

Modelo de Dados INSPIRE da Geologia e sua aplicação à Carta Geológica de Portugal

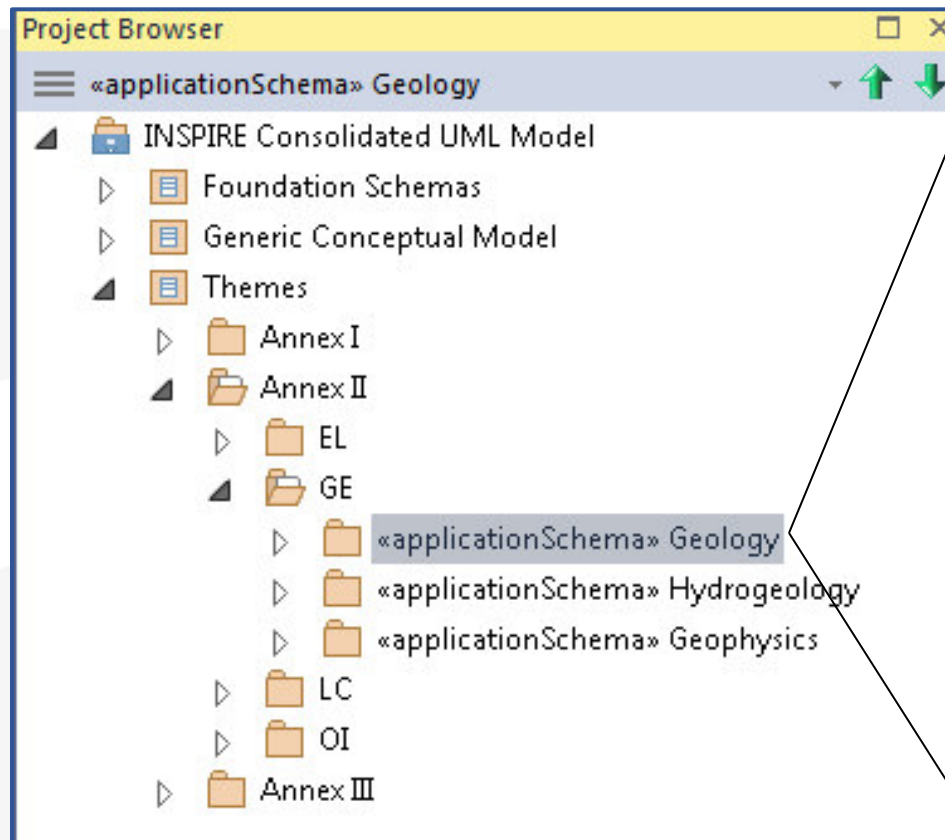
Aurete Pereira

DGT, 21 junho de 2017

Objetivos

- Partilhar conhecimento
- Modelo de dados INSPIRE-GE
- Aplicação à Cartografia Geológica

Modelo INSPIRE UML - Geologia

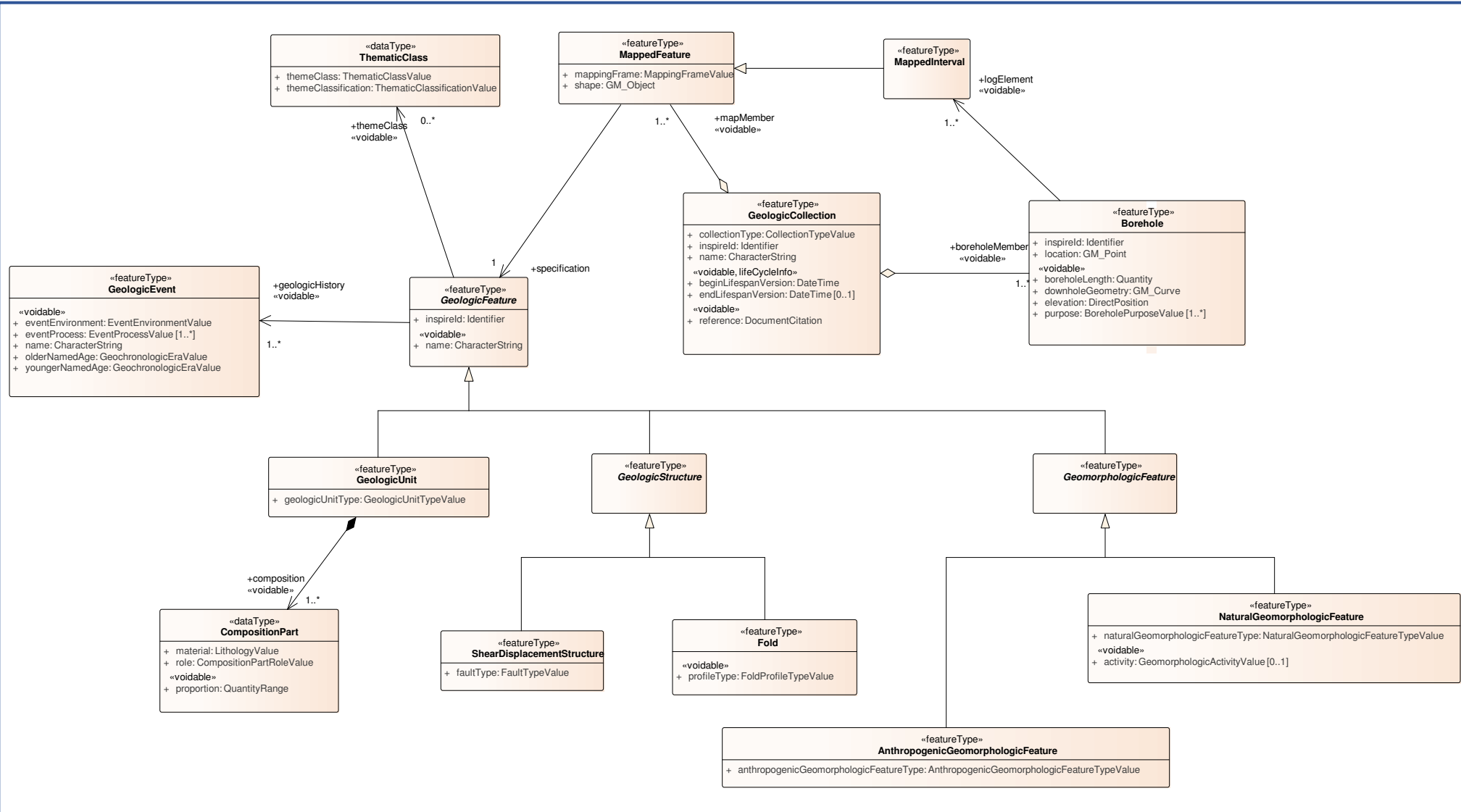


«applicationSchema»

Geology

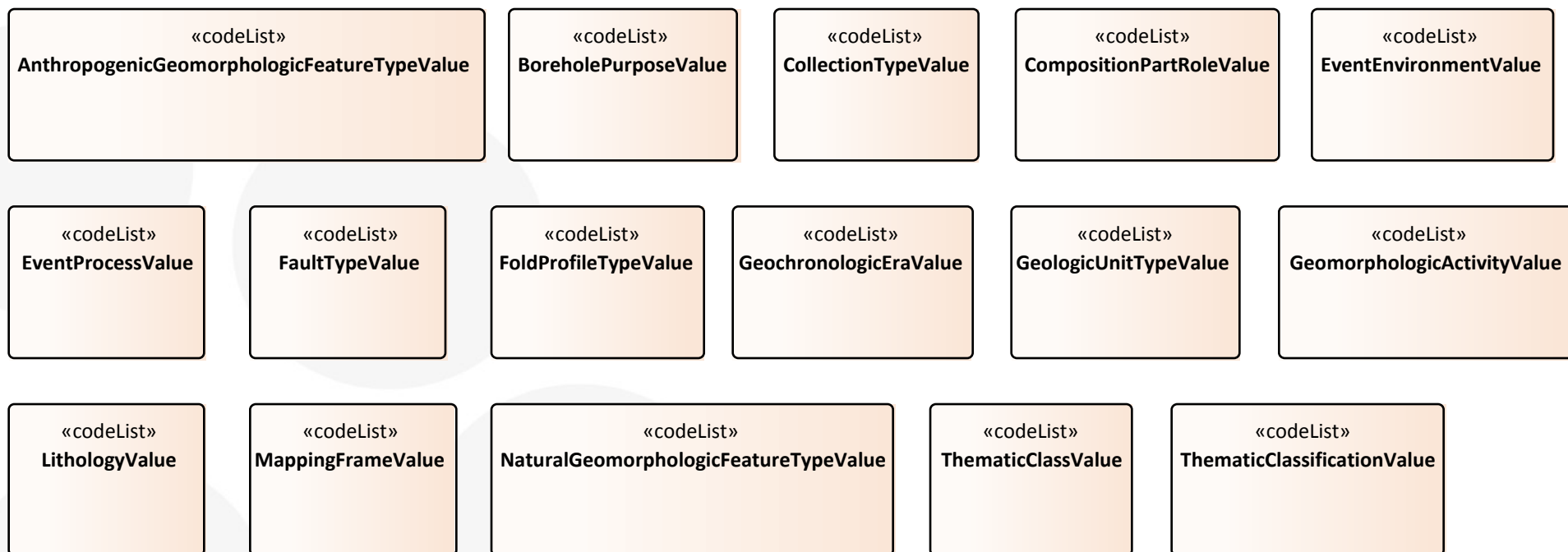
- + AnthropogenicGeomorphologicFeature
- + AnthropogenicGeomorphologicFeatureTypeValue
- + Borehole
- + BoreholePurposeValue
- + CollectionTypeValue
- + CompositionPart
- + CompositionPartRoleValue
- + EventEnvironmentValue
- + EventProcessValue
- + FaultTypeValue
- + Fold
- + FoldProfileTypeValue
- + GeochronologicEraValue
- + GeologicCollection
- + GeologicEvent
- + *GeologicFeature*
- + *GeologicStructure*
- + GeologicUnit
- + GeologicUnitTypeValue
- + GeomorphologicActivityValue
- + *GeomorphologicFeature*
- + LithologyValue
- + MappedFeature
- + MappedInterval
- + MappingFrameValue
- + NaturalGeomorphologicFeature
- + NaturalGeomorphologicFeatureTypeValue
- + ShearDisplacementStructure
- + ThematicClass
- + ThematicClassificationValue
- + ThematicClassValue

