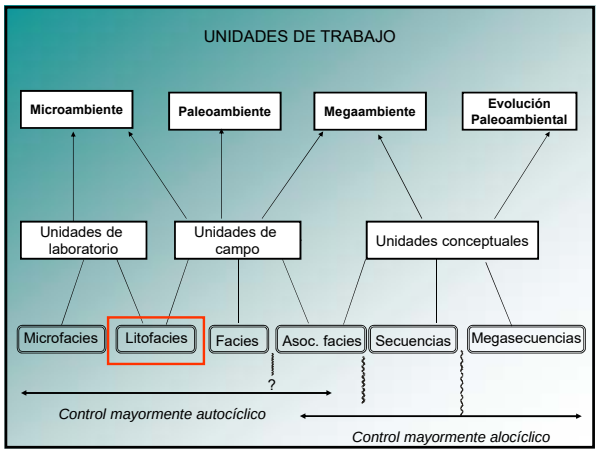
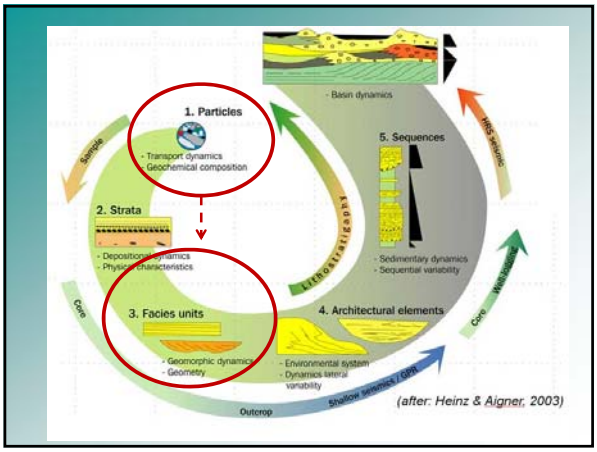




UNIDADES DE TRABAJO

A. DE USO EN LA CARACTERIZACIÓN DE AMBIENTES DEPOSITACIONALES

- ✓ LITOFACIES
- ✓ FACIES
- ✓ ASOCIACIONES DE FACIES
- ✓ MICROFACIES

B. DE USO EN ESTRATIGRAFÍA SECUENCIAL

LOS CÓDIGOS DE LITOFACIES: Por qué?, Para qué? Cómo?

- ❖ **Fundamentos: Miall (1978-1975) – Eyles (1980)**
- ➢ **Economía de lenguaje**
- ➢ **Establecer una nomenclatura objetiva que permita una rápida comparación de diferentes tipos de depósitos**
- ➢ **Presentar un lenguaje que permita la sistematización computacional de las observaciones**
- ❖ **Críticas: Bridge (1993)**
- ➢ **Desalienta las observaciones de detalle**
- ➢ **Complica la lectura de los artículos**
- ➢ **Diferencias en la interpretación de algunas litofacies.**

UNIDADES DE TRABAJO: LOS CÓDIGOS DE LITOFACIES

Ambiente fluvial

Sr: Textura + estructura = Competencia + forma de lecho

Gmm: Textura + fábrica + estructura = Compet. + Mecan. Deposit. + Forma de lecho

Ambiente eólico

Spt : Textura + estructura + detalle = Competencia + forma de lecho + proceso depositacional

Ambiente Glacial + Abanicos aluviales

Dmm(r): Textura + fábrica + estructura + interpretación =

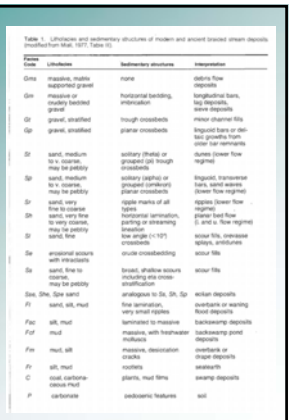
Competencia + mecanismo depositacional + ordenameinto de la unidad depositacional + génesis

