia and industry are invited through submission of an abstract as well as through personal invitations (see [wodad.org](http://wodad.org) for information and instructions). It is anticipated that by 2007 the database will be published as a digital publication.

# WODAD - A Web-Based Outcrop Digital Analog Database of Carbonate Platform Margins

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## Rationale

Information on outcrops is generally poorly accessible; no systematic (semi) quantitative catalog exists in the public domain

This information is essential to the Earth Science community for contrast-comparative and background research

Outcrops analogs are an important part of any hydrocarbon or water exploration or development project (conceptualize relationships that develop reservoirs and traps; limit and constrain uncertainties and need to standardization)

53-56% booked reserves are in carbonates and 25-35% of that depleted by 2009

However, matching analogs are difficult to locate since no uniform catalog exists

## Web-based Outcrop Digital Analog Database

HOME

Info

Main

Login

Sign Up

About

Contact

### MAIN

**Note:** Make sure your browser allows the use of cookies and javascript, WODAD.ORG can only perform correctly when both are enabled. Both options can be found under [Tools](#) -> [Options](#) (for most browsers).

**Web-based Outcrop Digital Analog Database (WODAD):**  
**"A Public Relational and Searchable Database Archiving Geological Outcrops in the Geological Record"**

Information on geological outcrops is generally poorly accessible in the literature and no systematic (semi) quantitative catalog exists in the public domain. However, such information is essential to the Earth Science community for comparative and background research and similarly outcrop analogs are an important part of any hydrocarbon or water exploration or development project. Analogs provide information to supplement what is available from the academic or industry project's data set and thereby often add significantly to one's understanding and interpretation. Specifically, analogs help to conceptualize stratigraphic, facies and diagenetic relationships that develop reservoirs and traps. The range of scenarios that analogs can help to illustrate is particularly important when uncertainties are of a concern and need to be quantified.


This relational database will 1) cover the Phanerozoic, 2) include carbonates, siliciclastics as well as mixed systems and, 3) maximize the searchable parameters. This way (ideally), the database will be searchable from any angle and not necessarily by age or system type alone. The database will offer earth scientists unique and unsurpassed opportunities for comparative research, many of which will be only discovered once the database is available.


WODAD is hosted at the Vrije Universiteit in Amsterdam and is partly funded by ChevronTexaco. The web-based database has been operational since January 2006 and contributions are invited from academia and industry through personal invitations or through submission of unsolicited (short) abstracts to the web site. Independent referees review contributions before they are accepted for publication. The first of three databases will focus on carbonate outcrops and (digital) publication with a major journal is planned for early 2008.


Online Members

J. Kenter

Main Supporters

  
vrije Universiteit  
amsterdam





E-mail

jeroenkenter@chevron.com

Password

\*\*\*\*\*

Login

Forgot your password, please click here.

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## What is WODAD?

A public "searchable" and "relational" digital outcrop analog database (web-based and downloadable)

Including a set of key qualitative and quantitative variables that allow cross-variable queries

Covering the Phanerozoic

Including carbonates, clastics and mixed systems

A database compatible with C&C Reservoirs Digital Analog System

Published as digital AAPG publication where the contributors are co-authors

# Web-based Outcrop Digital Analog Database

# How Does WODAD Work?

Will function as a dynamic web-based database

Is hosted with a public university that has latest facilities and back-up systems

Is based on a combination of PHP and PostgreSQL; open source licensed packages keeping the database at a relative low cost level

PHP (Hypertext Pre-processor) is server-side web-scripting language and connecting Web sites to back end servers (two-way communication), such as databases.

PostgreSQL is an Object Relational Database which excels at handling large media objects, tables, spatial, and series style data sets

## Spatial Information

INSERT/EDIT RECORD: JBD (#5)

#1 - #2 - #3 - **#4 - Spatial Info** - #5 - #6 - #7 - #8 - #9 - #10 - #11 - #12 - #13 - #14 - #15

Example Preview

Coordinates\* [Latitude] [Longitude] Submit

Use MapInterface Refresh Page

Previous

[Top]

Legend WODAD World Map Interface Background Information

Layers: Sedimentary, Topography, Coastlines, Country Borders, Major Rivers, Country Names, Capital, Sedimentary Basins, Plot Basin Names, Grid, Rock Map, Standard WorldMap, Use Mode Disabled, Click to Enable

WODAD World Map Interface Background Information

Layers: Sedimentary, Topography, Coastlines, Country Borders, Major Rivers, Country Names, Capital, Sedimentary Basins, Plot Basin Names, Grid, Rock Map, Standard WorldMap, Use Mode Disabled, Click to Enable