Diagrama de classes UML - Geologia



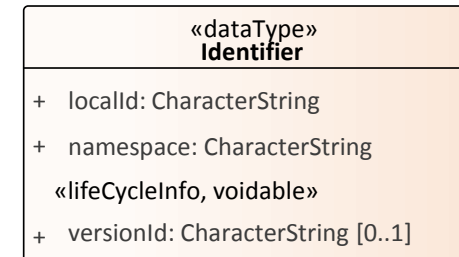
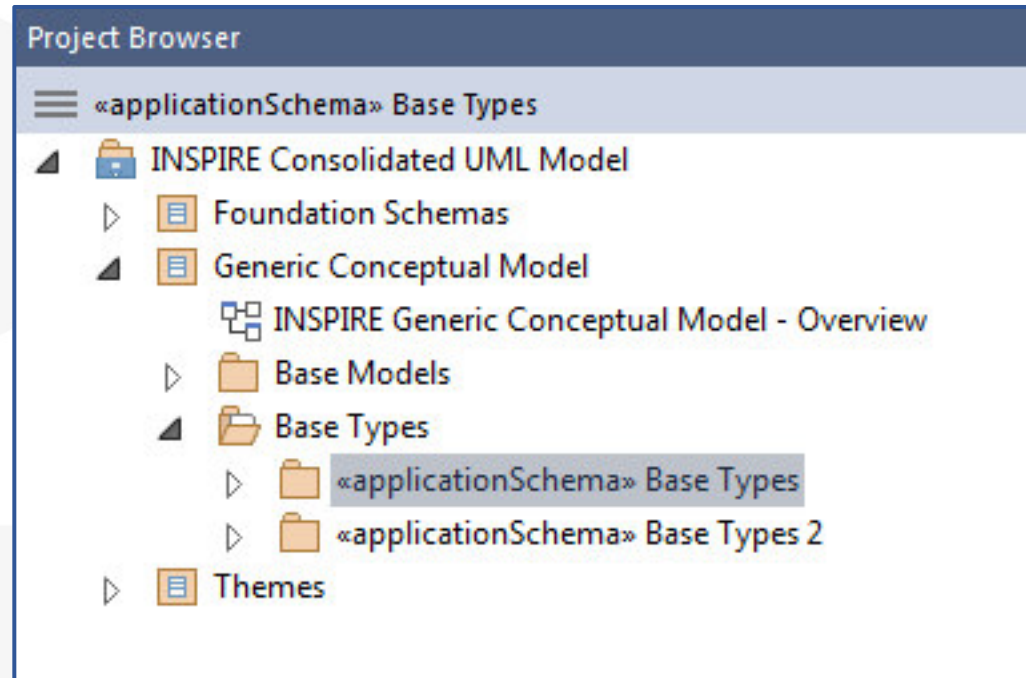
Listas de códigos

Exemplo do URI para o vocabulário das litologias: <http://inspire.ec.europa.eu/codelist/LithologyValue>



«codeList» Base Types:: VoidReasonValue
+ Unknown
+ Unpopulated
+ Withheld

Modelo INSPIRE UML – Base Types



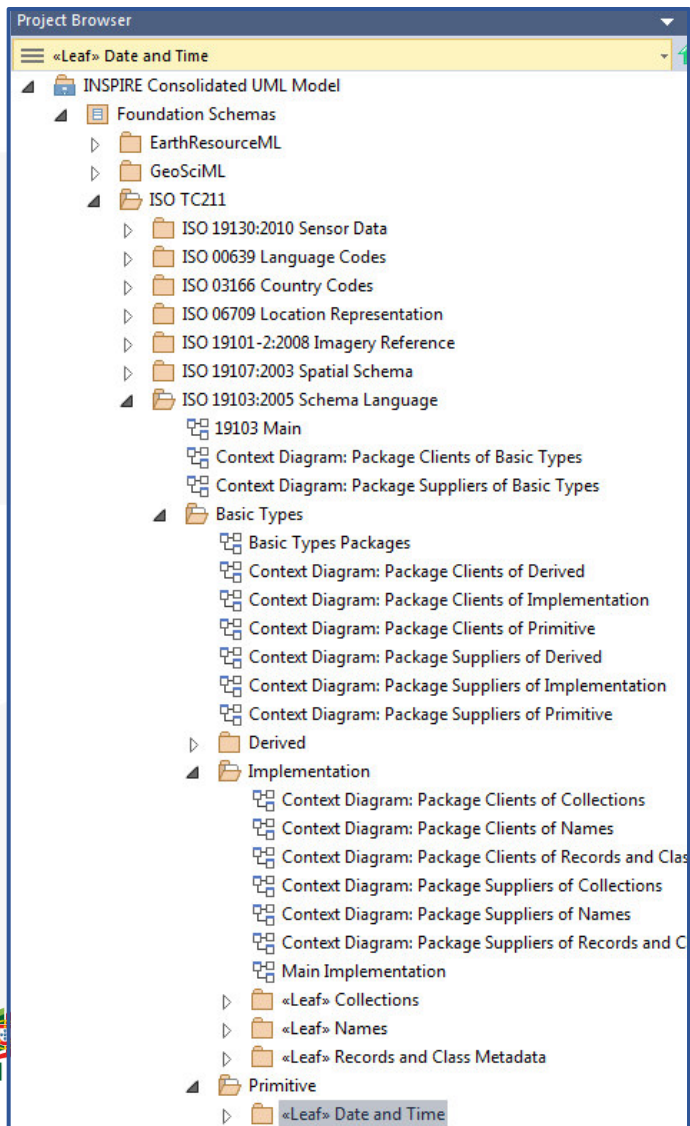
namespace:

<http://id.igeo.pt/so/GE/GeologicUnit>

localId:

CGP1M_54

Modelos UML – ISO/TS 19103:2005



Date – YYYY-MM-DD

DateTime – YYYY-MM-DDThh:mm:ssTZD

Exemplo: 2017-06-21T10:30:55+01:00

the "T" appears literally in the string, to indicate the beginning of the time element

hh = two digits of hour (00 through 23)

mm = two digits of minute (00 through 59)

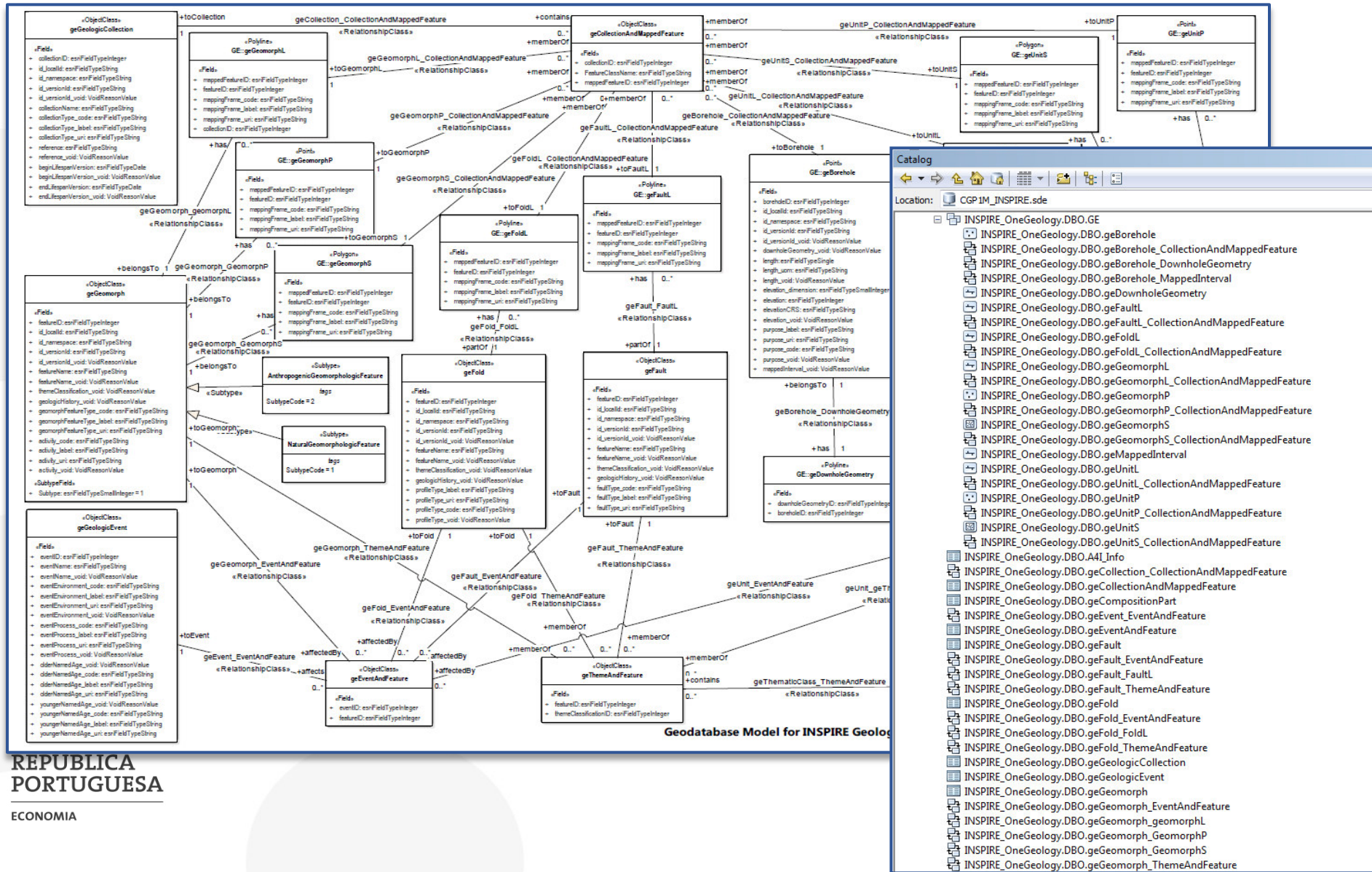
ss = two digits of second (00 through 59)