AMBIENTE FLUVIAL

LITHOFACIES TYPES AND VERTICAL PROFILE MODELS IN BRAIDED RIVER DEPOSITS: A SUMMARY

ANDREW D. MIALL[1]

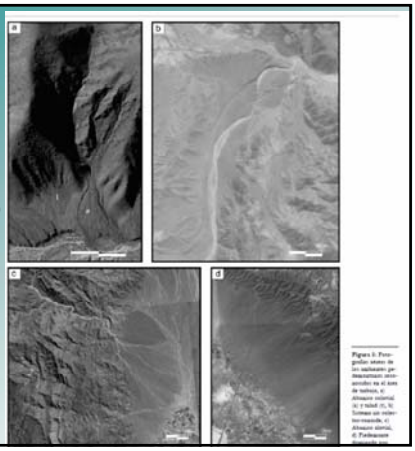
Geological Survey of Canada, 1977: 3003: 597-604



AMBIENTE ALUVIAL

Suriano y Limarino, 2009

Sedimentación pedemontana en las nacientes del río Jachal y Pampa de Gualilán, Precordillera de San Juan.
RAGA 65: 516-532.



Bcg1

- Gradación directa, inversa, etc.
- Gradación, entrecruzamiento, laminación, etc.
- Clasto- , matriz-sostenido, calado
- Litología

Bc(f)g1 o Bc(s)g1

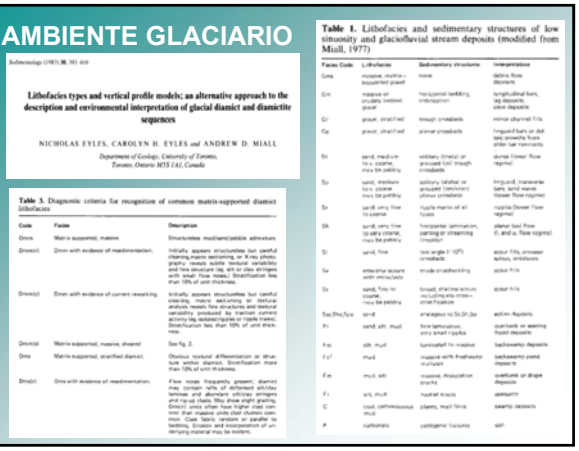
- Gradación directa, inversa, etc.
- Gradación, entrecruzamiento, laminación, etc.
- Clasto- , matriz-sostenido, calado
- Litología

Bcg1

- CARACTERÍSTICAS PARTICULARES
- FORMA DE LECHO
- MECANISMO DE TRANSPORTE Y DEPOSITACIÓN
- COMPETENCIA

Litofacies	Descripción	Interpretación	Presencia 1	2	3	4
Bsl	Brechas sin matriz clasto-soportadas imbricadas	Deslizamiento de detritos seco	X	X		
Bsl	Brechas sin matriz clasto-soportadas fábrica planar	Deslizamiento de detritos seco	X	X		
Bsm	Brechas sin matriz clasto-sopotadas macizas	Deslizamiento de detritos seco / caida de roca/ Depositación en masa	X	X	/	/
Bcl	Brechas clasto-soportadas fabrica planar	Deslizamiento de detritos	X			
Asm	Aglomerados sin matriz clasto-soportados macizos	Caida de roca		X		
Bmm	Brechas matriz-soportadas macizas	Flujo hiperconcentrado cohesivo		X	X	/
Bml	Brechas matriz-soportadas fabrica planar	Flujo hiperconcentrado cohesivo			X	
Bcm	Brechas clasto-soportadas macizas	Flujo fluido	X	X	X	X
Bch	Brechas clasto-soportadas estrat. horizontal	Flujo fluido, migracion de barras longitudinales				X
Bcg1	Brechas clasto-soportadas con gradación inversa	Flujo hiperconcentrado no cohesivo			X	
Bcg2	Brechas clasto-soportadas con gradación normal	Flujo fluido			X	
Bcl	Brechas clasto-soportadas imbricadas	Flujo fluido			X	
Bcp	Brechas clasto-soportadas entrecruzadas	Flujo fluido, migracion de barras transversales			/	X
SGm	Arenisacas guijarrosas macizas	Depositación en masa				/
SGp	Arenisacas guijarrosas entrecruzadas	Flujo fluido, migracion de megaondulas de crestas rectas				/
Sm	Arenisacas macizas	Depositación en masa				/
FGm	Fangolitas guijarrosas macizas	Flujo fluido y decantación	X		/	
Fl	Fangolitas laminadas	Decantación			/	
Fm	Fangolitas macizas	Decantación			/	