## Time Interval

INSERT/EDIT RECORD: SIERRA DE CUERA (#1)

#1 - #2 - **#3 - Time Interval** - #4 - #5 - #6 - #7 - #8 - #9 - #10 - #11 - #12 - #13 - #14 - #15

Example Preview

Please select the most precise known Geological Time Interval (Lower Boundary - Upper Boundary)

Serpukhovian until Moscovian

Previous Next

## Rock Properties

INSERT/EDIT RECORD: SIERRA DE CUERA (#1)

#1 - #2 - #3 - #4 - **#5 - Rock Properties** - #6 - #7 - #8 - #9 - #10 - #11 - #12 - #13 - #14 - #15 - #16

Example Preview

Lithology: Breccia, Chalk, Clay, Conglomerate, Add new category, Primary Lithology: Limestone, Secondary Lithology: Dolomite, Siliceous Mudstone

Texture: Boundstone, Grainstone, Mudstone, Add new category, Microbial Cement Boundstone, Packstone

Components: Skeletal Grains: Microbes, Calcareous Algae, Calcimicrobes and cyanobacteria, Marine green algae, Charophytes, Red Algae, Phylloid algae, Foraminifera, Agglutinated forms, Primary Components: Calcimicrobes and cyanobacteria, Marine green algae, Calcareous benthics, Secondary Components: Brachiopods, Bryozoans, Ooids

Overprint: Diagenetic: Extensive Re-crystallization, Diagenetic: Karsted, Diagenetic: Moderate Re-crystallization, Add Diagenetic, Add Tectonic, Tectonic: Tilted minor fracturing

Previous Next

## Platform Details

INSERT/EDIT RECORD: SIERRA DE CUERA (#1)

#1 - #2 - #3 - **#4 - Platform Details** - #5 - #6 - #7 - #8 - #9 - #10 - #11 - #12 - #13 - #14 - #15 - #16

Example Preview

Platform Type\*: Delta-Top, Fault Block, Offshore Back (or unattached), Salt Diapir, Add new category, Foreland Margin

Sedimentary Basin Type: Foreland, Delete

Morphology of Depositional System (plan view): Amalgated, Amoeboid, Arcuate, Circular, Add new category

Morphology of Depositional System (cross view): Backstepping, Hat to Bell shaped (plano-concave), Inverted bowl/saucer (convex-concave), Lenticular, Add new category, Aggradational Progradation

Additional System Info (max. 25 words): Seismic scale undisturbed dip section: 5 km horizontal progradation followed by near vertical aggradation: microbial boundstone slope shedding controls depositional flank, Update

Previous Next

## More about WODAD

Fully searchable data base (functionality in progress)

Open call for participants as well as invited contributions

Pre-formatted pull down menus to ensure coherent information

Simple primary search items like age, system type, rock properties, overprint, and geographical location; Information items short descriptions

GIS based using Basin World Map

Digital and analog data can be added as new items

Physical Properties

INSERT/EDIT RECORD: SIERRA DE CUERA (#1)

#1 - #2 - #3 - #4 - #5 - #6 - **Physical Properties** - #8 - #9 - #10 - #11 - #12 - #13 - #14 - #15 - #16

Example Preview

Rock Mechanics/  
Petrophysics

Permeability

Density  
P-wave velocity  
Porosity  
S-wave velocity

Add new category

Geophysics

2D Seismic  
3D Seismic  
Bouguer Anomaly  
Magnetic Anomaly

Synthetic Seismic Model

Add new category

PreviousNext

Object Dimensions

INSERT/EDIT RECORD: SIERRA DE CUERA (#1)

#1 - #2 - #3 - #4 - #5 - #6 - #7 - **Dimensions** - #9 - #10 - #11 - #12 - #13 - #14 - #15 - #16

Example Preview

Platform Dimensions

Dip width15000 m.

Thickness1300 m.

Slope Dimensions

Height min650 m. max850 m.