TZD = time zone designator (Z or +hh:mm or -hh:mm)

Fonte: <https://www.w3.org/TR/NOTE-datetime>

The screenshot displays the ArcGIS Desktop environment with the ArcGIS Diagram: "INSPIRE-GE-GDB-ESRI" open. The interface includes a top menu bar with options like Window, Browser Navigator, Search, Model Views, Element Browser, Resources, Mail, Calendar, My Kanban, My Gantt, My Work Sets, Discussion, Active Diagrams, Active Elements, Active Tasks, Notes, Summary, Document, Relationships, Tagged Values, Manage, Perspectives, Views, Visual Style, Full Screen, Preferences, Help, Home Page, Libraries, Register, and Help. The main workspace shows a complex UML diagram with various classes and relationships. The Project Browser on the left lists the project structure, including the "INSPIRE-GE-GDB-ESRI" workspace and its sub-elements. The Toolbox on the right provides access to various GIS tools and data sources. The status bar at the bottom indicates the diagram was created on 24-09-2015 and modified on 21-09-2016.

Template da Geodatabase para o tema Geologia – ArcGis for INSPIRE



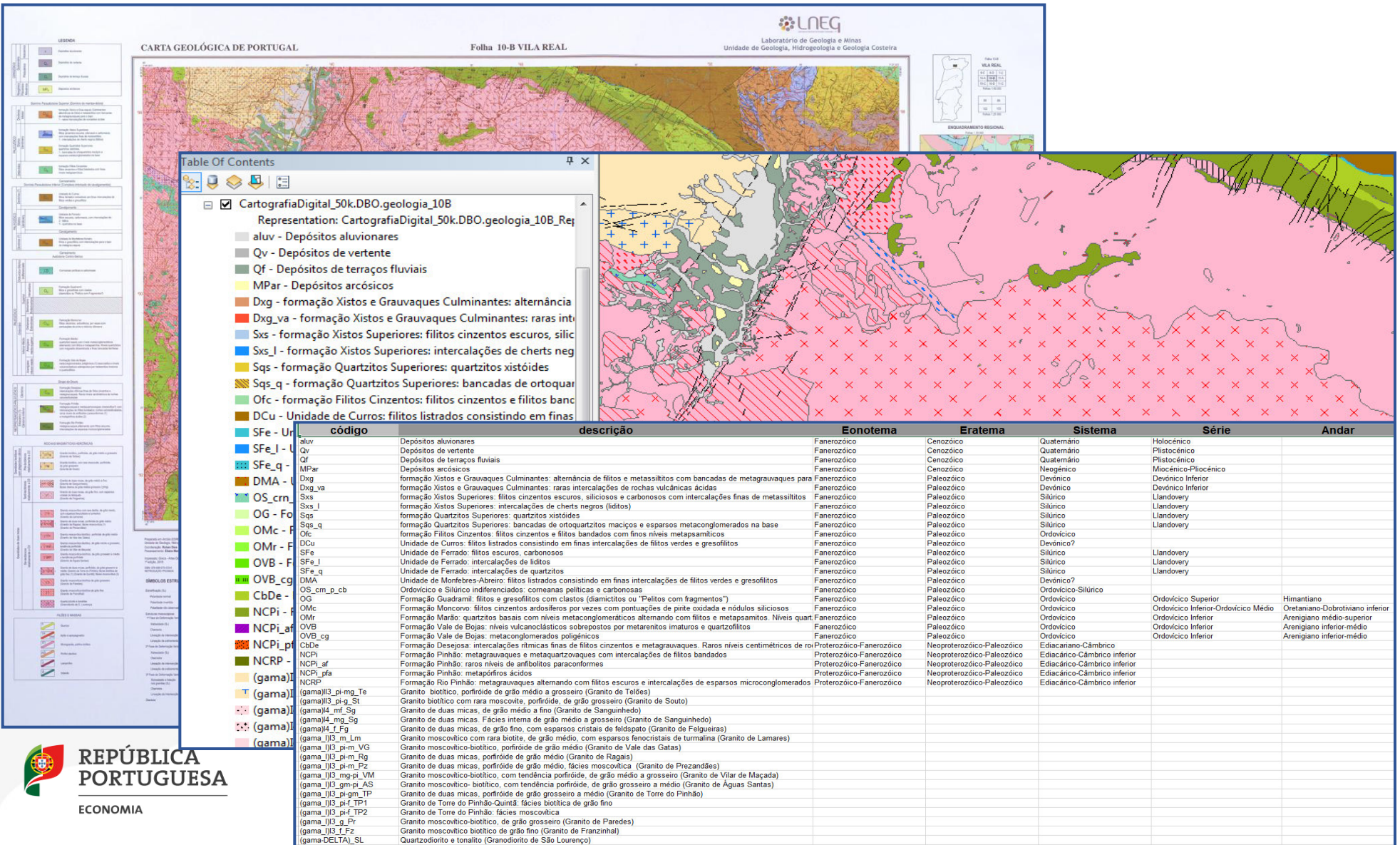


Tabela de mapeamento

Application Schema 'Geology' (version 3.0)							Carta Geológica de Portugal à escala 1:50 000													
Feature Type Description		Feature type Definition					Feature type		Feature Type Description		Feature type Definition				Comments					
This representation allow Geology data being supported by vector geometry		Another representation of Geology dataset					CGP50k		This representation allow Geology data being supported by vector geometry		Another representation of Geology dataset									
Type (Application schema)	Documentation	Attribute Association role Constraint	Attribute Name 2.Level/ Association role/ Constraint	Attribute / Association role / Constraint documentation	Values / Enumerations	Multiplicity	Voidable / Non-Voidable	Type	Documentation	Attribute Association role Constraint	Attribute Name 2.Level/ Association role/	Attribute / Association role / Constraint	Values / Enumerations	Multiplicity	Voidable / Non-Voidable	Status	Remarks	Mapping Explanations		
gmlBase	gmlid	id		The attribute gml:id associates instances of objects for the GML document namespace (GML Object). It can be used also for all GML objects. It is a XML type ID, so its cardinality is by value to the XML document within which instance GML object identifier. This attribute is required for proper validation software.		1		gmlBase		not nullable		XML type ID		1		Req.	Used as function to generate a universal ID. Considered as ID related with hrefs.	Generated upon call ID		
	gmlCodeWithAuthorityType	identifier		When, explicit identifier is assigned to an object by the application authority with the information that it can be referenced to the object. For each name, the address shall be provided. The identifier is usually unique within globally or within an application domain; specific identifier is given.		0..1			not nullable											
	gmlCodeType	name		The address property provides a label for identifier for the object, normally, descriptive name; the object may have several names, typically assigned by different authorities, applications across the qualified type control models. The authority for name is indicated by the value of the top-level address attribute. The name may or may not be unique, as determined by the value of the multiplicity constraint for the name of this property in a particular description of the object. The checkered attribute of the qualified descriptor reference property references the relevant description(s).		0..n			not nullable											
	gmlReferenceType	descriptionReference					0..1			not nullable										
Fold <small>Superclass: GeologicalFeature, superclass: GeologicalFeature</small>	See or more applications for names, features, or items in each body. Fold describes a structure formed by the deformation of a Geological Feature by force a structure that can be describing by the combination of a structural line (the fold axis) and a third, always one occurrence with the fold profile. Folds have a hinge area (area of maximum curvature along the surface) and the limbs (parts of the folded surface on the hinge axis).	inspired		- Base - Inspired External object identifier of the spatial object. IRI of the external object identifier is a unique object identifier published by the responsible body, which may be referred from applications to access the spatial object. The identifier is an identifier of the spatial object, not an identifier of the real-world phenomenon.	Identifier	1		CGP50k		not nullable										
			localId	A local identifier, assigned by the data provider. The local identifier is unique within the same data set. It does not change uniquely identifying the data source of the spatial object.	CharacterString	1			not nullable											
			nameSpaceVersionId	The identifier of the particular version of the spatial object, with extension number 24 characters in the concatenation. The case of the extension feature EXMPLE is: (blank) character null, where 0 occurrence, or single digit. But all Geographic features will have some, for example name 24bits.	CharacterString	0..1	optional		not nullable											
			name			CharacterString	1			not nullable										
		geologicHistory	An association that defines one or more geologic records by a geologic feature to describe their own geologic history.	GeologicEvent	0..*	optional	not nullable													
		themeClass	A thematic classification of the geologic feature. A Geologic class may be classified according to one or more thematic values, for example ground stability or mineral resources potential.	ThematicClass	0..*	optional	not nullable													
		profileType	The type of the fold. Profile can depend according to the nature/nature geometry of the fold relative to the earth surface, and the relationship to spanning direction is folded structural frame. EXMPLE: anticline, syncline, canticline, recumbent etc.	PdIDProfileTypeValue	1	optional	not nullable			Type	CharacterString									