AMBIENTE GLACIARIO



Lithofacies types and vertical profile models; an alternative approach to the description and environmental interpretation of glacial diamict and diamictite sequences

NICHOLAS EYLES, CAROLYN H. EYLES and ANDREW D. MIALL

Department of Geology, University of Toronto, Toronto, Ontario M5S 1A1, Canada

Table 3. Diagnostic criteria for recognition of common matrix-supported diamict lithofacies

Table 1. Lithofacies and sedimentary structures of low sinuosity sand glaciofluvial stream deposits (modified from Miall, 1977)

LAS DIAMICTITAS Y SU CÓDIGO DE LITOFACIES
Eyles et al (1983)

Litofacies descriptivas	Litofacies genético
Dm : matriz-soportado	D--(r): resedimentado
Dc: Clasto-soportado	D--(c): retrabajado por corrientes
D-m: masivo	D--(s): cizallado
D-s : estratificado	
D-g : gradado	

EL TÉRMINO RESEDIMENTADO EN EL SENTIDO DE EYLES ET AL (1983)

"The term 'resedimented' (r) is used here for diamicts that show evidence of movement and deposition by sediment gravity flow and slides …"

POR LO TANTO DIFERENTE DE "RETRABAJADO"

EL TÉRMINO DIAMICTITA

Flint, Sanders y Rodgers (1960, abril) "Symmictite: a name for nonsorted terrigenous sedimentary rocks that contain a wide range of particle size" GSA Bulletin 71: 507-510
Terminología

- Paraconglomerado
- Fangolita conglomerádica
- Fangolita guijarrosa/Guijosa (pebbly mudstones)
- Boulder clay = till
- Gerollton fangolita Guijosa no glacial (Ackermenn, 1951)

Symmicton anglisismo derivado del griego symmeikton que se refiere a una mezcla de sustancias de cualquier naturaleza.
Symmictite el equivalente litificado para "any nonsorted or poorly sorted terrigenous sediment that consists of sand and/or larger particles in a muddy matrix. Size distribution is commonly bimodal or poly modal, with one or more modes in the coarse-grain range and one or more in the siltclay sizes.

Sederholm (1924) brecha volcánica compuesta por diferentes tipos de rocas

DIAMICTITA Flint et al. (1960, diciembre GSA Bulletin 71: 1809-1810.

AMBIENTE EÓLICO

Geohorizon 2012

1° descriptivo 2° interpretativo

Aeolian dune

Sand flat

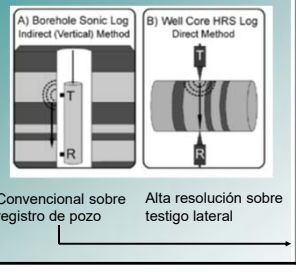
High-resolution ultrasonic measurements as proxies to resolve clastic reservoir heterogeneity in a salt-cemented gas reservoir
Claudio Miro Filomena, Harald Stollhofen, and Kees van Ojik

Table 1. Lithofacies, Sedimentary Fabrics, and Process-Related Interpretation of Fluvioeolian Deposits of the Middle Solling Sandstone Member in Well L9-FF-101, Offshore Netherlands