Angle min5 0 max92 0

Slope ShapePlanar

PreviousNext

Outcrop Properties

INSERT/EDIT RECORD: SIERRA DE CUERA (#1)

#1 - #2 - #3 - #4 - #5 - #6 - #7 - **Outcrop Properties** - #9 - #10 - #11 - #12 - #13 - #14 - #15 - #16

Example Preview

Outcrop StructureUndisturbed | Delete

Outcrop ExposureModerate (>40% exposure and moderately continues) | Delete

Stratal AnatomySuperb (visible and continues) | Delete

PreviousNext

Example of Input Data Set

INSERT/EDIT RECORD: SIERRA DE CUERA (#1)

#1 - #2 - #3 - #4 - #5 - #6 - #7 - #8 - #9 - #10 - **Cross Section** - #12 - #13 - #14 - #15 - #16

Example Preview

Simplified Geological Cross-Section

Delete Uploaded Cross-section

Description Regions

Add the following (main) region to describe in the table below: Please select.

Region	Sub-Region	Description	Position
Inner Platform	Lithofacies A	3-35 m thick intervals of subtidal open marine, around or below wave base, skeletal packstone to packstone, locally grainstone, with <i>Donezella</i> and	1
	Lithofacies B	1-6 m thick intervals of restricted shallow subtidal lagoonal peloidal packstone, with low diversity fossil assemblage; fossil assemblage consists of common	
	Lithofacies C	Thin intervals of high energy intertidal to shallow subtidal coarse grained, poorly sorted oncoid packstones to grainstone to moderately well sorted,	

Color Code #B4DCC submit - Max. 100 words per text box -

Deactivate Sub-regions select

Delete region

Depositional Information

INSERT/EDIT RECORD: SIERRA DE CUERA (#1)

#1 - #2 - #3 - #4 - #5 - #6 - #7 - #8 - #9 - #10 - #11 - #12 - **Depositional** - #15 - #16

Example Preview

Depositional

Five general lithofacies zones were observed: inner – and outer platform, upper slope, lower slope and toe-of-slope to basin (Kanter et al., 2002; Della Porta et al., 2002). 1) The platform deposits consist of subtidal limestones and contain shoaling-upwards cycles with a transgressive interval of coated grainstones with oncoids, followed by normal marine algal boundstone and bioclastic grainstone to packstone and, near the top, restricted lagoonal peloidal packstone to grainstone with calcispheres. These cycles have a thickness between 2.5 and 15 m and can be traced from the platform break into the platform interior for at least 6 km. The base consists of intraclast and coated grain-rich packstones and grainstones. Increase in water depth enhances the development of massive, carbonate mud-rich accumulations in a fine-grained packstone with in situ *Donezella* and scattered phylloid algae. This lithofacies (up to 20 m thick) shows a flat-lens shape, and is adjacent to locally bioturbated, skeletal packstones with a diverse, open marine fossil assemblage. These low-relief bioherms, besides *Donezella* and phylloid algae, contain bryozoans, ostracodes, encrusting benthic foraminifers, endothyrids, globivalvulinids, paleotextulariids, rare fusulinids, brachiopods, echinoderms, polychaete worm tubes, and rare sponge spicules and trilobites. At the top of the lense shaped bodies *Chaetetes* colonies and rare solitary rugose corals are observed. The associated skeletal packstone are enriched in benthic foraminifers and echinoderms. The fossil assemblage also includes brachiopods, bivalves, bryozoans and calcareous algae, and minor phylloid alga plates. The low relief algal bioherms are overlain by shallow

Submit depositional

Optional Figure(s)

Figure

Figure [jpg, jpeg, gif and png formats, max. 500kb]

Caption [max. 500 words]

Upload figure and caption



# PDF Reporting

## Web-based Outcrop Digital Analog Database

Home	Info	DATABASE	Options
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Basic Search  
Advanced Search  
Submit Data  
Edit Data  
Validate Data

SIERRA DE CUERA  
Jeren Kenter

TIME INTERVAL  
Asselian  
CARBONIFEROUS  
Pennsylvanian  
Gzellan  
Kasimovian  
Moscovian  
Bashkirian  
Mississippian  
Serpukhovian  
Visean  
Tournaisian  
Devonian  
Upper  
Famennian

SPATIAL INFORMATION  
Region Europe  
Country Spain  
Coordinates 43.35145 / -4.79799  
Sedimentary Basin Spanish Trough-Cantabrian Zone

CARBONATES SYSTEM TYPE  
Platform Type Foreland Margin  
Sedimentary Basin Type Foreland  
Morphology of Depositional System  
Additional Sytem Information Seismic scale undisturbed dip section; 5 km horizontal progradation followed by near vertical aggradation; microbial boundstone slope shedding controls depositional flank

ROCK PROPERTIES  
Lithology [Primary] Limestone  
[Secondary] Siliceous Mudstone, Dolomite  
Components [Primary] Calcimicrobes and cyanobacteria, Marine green algae, Calcareous benthics, Crinoids, Pellets and Peloids  
[Secondary] Bryozoans, Brachiopods, Ooids