		GeologicEvent	An identifiable event during which one or more geologic processes can be modify geological entities. A GeologicEvent should have a specific geologic age and extension, and a basic geologic environment, for example slightly or a certain spatial point during which tension, deformation, and extension affect the place. A GeologicEvent age can be represented as instant in time or as interval of time.	name	eventEnvironment	The physical setting within which the geologic event takes place. Geologic Environment is needed to include physical settings on the Earth's core can specified by altitude, inclination, photography or geography, and collapse in the Earth's crusty interior specified by pressure, temperature, structural environment, or tectonics.	EventEnvironmentValue		1	optional	CGP50k		not nullable							
eventProcess	The process or processes that occurred during the geologic event. EXMPLE: deposition, relaxation, contraction, swelling.							EventProcessValue				0..*	optional	not nullable						
olderNameAge	Other knowledge of the age of the record. This is expressed using a chronological era defined in accordance of recognized units, such as those of the International Commission on Stratigraphy (ICS) Stratigraphic Chart.							GeologicAgeValue				1	optional	not nullable		Note	CharacterString			

Harmonização de dados

Cartografia digital

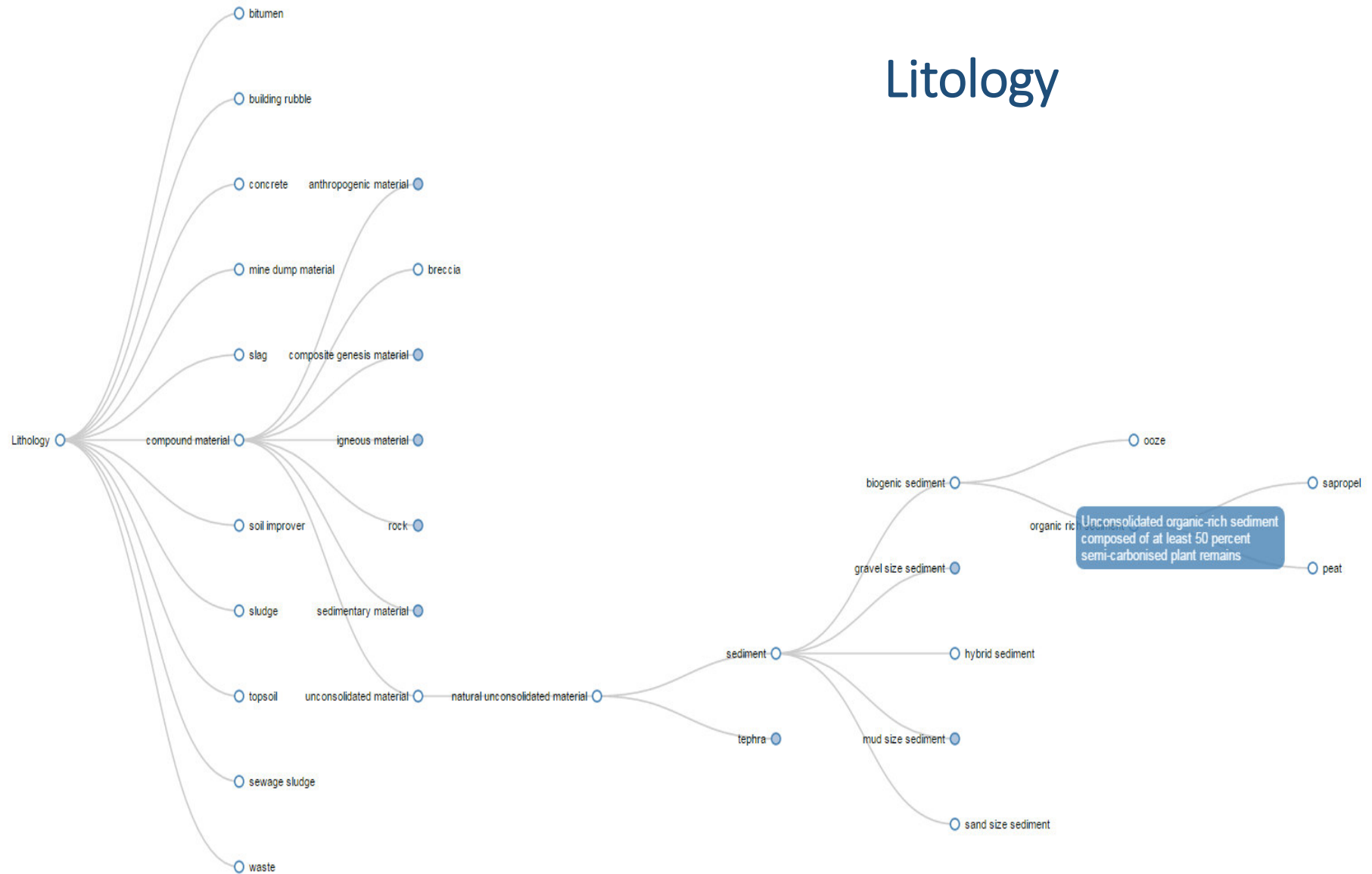
Legenda Única

Atributos INSPIRE

Código	Descrição	Eonotema	Eratema	Sistema	Série	Andar	ID	Descrição	Geologic Unit	Lithology	Role	Proportion	Older Age	Younger Age	Event Name	Event Process	Event Environment
aluv	Depósitos aluvionares	Fanerozóico	Cenozóico	Quaternário	Holocénico		100										
Qv	Depósitos de vertente	Fanerozóico	Cenozóico	Quaternário	Plistocénico		110										
Qf	Depósitos de terraços fluviais	Fanerozóico	Cenozóico	Quaternário	Plistocénico		120										
MPar	Depósitos arcóscios	Fanerozóico	Cenozóico	Neogénico	Miocénico-Pliocénico		130										
	formação Xistos e Grauwagues Culminantes: alternâncias de filitos e metassiltitos com bancadas de metagrauwagues para o topo							Formação dos Xistos e Grauwagues Culminantes: alternância de filitos e metassiltitos com bancadas de metagrauwagues para o topo									
Dsg	formação Xistos e Grauwagues Culminantes: raras intercalações de rochas vulcânicas ácidas	Fanerozóico	Paleozóico	Devónico	Devónico Inferior		1605										
Dsg_va	formação Xistos Superiores: filitos cinzentos escuros, siliciosos e carbonosos com intercalações finas de formação Xistos Superiores: intercalações de cherts negros (líditos)	Fanerozóico	Paleozóico	Devónico	Devónico Inferior		1606										
Ses	formação Xistos Superiores: filitos cinzentos escuros, siliciosos e carbonosos com intercalações finas de formação Xistos Superiores: intercalações de cherts negros (líditos)	Fanerozóico	Paleozóico	Silúrico	Llandovery		1655										
Ses_l	formação Xistos Superiores: intercalações de cherts negros (líditos)	Fanerozóico	Paleozóico	Silúrico	Llandovery		1656										
Sqs	formação Quartzitos Superiores: quartzitos sistóides	Fanerozóico	Paleozóico	Silúrico	Llandovery		1705										
Sqs_q	formação Quartzitos Superiores: bancadas de ortoquartzitos maciços e esparsos metaconglomerados na base	Fanerozóico	Paleozóico	Silúrico	Llandovery		1706										
Ofo	formação Filitos Cinzentos: filitos cinzentos e filitos bandados com finos níveis metapsamíticos	Fanerozóico	Paleozóico	Ordovício			1175										
DCu	Unidade de Curois: filitos listrados consistindo em finas intercalações de filitos verdes e gresofilitos	Fanerozóico	Paleozóico	Devónico?			1185										
SFe	Unidade de Ferrado: filitos escuros, carbonosos	Fanerozóico	Paleozóico	Silúrico	Llandovery		1195										
SFe_l	Unidade de Ferrado: intercalações de líditos	Fanerozóico	Paleozóico	Silúrico	Llandovery		1196										
SFe_q	Unidade de Ferrado: intercalações de quartzitos	Fanerozóico	Paleozóico	Silúrico	Llandovery		1197										
DMA	Unidade de Monfres: Abreio: filitos listrados consistindo em finas intercalações de filitos verdes e gresofilitos	Fanerozóico	Paleozóico	Devónico?			1195										
OS_cm_p_cb	Ordovício e Silúrio indiferenciados: corneanas pelíticas e carbonosas	Fanerozóico	Paleozóico	Ordovício Silúrico													
OG	Formação Guadramil: filitos e gresofilitos com clastos (diamictitos ou "Pelitos com fragmentos")	Fanerozóico	Paleozóico	Ordovício	Superior	Himantian o	22250										
OMe	Formação Moncorvo: filitos cinzentos andosíferos por vezes com pontuações de pirite oxidada e nódulos siliciosos	Fanerozóico	Paleozóico	Ordovício	Ordovício Inferior- Dobroia no Inferior	Arenigiano superior?;	22400										
OMr	Formação Marão: quartzitos basais com níveis metaconglomeráticos alternando com filitos e metapsamitos. Níveis quartzíticos com magnetite disseminada e finas bancadas ferríferas	Fanerozóico	Paleozóico	Ordovício	Ordovício Inferior	Arenigiano médio- superior	22550										
OVB	Formação Vale de Bojas: níveis vulcanoclásticos sobrepostos por metarenitos imaturos e quartzofilitos	Fanerozóico	Paleozóico	Ordovício	Ordovício Inferior	Arenigiano inferior- médio	22706										
OVB_cg	Formação Vale de Bojas: metaconglomerados poligénicos	Fanerozóico	Paleozóico	Ordovício	Ordovício Inferior	Arenigiano inferior- médio	22705										
CbDe	Formação Desejo: intercalações rítmicas finas de filitos cinzentos e metagrauwagues. Raras níveis centimétricos de rochas calcossilicatadas	Proterozóico- Fanerozóico	Neoproterozóico- Paleozóico	Ediário- Cambrio			23100										
NCPI	Formação Pinhão: metagrauwagues e metaquartzovagues com intercalações de filitos bandados	Proterozóico- Fanerozóico	Neoproterozóico- Paleozóico	Ediário- Cambrio Inferior			23155										
NCPI_af	Formação Pinhão: raros níveis de anfibolitos paraconformes	Proterozóico- Fanerozóico	Neoproterozóico- Paleozóico	Ediário- Cambrio Inferior			23156										