Code	Grain Size	Characteristics	Gamma-Ray (API)	Interpretation
AeD-x	Fine to medium sandstones	Very well to well sorted, cross-bedded, high structural and compositional maturity	20–35	Eolian dune deposits
AeD-h	Fine to medium sandstones	Very well to well sorted, massive, high structural and compositional maturity, mottling, root casts and/or calcareous rhizocretions	20–35	Strongly bioturbated (homogenized) eolian sandstone
Sdr	Fine to medium sandstones	Well sorted, weakly plane to low-angle cross-bedded, rippled, in parts shallow erosive bases	30–35	Sand-flat deposits (alternating eolian sand sheet and shallow braided sheet-flood deposits)
Sda*	Very fine to fine sandstones	Horizontally to wavy bedded, slightly clayey, small clay intraclasts, carbonate and/or anhydrite nodules	35–45	Damp eolian sand-flat deposits
Md*	Clay-rich fine sandstones	Plane-bedded, mottled texture, large carbonate and anhydrite nodules	<75	Mud-flat deposits

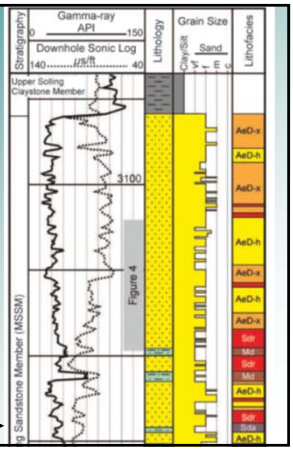
*Clay-bearing lithologies with strong bedding-related anisotropies, which are less suitable for the calculation of high-resolution sonic data–derived porosity proxies.

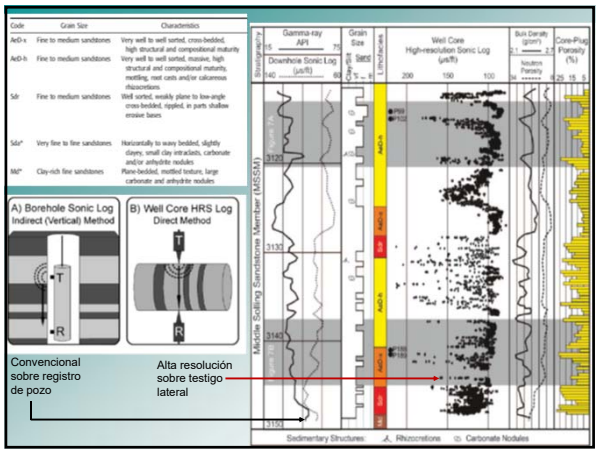
High-resolution ultrasonic measurements as proxies to resolve clastic reservoir heterogeneity in a salt-cemented gas reservoir
Claudio Miro Filomena, Harald Stollhofen, and Kees van Ojik

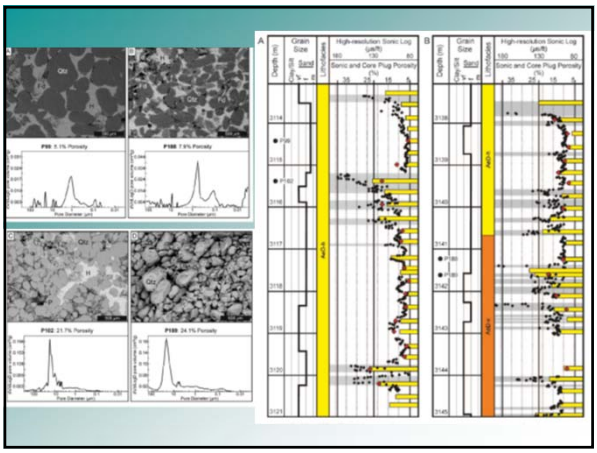


Convencional sobre registro de pozo

Alta resolución sobre testigo lateral







High-resolution ultrasonic measurements as proxies to resolve clastic reservoir heterogeneity in a salt-cemented gas reservoir