PHYSICAL PROPERTIES  
Rock Mechanics / Petrophysics Density, P-wave velocity, Porosity, S-wave velocity  
Geophysics Synthetic Seismic Model

OUTCROP PROPERTIES  
Outcrop Structure Undisturbed  
Outcrop Exposure Moderate (>40% exposure and moderately continues)  
Stratal Anatomy Superb (visible and continues)

ADDITIONAL INFORMATION  
Historical Appl. to Subsurface Tengiz, Korolev, Kashagan, Karachaganak (North Caspian Basin)  
Green/Ice House Icehouse

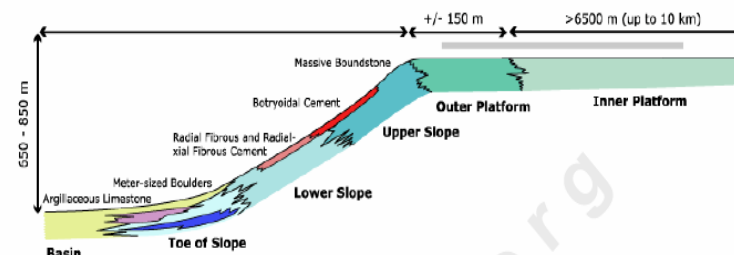
Online Members  
J. Kenter

Main Supporters  
vrije Universiteit amsterdam  
Chevron  
CARBMT

### SIERRA DE CUERA J. Kenter

TIME INTERVAL Asselian Carboniferous Pennsylvanian Gzellan Kasimovian Moscovian Bashkirian Mississippian Serpukhovian Visean Tournaisian Devonian Upper Famennian	SPATIAL INFORMATION Region Europe Country Spain Coordinates 43.35145 / -4.79799 Sedimentary Basin Spanish Trough-Cantabrian Zone
CARBONATES SYSTEM TYPE Platform Type Foreland Margin Sedimentary Basin Type Foreland Morphology of Depositional System [Plan View] [Cross View] Aggradational, Progradation Additional System Information Seismic scale undisturbed dip section; 5 km horizontal progradation followed by near vertical aggradation; microbial boundstone slope shedding controls depositional flank	
ROCK PROPERTIES Lithology [Primary] Limestone [Secondary] Siliceous Mudstone, Dolomite Components [Primary] Calcimicrobes and cyanobacteria, Marine green algae, Calcareous benthics, Crinoids, Pellets and Peloids [Secondary] Bryozoans, Brachiopods, Ooids	Texture Packstone, Microbial Cement Boundstone Type of Overprint Tectonic - Tilted minor fracturing
PHYSICAL PROPERTIES Rock Mechanics / Petrophysics Density, P-wave velocity, Porosity, S-wave velocity Geophysics Synthetic Seismic Model	DIMENSIONS Platform [Dip width] 15000 m. [Thickness] 1300 m. Slope [Height] min 650 m. max 850 m. [Angle] min 5 ° max 32 ° [Shape] Planar
OUTCROP PROPERTIES Outcrop Structure Undisturbed Outcrop Exposure Good (>60% exposure and moderately continues) Stratal Anatomy Superb (visible and continues)	
ADDITIONAL INFORMATION Historical Appl. to Subsurface Tengiz, Korolev, Kashagan, Karachaganak (North Caspian Basin) Green/Ice House Icehouse	Summary of Sequence Stratigraphy