Descriptions:

Hide



Lithology

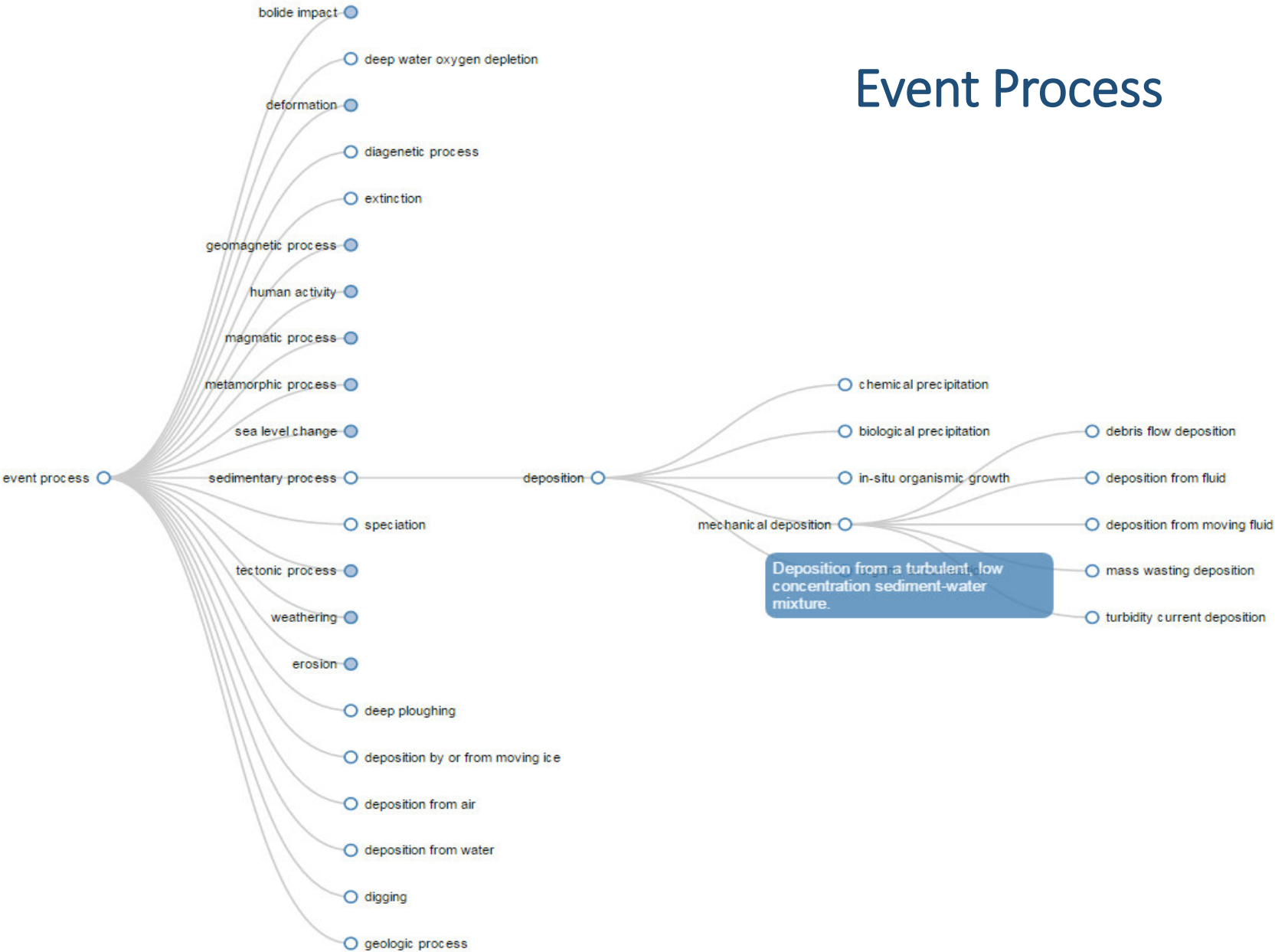
Composition Part Role *versus* Proportion

Lithology	Role	Proportion
sand size sediment	part of	predominant
boulder gravel size sediment	part of	predominant
silt	part of	predominant
slate	part of	predominant
wacke	only part	
conglomerate	part of	
slate	facies	
wacke	inclusion	predominant
conglomerate	lithosome	
	stratigraphic part	
	unspecified part role	
slate	only part	all
slate	part of	predominant
wacke	only part	major
slate	only part	minor
slate	part of	predominant
wacke	only part	present
conglomerate	only part	rare
		subordinate
		trace
		variable

Descriptions:

Hide

Event Process



Descriptions:

Hide ☐



GeochronologicEraValue – Lista de códigos das idades

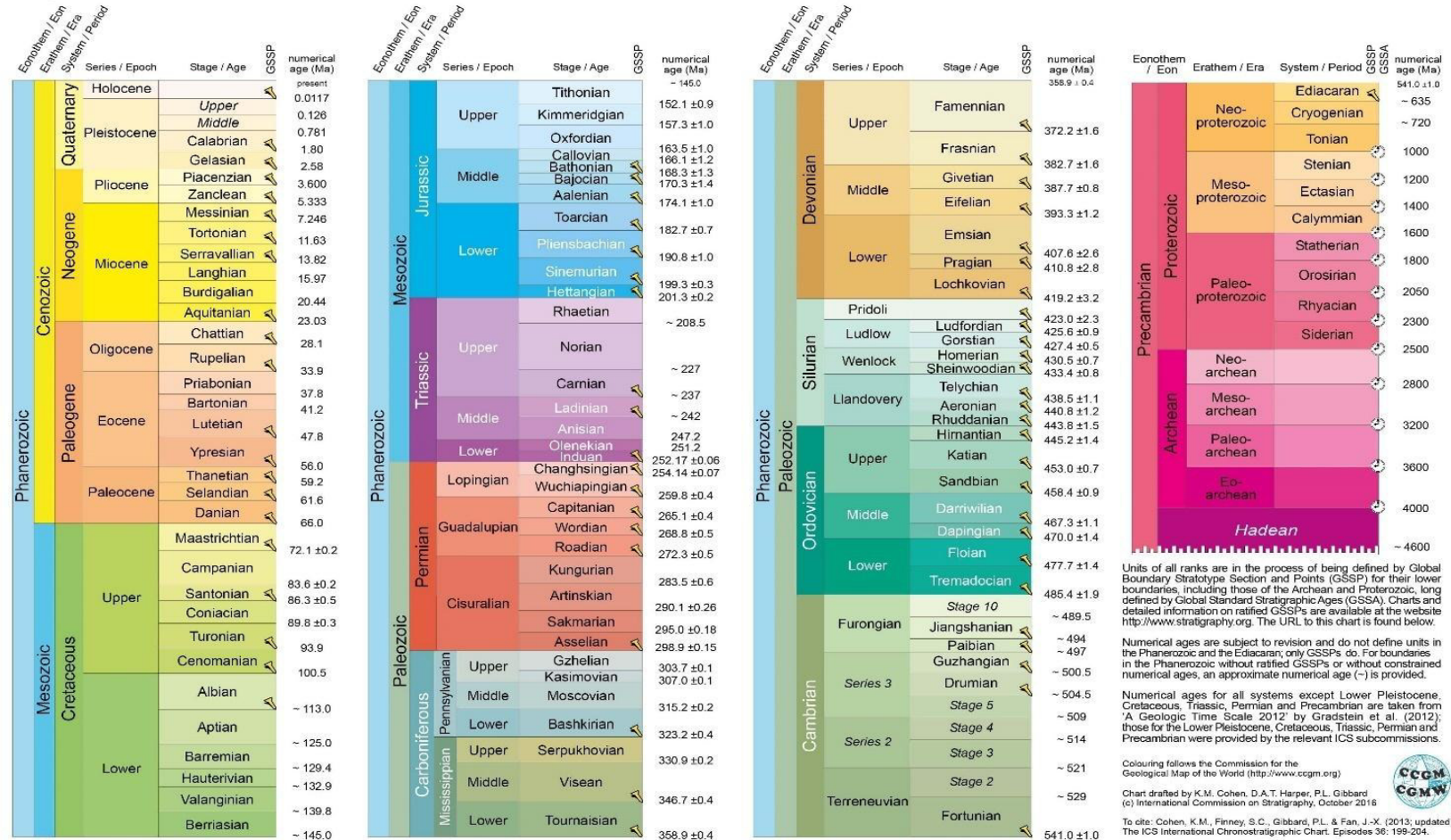


INTERNATIONAL CHRONOSTRATIGRAPHIC CHART

www.stratigraphy.org

International Commission on Stratigraphy

v 2016/10



Units of all ranks are in the process of being defined by Global Boundary Stratotype Section and Points (GSSP) for their lower boundaries, including those of the Archean and Proterozoic, long defined by Global Standard Stratigraphic Ages (GSSA). Charts and detailed information on ratified GSSPs or without constrained numerical ages, an approximate numerical age (–) is provided.

Numerical ages for all systems except Lower Pleistocene, Cretaceous, Triassic, Permian and Precambrian are taken from 'A Geologic Time Scale 2012' by Gradstein et al. (2012); those for the Lower Pleistocene, Cretaceous, Triassic, Permian and Precambrian were provided by the relevant ICS subcommissions.

Colouring follows the Commission for the Geological Map of the World (http://www.cgmw.org)

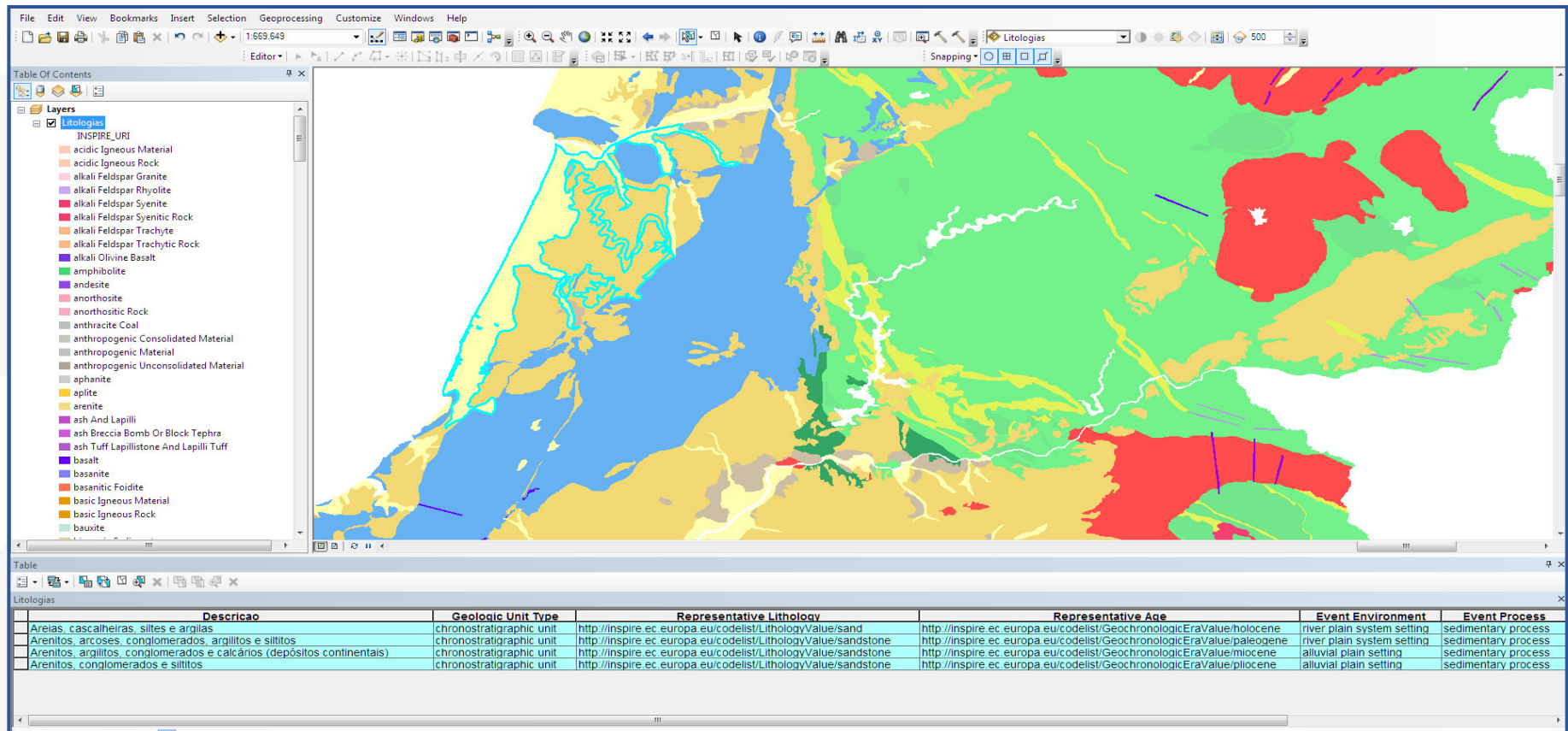
Chart drafted by K.M. Cohen, D.A.T. Harper, P.L. Gibbard (c) International Commission on Stratigraphy, October 2016

To cite: Cohen, K.M., Finney, S.C., Gibbard, P.L. & Fan, J.-X. (2013; updated) The ICS International Chronostratigraphic Chart. Episodes 36: 199-204.

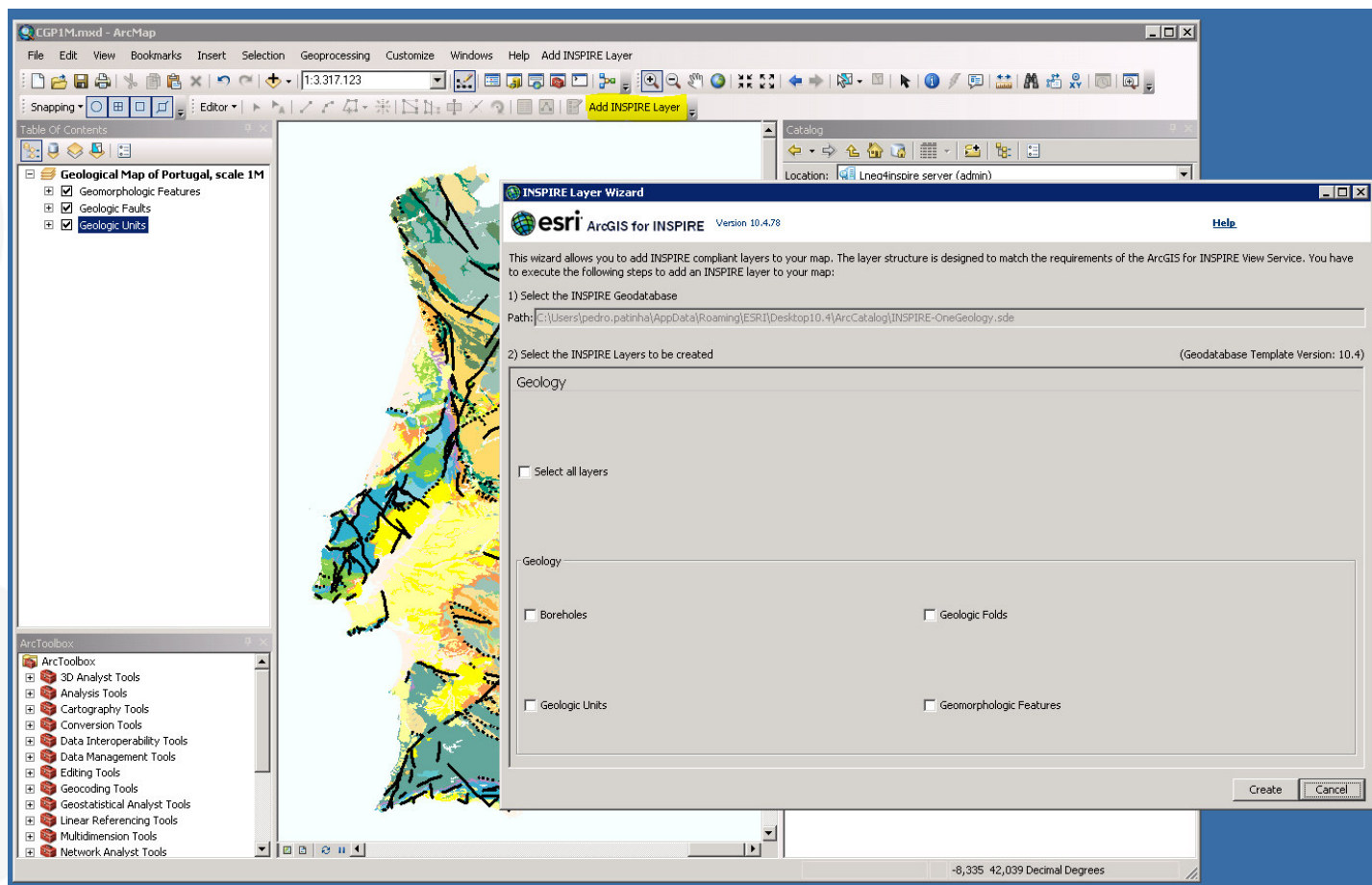
URL: http://www.stratigraphy.org/ICSChart/ChronostratChart2016-10.pdf