Claudio Miro Filomena, Harald Stollhofen, and Kees van Ojik

1. Se trabajó en dos escalas de microfacies: 1° descriptiva y 2° interpretativa
2. Las medidas de ultrasonido de alta resolución permiten el análisis centimétrico de la porosidad
3. La velocidad de transito depende de tamaño de grano, composición, proporción de cemento, tipo de poro.
4. "a detailed petrographic study is of Paramount importance for a successful application of HRS logging"

Journal of Sedimentary Research, 2012, v. 82, 364–378

STANDARDIZING TEXTURE AND FACIES CODES FOR A PROCESS-BASED CLASSIFICATION OF CLASTIC SEDIMENT AND ROCK

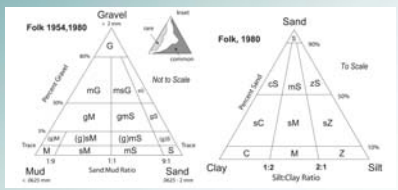
KATHLEEN M. FARRELL,1 W. BURLEIGH HARRIS,2 DAVID J. MALLINSON,3
STEPHEN J. CULVER,3 STANLEY R. RIGGS,3
JESSICA PIERSON,*,1 JEAN M. SELF-TRAIL,4
AND JEFF C. LAUTIER5

ABSTRACT: Proposed here is a universally applicable, texturally based classification of clastic sediment that is independent from composition, cementation, and geologic environment ……..

FOLK et al (1960): PRINCIPIOS

Folk's (1980) Textural Classes for Clastic Sediment

	Code	Unconsolidated	Consolidated Equivalent
Gravel	G	Gravel	Conglomerate
	sG	Sandy gravel	Sandy conglomerate
	mG	Muddy gravel	Muddy conglomerate
	msG	Muddy sandy gravel	Muddy sandy conglomerate
Sand	S	Sand	Sandstone
	gS	Gravelly sand	Gravelly sandstone
	mS	Muddy sand	Muddy sandstone
	gmS	Gravelly muddy sand	Gravelly muddy sandstone
	(g)mS	Slightly gravelly muddy sand	Slightly gravelly muddy sandstone
	(g)S	Slightly gravelly sand	Slightly gravelly sandstone
Mud	M	Mud	Mudstone
	sM	Sandy mud	Sandy mudstone
	gM	Gravelly mud	Gravelly mudstone
	(g)M	Slightly gravelly mud	Slightly gravelly mudstone
	(g)sM	Slightly gravelly sandy mud	Slightly gravelly sandy mudstone



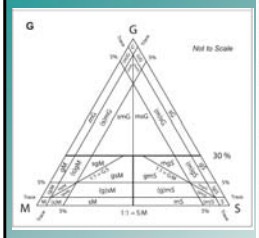
FARRELL et al (2012): ESTANDARIZACIÓN

Textural Classes for Fine-Grained Sediment from Folk's (1980) S:Z:C Ternary Diagram

Major Textural Class G:S:M	Code G:S:M	Code S:Z:C	Ratio	Textural Fields based on Z:C Ratio Unconsolidated	Consolidated Equivalent
Mud	M	Z	Z:C > 2:1	Silt	Siltstone
		M	2:1 > Z:C > 1:2	Mud	Mudstone
		C	Z:C < 1:2	Clay	Claystone
Sandy Mud	sM	sZ	Z:C > 2:1	Sandy silt	Sandy siltstone
		sM	2:1 > Z:C > 1:2	Sandy mud	Sandy mudstone
		sC	Z:C < 1:2	Sandy clay	Sandy claystone
Muddy Sand	mS	zS	Z:C > 2:1	Silty sand	Silty sandstone
		mS	2:1 > Z:C > 1:2	Muddy sand	Muddy sandstone
		cS	Z:C < 1:2	Clayey sand	Clayey sandstone
Sand	S	S		Sand	Sandstone