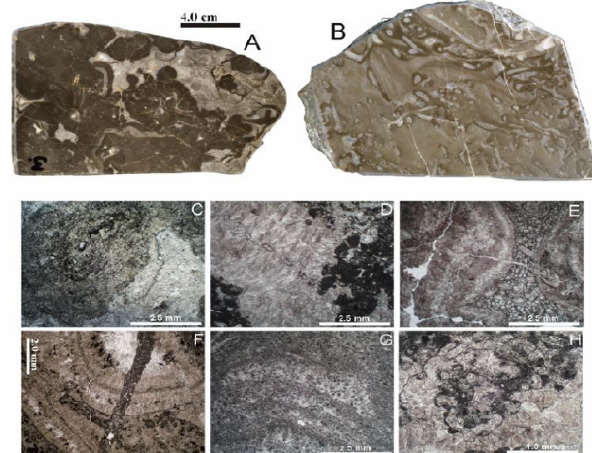
## GEOLOGICAL CROSS SECTION WITH DESCRIPTION OF THE MAJOR REGIONS



### Region / Sub-Region Description

Inner Platform	Lithofacies A	5-35 m thick intervals of subtidal open marine, around or below wave base, skeletal packstone to wackestone, locally grainstone, with Donezella and phylloid algae along with diverse skeletal grains and probably formed mounds in A1. The skeletal assemblage consists of: foraminifers (fusulinids, Endothyra, Globivalvulina, tubular calcitornellids, Climacamma, Bradyina, Tubertina, Tetrataxis), calcareous algae (few phylloid algae, Komia and Ungdarella, very rare beresellid algae and Donezella fragments), echinoderms, and rare bryozoan fragments, ostracodes, brachiopods, and bivalves. Few peloids and rare oncoids and intraclasts are observed. Lithofacies A represents the m-scale alternation of flat lens-shaped algal-skeletal banks (A2) and bioclastic debris sediments (A1) deposited in an open marine, subtidal environment.
	Lithofacies B	1-6 m thick intervals of restricted shallow subtidal lagoonal peloidal packstone, with low diversity fossil assemblage; fossil assemblage consists of common to few calcareous algae (Beresella, Dvinella, Uraloporella, Petschoria, Ungdarella, Komia, phylloid algae), few foraminifers (fusulinids, endothyrids, Climacamma, Bradyina, Tetrataxis, Tubertina, Globivalvulina), calcispheres, ostracodes, brachiopods, echinoderms. In situ Chaetetes colonies and fragments. Few to common peloids; coarser intervals with rare oncoids, intraclasts, fusulinids and echinoderms. Burrows (mm's to cm's size). Locally Microcodium and common peloids. The texture and paleoecology of the fossil assemblage contained in lithofacies B are indicative of a shallow lagoon, with deposition in normal marine (B1) to restricted conditions (B2).
	Lithofacies C	Thin intervals of high energy intertidal to shallow subtidal coarse grained, poorly sorted oncoid packstones to grainstone to moderately to well sorted, mixed coated grain-skeletal-intraclast-oid grainstone. C1 is represented by bedded intervals, frequently thin, rich in oncoids and associated with lithofacies B; C2 is ooid coated pisoid grain grainstone and coated grain-skeletal-peloid grainstone/packstone associated with lithofacies D. These intervals are generally not compacted and have abundant cement. Near the platform break, the C2 interval does not contain oncoids and it is a well-washed ooidal grainstone with isopachous rims of fibrous cement. In the outer platform are grainstone intervals, nearly 5 m to 2 m thick, which should be considered separately. Components are benthic foraminifers (Bradyina, fusulinids, tubular calcitornellids, Climacamma, endothyrids, staffellids), few calcareous algae (Epimastopora, Komia, Beresella, phylloid algae), few to common crinoids and echinoid spines, rare brachiopods, fenestellids, gastropods, and fragments of Chaetetes. Rare observed presence of Microcodium but common to few Osagia oncoids, coated grains, ooids, aggregates, peloids, and intraclasts. Evidence found for current and wave traction; cross-bedding (?) and subaerial exposure.

Caption: Figure 7. Lithofacies Type E - Platform Flooding and Outermost Platform (A) Slab photo showing typical lithofacies E. (B) Lithofacies E-A1 skeletal packstone containing crinoid ossicles, peloids, staffellids, Bradyina, ungdarellid algae and bryozoan fragments. (C) Crinoid dominated grainstone to rudstone with syntaxial overgrowth calcite cement and associated fenestellid bryozoa. (D) Packstone containing echinoderms, fenestellid bryozoan fragments (F), intraclasts (I) pellets (P) and an ostracod shell (O). Lithofacies Type E - Platform Flooding and Outermost Platform (E) Crinoid-dominated pack- to rudstone showing crinoid ossicles with borings and sediment fills. (F) Skeletal packstone with crinoid ossicles, Komia, brachiopod fragments and intraclasts.



# WODAD - A Web-Based Outcrop Digital Analog Database of Carbonate Platform Margins

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## Web-based Outcrop Digital Analog Database

### Summary

WODAD will be a searchable and interactive database

Conceptualization of stratigraphic, facies and diagenetic relationships

Providing quantitative information that can be compared across timescales and worldwide

15 data sets are currently edited as test phase

Search functionality is currently added

An Open Call is advertised and individual authors are being contacted

Spatial (GIS) data sets will be added soon

## Web-based Outcrop Digital Analog Database

**Please join us in this effort by contributing your outcrop examples!**