Mapa harmonizado – representação das Litologias representativas

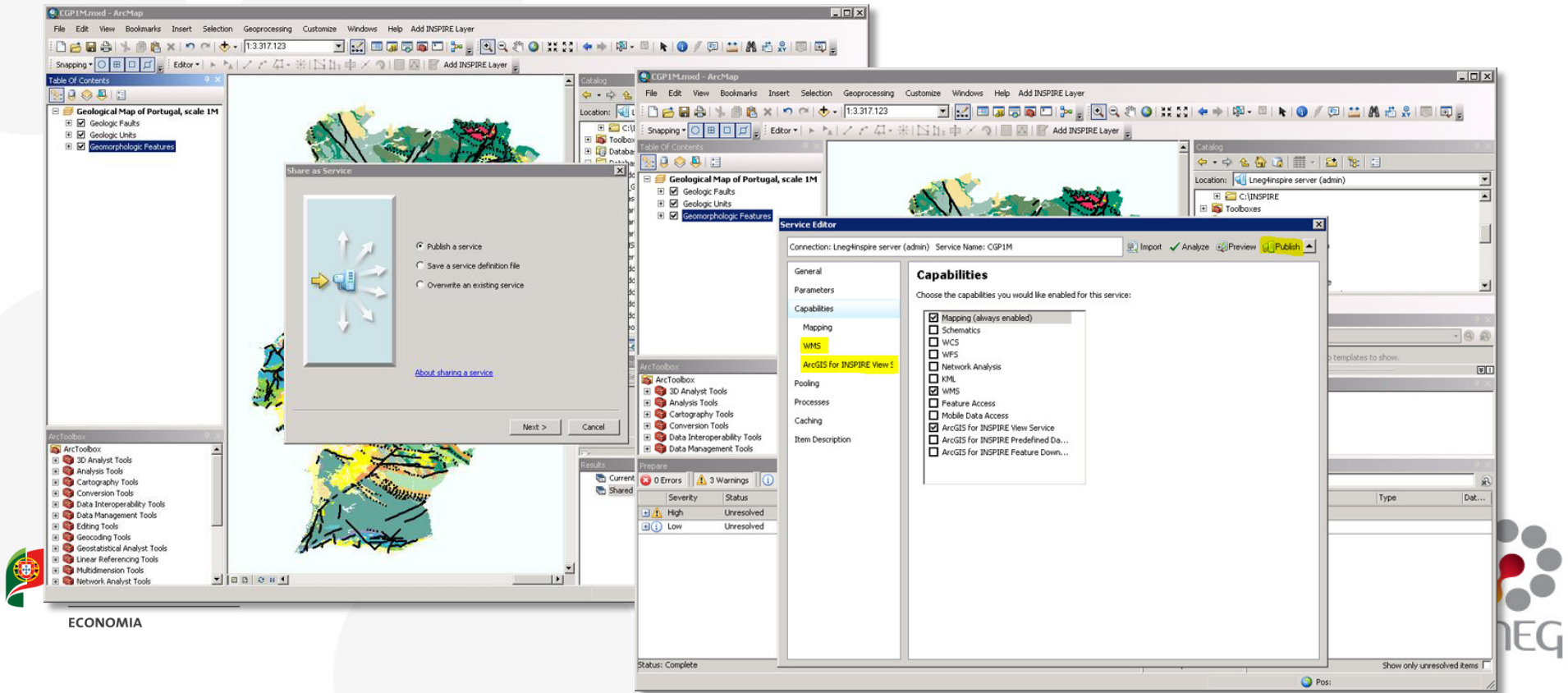


Criação do template INSPIRE *compliant* – ArcGis for INSPIRE Desktop



Criação e publicação dos serviços – ArcGis for INSPIRE Server

- ✓ WMS
- ✓ WFS
- ✓ INSPIRE View Service
- ✓ INSPIRE Feature Download



Metadados dos serviços INSPIRE – ArcGis for INSPIRE Server

Editing the InspireView properties

Select one of the following options for defining INSPIRE View service metadata

☐ Enter a url referencing the INSPIRE metadata record describing this INSPIRE View service

☒ Enter all INSPIRE metadata element values, these will be exposed directly in the service capabilities document

Properties of the service

Required fields are marked yellow.

Properties	English	Portuguese
Title	Geological Map of Portugal, scale 1M	Carta Geológica de Portugal, escala 1:1000000
Abstract	OGC Web Map Service (WMS) displaying the Geology of Portugal at a scale of 1:1M cre...	Serviço WMS da Carta Geológica de Portugal, escala 1:1000000
Common keywords	WMS,INSPIRE,ViewService,infoMapAccessService,Geology,Lithology,Age,Geologic Unit...	WMS,INSPIRE,ViewService,infoMapAccessService,Geologia,Litologia,Idades,Unidade ...
Access constraints	None	None
Fees	no conditions apply	no conditions apply
Online resource	http://lNEG4inspire:6080/arcgis/rest/services/CartografiaGeologica/CGP1M/MapServer/exprs/InspireView/service	
External GetFeatureInfo URL		
Authority Name		
Authority URL		
Metadata URL		
Metadata published at (YYYY-MM-DD)	2016-10-24	
Metadata contact organisation	LNEG	
Metadata contact mail	aurete.pereira@lNEG.pt	
Service created at (YYYY-MM-DD)		
Service last revised at (YYYY-MM-DD)		
Service published at (YYYY-MM-DD)	2016-10-24	
Individual temporal extent value covered by the service (YYYY-MM-DD)		
Begin of temporal extent covered by the service (YYYY-MM-DD)		
End of temporal extent covered by the service (YYYY-MM-DD)		
Degree of conformity	Conform	