Donde Z limo, C arcilla, M fango y s arena. En minúscula adjetivan como arcillosa, fangosa, etc

STANDARDIZING TEXTURE AND FACIES CODES FOR A PROCESS-BASED CLASSIFICATION OF CLASTIC SEDIMENT AND ROCK



Modificación propuesta al esquema de Folk (1980) para las mezclas GMS

Complete Array of Textural Classes for Clastic Sediment

	Code	Unconsolidated	Consolidated Equivalent
Gravel	G	Gravel	Conglomerate
	(s)G	Slightly sandy gravel	Slightly sandy conglomerate
	(m)G	Slightly muddy gravel	Slightly muddy conglomerate
	sG	Sandy gravel	Sandy conglomerate
	mG	Muddy gravel	Muddy conglomerate
	(sm)G	Slightly sandy and muddy gravel	Slightly sandy and muddy conglomerate
	(ms)G	Slightly muddy and sandy gravel	Slightly muddy and sandy conglomerate
	(s)mG	Slightly sandy muddy gravel	Slightly sandy muddy conglomerate
	(m)sG	Slightly muddy sandy gravel	Slightly muddy sandy conglomerate
	smG	Sandy muddy gravel	Sandy muddy conglomerate
	msG	Muddy sandy gravel	Muddy sandy conglomerate
Sand	S	Sand	Sandstone
	(g)S	Slightly gravelly sand	Slightly gravelly sandstone
	(m)S	Slightly muddy sand	Slightly muddy sandstone
	mS	Muddy sand	Muddy sandstone
	gS	Gravelly sand	Gravelly sandstone
	(gm)S	Slightly gravelly and muddy sand	Slightly gravelly and muddy sandstone
	(mg)S	Slightly muddy and gravelly sand	Slightly muddy and gravelly sandstone
	(g)mS	Slightly gravelly muddy sand	Slightly gravelly muddy sandstone
	(m)gS	Slightly muddy gravelly sand	Slightly muddy gravelly sandstone
	gmS	Gravelly muddy sand	Gravelly muddy sandstone
	mgS	Muddy gravelly sand	Muddy gravelly sandstone
Mud	M	Mud	Mudstone
	(s)M	Slightly sandy mud	Slightly sandy mudstone
	(g)M	Slightly gravelly mud	Slightly gravelly mudstone
	sM	Sandy mud	Sandy mudstone
	gM	Gravelly mud	Gravelly mudstone
	(sg)M	Slightly sandy and gravelly mud	Slightly sandy and gravelly mudstone
	(gs)M	Slightly gravelly and sandy mud	Slightly gravelly and sandy mudstone
	(s)gM	Slightly sandy gravelly mud	Slightly sandy gravelly mudstone
	(g)sM	Slightly gravelly sandy mud	Slightly gravelly sandy mudstone
	sgM	Sandy gravelly mud	Sandy gravelly mudstone
	gsM	Gravelly sandy mud	Gravelly sandy mudstone

STANDARDIZING TEXTURE AND FACIES CODES INTRODUCIENDO LITOFACIES

Texture		Attribute		Lithofacies Codes - Examples	
Code	Description	Code	Description	Code	Description
G	gravel	m	massive	xG gr	Graded sandy gravel
sG	sandy gravel	biot	bioturbated	smG df	Sandy muddy gravel with dissolution fabric
mG	muddy gravel	b	burrowed	msG ch	Chaotically bedded, muddy, sandy gravel
smG	sandy, muddy gravel	lam	laminated	(x)G mot	Mottled, slightly sandy gravel
msG	muddy, sandy gravel	b-lam	burrow-laminated		
		l	lenticular bedding	S m	Massive sand
S	sand	w	wavy bedding	S biot	Bioturbated sand
mS	muddy sand	f	flaser bedding	S b	Burrowed sand
gS	gravelly sand	gr	graded	S x	Crossbedded sand
gmS	gravelly muddy sand	gr-lam	graded laminates	S r-lam	Ripple-laminated sand
mgS	muddy gravelly sand	x	cross-bedded		
		ch	chaotic bedding	(m)S f	Flaser-bedded slightly muddy sand
M	mud	con	convoluted	mS b	Burrowed muddy sand
sM	sandy mud	s	swirling	gmS b-gr	Burrowed to graded gravelly, muddy sand
gM	gravelly mud	r	rippled		
gsM	gravelly mud	r-lam	ripple-laminated	M mp	Micropelletal mud
sgM	sandy gravelly mud	s-lam	swirling laminated	M lam	Laminated mud
		mld	moldic	(x)M l	Lenticularly bedded, slightly sandy mud
(g)	slightly gravelly	intr	intraclastic	sM b	Burrowed sandy mud
(x)	slightly sandy	df	dissolution fabric	(g)sM r	Rooted, slightly gravelly sandy mud
(m)	slightly muddy	rt	root traces	sP b	Burrowed sandy peat
(c)	slightly clayey	mot	mottled		
(x)	slightly silty	org	plant debris		
	Other	dis	disturbed		Heterolithic Strata
		rt-mot	root-mottled	G/S	Interbedded gravel and sand, gravel dominant
C	clay	rh	rhythmically layered	S/G	Interbedded sand and gravel, sand dominant
Z	silt	bnd	banded	S/M w	Wavy bedded sand and mud (interbedded)
c	clayey	cem	cemented	M/S l	Lenticularly bedded mud with subordinate sand
z	silty	p	pelletal	M/G	Interbedded mud and gravel, mud dominant
i	interlayered	mp	micropelletal	mSs/M l	Rhythmic interbeds of burrowed muddy sand and lenticularly bedded sandy mud.
P	peat	lig	lignitic		

STANDARDIZING TEXTURE AND FACIES CODES INTRODUCIENDO COMPOSICIÓN, CEMENTACIÓN Y FÁBRICA

A	**Composition Codes**		
	% Bioclasts	**Prefix**	**S/B ratio**
Siliciclastic	< 30%	none	S
Mixed	30 - 70%	mxd	
Bioclastic	> 70%	bio	B
B	**Cementation Code**	**Prefix**	
	cemented	cem	
	uncemented	none	
C	**Fabric Codes**	**Suffix**	
	clast - supported	- c	
	matrix - supported	- m	
	clast/matrix - supported	- c/m	
	not applicable (N/A)	none	

Sólo para sedimentos no diagenizados

Una transición entre clasto y matriz soportada muchas veces derivada de bioturbación

"STANDARDIZING TEXTURE AND FACIES CODES" INTRODUCIENDO COMPOSICIÓN, CEMENTACIÓN Y FÁBRICA

mxd gmS b –cem m

Arena (*cem indica no arenisca*) gravillosa fangosa, matriz soportada, bioturbada, composicionalmente mezcla de material siliciclástico y bioclástico, parcialmente cementada

sG x –c

Grava (o conglomerado) arenoso, clasto-soportado con estratificación entrecruzada.

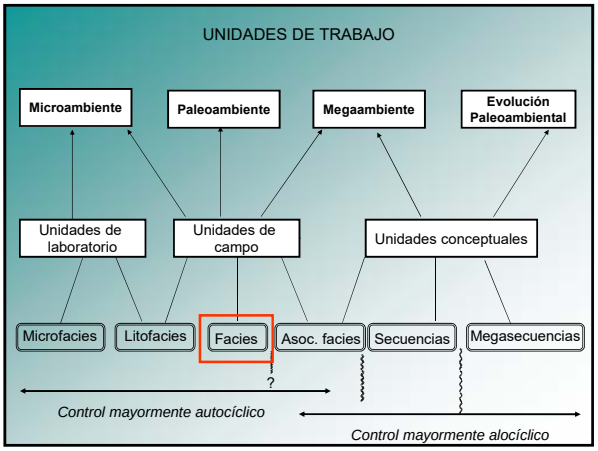
LOS CÓDIGOS DE LITOFACIES: CONCLUSIONES

Principles of Paleocurrent Analysis 79

Table 4.1. Facies classification. (Modified from Miall 1978c)