GEMET keywords

Supported GEMET themes **Geology**

Contact metadata of the service

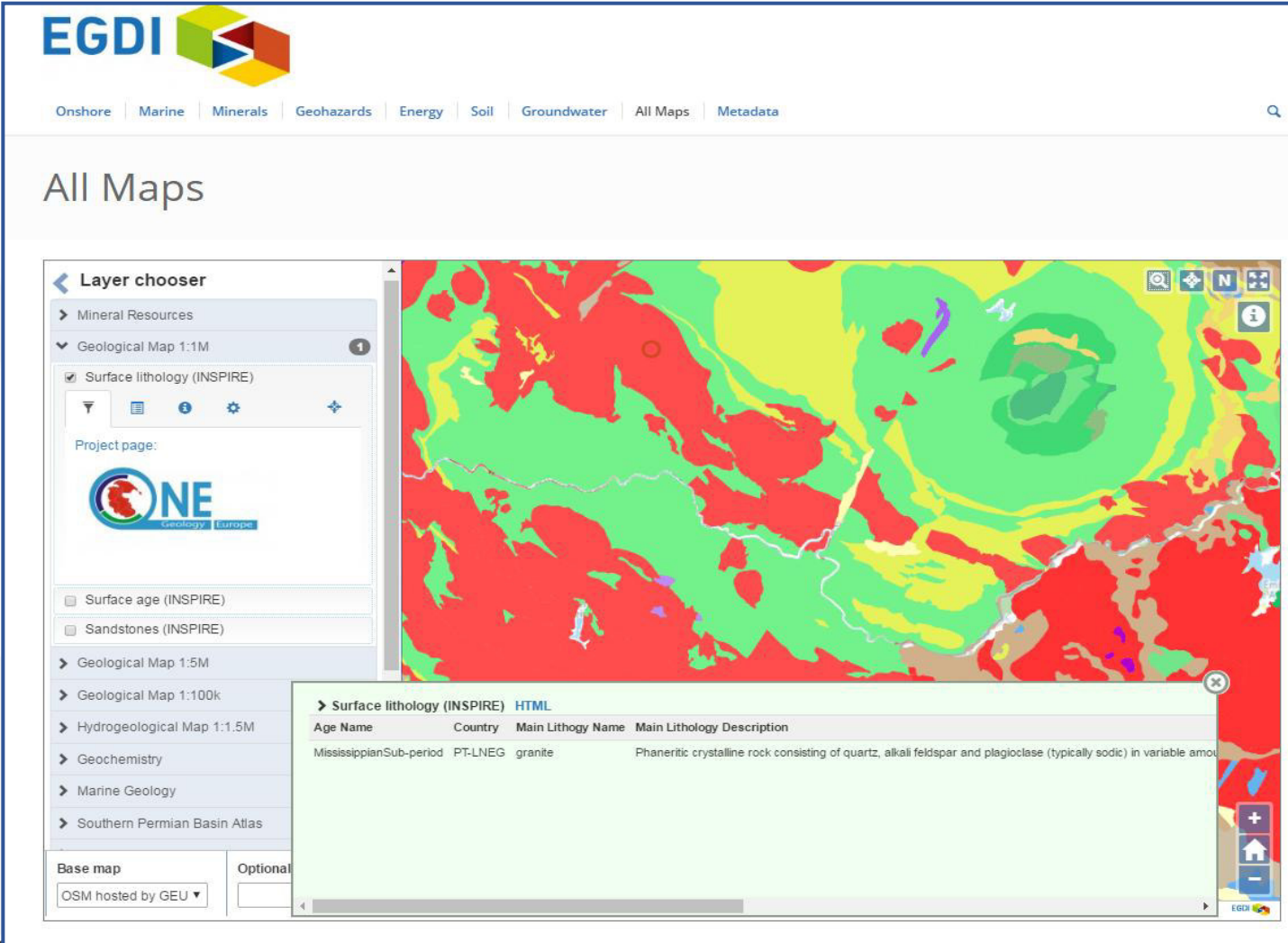
Properties	English	Portuguese
Name	Pedro Patinha	Pedro Patinha
Organization	LNEG	LNEG
Address type	postal	postal
Street	Estrada da Portela, Bairro do Zambujal	Estrada da Portela, Bairro do Zambujal
City	Amadora	Amadora
State or province	Lisboa	Lisboa
Zip code	2610-999 Amadora	2610-999 Amadora
Country	Portugal	Portugal
Telephone	351 210 924 600	351 210 924 600
Fax	your fax number	your fax number
Mail	pedro.patinha@lNEG.pt	pedro.patinha@lNEG.pt

Position **Publisher**

In order to have custom designed legend graphics for each layer, language and style, you have to save it to C:\arcgisserver\directories\arcgisforinspire\CartografiaGeologica_CGP1M_MapServer with naming schema <layer>_<language>_<style>.png . E.g. for layer 'ge.geomorphologicfeature' with style 'inspire_common_default' and language 'eng' the file would be named ge.geomorphologicfeature_eng_inspire_common_default.png


Close Cancel

European Geological Data Infrastructure Portal



The screenshot displays the EGDI portal interface. At the top, the EGDI logo is followed by navigation links: Onshore, Marine, Minerals, Geohazards, Energy, Soil, Groundwater, All Maps, and Metadata. A search icon is located on the right. Below the navigation bar, the heading "All Maps" is visible. The main content area features a "Layer chooser" panel on the left and a geological map on the right. The "Layer chooser" panel includes a tree view with categories like "Mineral Resources" and "Geological Map 1:1M". Under "Geological Map 1:1M", the "Surface lithology (INSPIRE)" layer is selected. Below this, there is a "Project page" section with the "ONE Geology Europe" logo. Other layers listed include "Surface age (INSPIRE)", "Sandstones (INSPIRE)", "Geological Map 1:5M", "Geological Map 1:100k", "Hydrogeological Map 1:1.5M", "Geochemistry", "Marine Geology", and "Southern Permian Basin Atlas". At the bottom of the panel, there are sections for "Base map" (set to "OSM hosted by GEU") and "Optional". The geological map on the right shows a colorful representation of surface lithology. A pop-up window titled "Surface lithology (INSPIRE) HTML" is overlaid on the map, displaying a table with columns: "Age Name", "Country", "Main Lithogy Name", and "Main Lithogy Description". The table contains one row of data for the "MississippianSub-period" in "PT-LNEG", describing it as "granite" and "Phaneritic crystalline rock consisting of quartz, alkali feldspar and plagioclase (typically sodic) in variable amon".

Layer chooser

- Mineral Resources
- Geological Map 1:1M
 - ☒ Surface lithology (INSPIRE)
 - Project page:

 - ☐ Surface age (INSPIRE)
 - ☐ Sandstones (INSPIRE)
- Geological Map 1:5M
- Geological Map 1:100k
- Hydrogeological Map 1:1.5M
- Geochemistry
- Marine Geology
- Southern Permian Basin Atlas

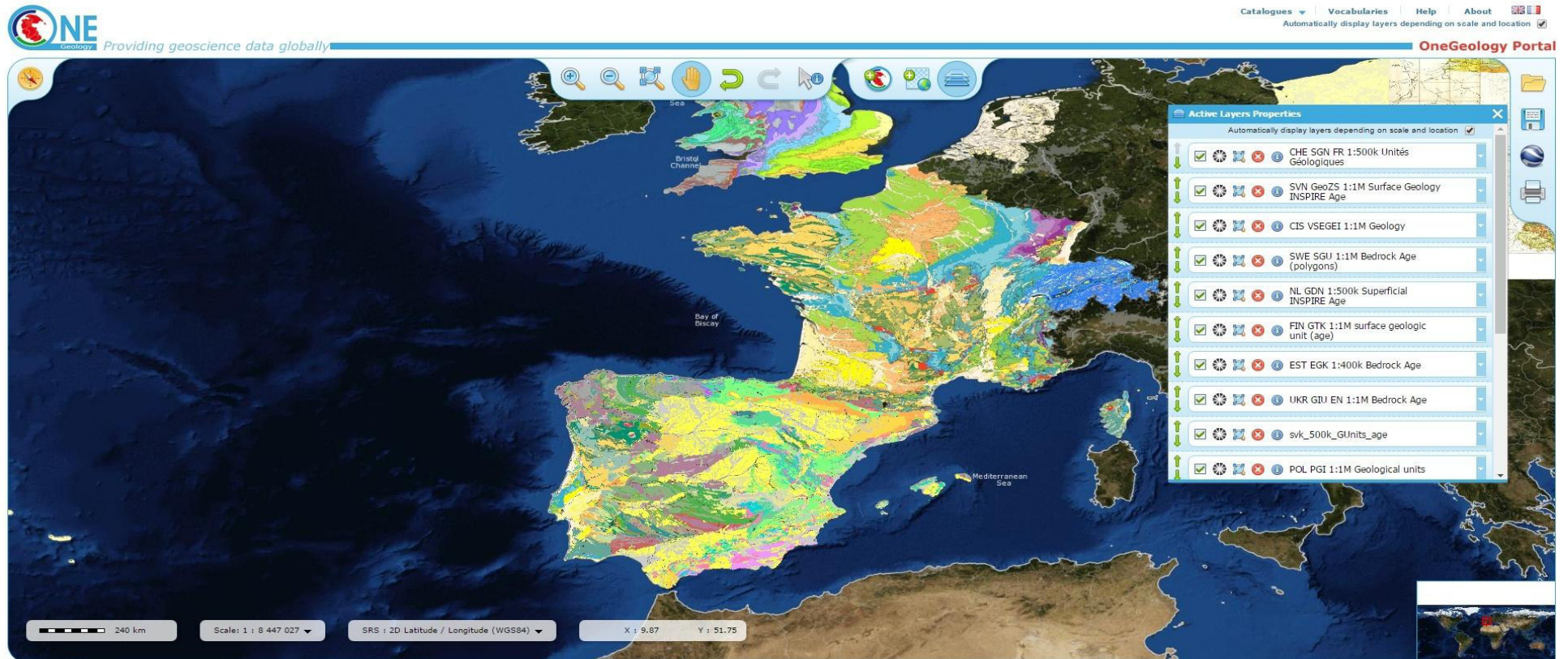
Base map: OSM hosted by GEU

Optional:

Surface lithology (INSPIRE) HTML

Age Name	Country	Main Lithogy Name	Main Lithogy Description
MississippianSub-period	PT-LNEG	granite	Phaneritic crystalline rock consisting of quartz, alkali feldspar and plagioclase (typically sodic) in variable amon

OneGeology Portal



Conclusões

- ✓ Muito importante estudo das especificações de dados
- ✓ Diagramas UML não são nenhum “bicho de 7 cabeças”
- ✓ Regras são iguais para todos os modelos INSPIRE
- ✓ Conhecer bem o modelo de dados de origem
- ✓ Definir e aplicar uma metodologia de harmonização
- ✓ Muito importante a partilha nos *clusters* INSPIRE
- ✓ Colaboração dos geólogos/especialistas necessária

Desenvolvimentos futuros

- ✓ Testes de validação ATS
- ✓ Obter o formato de dados GML
- ✓ Harmonizar e disponibilizar toda a restante cartografia a outras escalas
- ✓ Tratar os outros temas em que o LNEG participa