Facies code	Facies	Sedimentary structures	Interpretation
Gmm	Matrix-supported, massive gravel	Weak grading	Plastic debris flow (high-strength, viscous)
Gmg	Matrix-supported gravel	Inverse to normal grading	Pseudoplastic debris flow (low strength, viscous)
Gci	Clast-supported gravel	Inverse grading	Clast-rich debris flow (high strength), or pseudoplastic debris flow (low strength)
Gcm	Clast-supported massive gravel	–	Pseudoplastic debris flow (inertial bedload, turbulent flow)
Gh	Clast-supported, crudely bedded gravel	Horizontal bedding, imbrication	Longitudinal bedforms, lag deposits, sieve deposits
Gt	Gravel, stratified	Trough cross-beds	Minor channel fills
Gp	Gravel, stratified	Planar cross-beds	Transverse bedforms, deltaic growths from older bar remnants
St	Sand, fine to very coarse,	Solitary or grouped trough cross-beds	Sinuous-crested and linguoid (3-D) dunes

Los códigos son simples **herramientas de trabajo** que deben ser **modificadas según las necesidades** y no implican una **interpretación predeterminada.** En un futuro cercano su empleo será necesario para la **construcción de modelos matemáticos**



Unidades de trabajo: FACIES

- **FACIES " Un intervalo estratigráfico caracterizado por su litología, estructuras sedimentarias, forma de bancos ciclicidad u otros rasgos que permitan su caracterización en el registro geológico "**
- **Es una unidad de trabajo orientada a la caracterización paleoambiental por lo tanto no incluir en una misma facies depósitos de diferentes ambientes**

NOMENCLATURA DE LAS FACIES

Debe ser siempre objetiva y no interpretativa, preferentemente descriptiva

Facies = Asociaciones de facies

Gressly (1838)
Todas las características físico, químicas y biológicas de una roca sedimentaria que reflejan su ambiente depositacional

Selley (1970)
A sedimentary facies is a mass of rock which can be defined and distinguished from others by its geometry, lithologhy, sedimentary structures, paleocurrent pattern and fossils

AGI (1984) Definition (American Geologic Institute):
The aspect, appearance, and characteristics of a rock unit, usually reflecting the conditions of its origin; especially as differentiating it from adjacent or associated units

Oxford University
A group of sedimentary facies used to define a particular sedimentary environment. For example, all the facies found in a fluviatile environment may be grouped together to define a fluvial facies association.

PROBLEMAS: 1. Facies, Litofacies y Asociaciones de facies tienen diferente significado según el trabajo !!! 2. La simplicidad !!!

FACIES SEDIMENTARIAS

Aspectos generales

1. SON UN AGRUPAMIENTO DE LITOFACIES
2. RESULTAN "UNIDADES ROCA" DEFINIDAS BÁSICAMENTE PARA SEPARAR ROCAS SEDIMENTADAS EN DIFERENTES AMBIENTES DEPOSITACIONALES

Preguntas

- QUÉ REALMENTE REPRESENTA UNA FACIES SEDIMENTARIAS ?
- EN QUE MEDIDA EL ESPACIO DE ACOMODACIÓN SEDIMENTARIO ESTÁ REPRESENTADO EN UNA FACIES ?
- DIFERENCIAS ENTRE FACIES SEDIMENTARIA Y UNIDAD PALEOGEOMORFOLÓGICA
- ES CONVENIENTE USAR EL TÉRMINO FACIES SEDIMENTARIAS EN AMBIENTES ACTUALES ?