Geophysics in INSPIRE

László Sőrés PhD
MFGI, TWG-GE/MR

Data Specification Technical Workshop
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INSPIRE Data Models

Data Specifications > Data Models

INSPIRE data models

The INSPIRE Implementing Rules on interoperability of spatial data sets and services and the data specification guidance documents are based on the UML data models developed by the INSPIRE Thematic Working Groups. These data models are managed in a common UML repository, which also stores older revisions of the models.

This page makes different revisions of the INSPIRE UML models available in different formats and views (see below). Each of these revisions corresponds to a specific set of (draft or approved) Data Specification Technical Guidance (TG) documents and/or Implementing Rules.

Revision	Corresponding TG and IRs	Status	Feature catalogue	HTML view	Mapping Tables	EA project / XMI	SVN	GML & code lists

the content of the

http://inspire.ec.europa.eu/Data-Models/Data-Specifications

INSPIRE Code List Register

INSPIRE

Registry

European Commission > INSPIRE > INSPIRE registry > INSPIRE code list register > Station Type

Station Type

Search... 🔍

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|	
ID:	http://inspire.ec.europa.eu/codelist/StationTypeValue
This version:	http://inspire.ec.europa.eu/codelist/StationTypeValue:1
Latest version:	http://inspire.ec.europa.eu/codelist/StationTypeValue
Label:	**Station Type**
Definition:	A type of geophysical station.
Description:	An initial set of values are provided in the Implementation Rules. The codelist is expected to be extended by the geophysical community. Recommendations can be found in the Technical Guidence.
Governance level:	eu-legal
Status:	Valid
Themes:	Geology
Application schema:	
Extensibility:	

http://inspire.ec.europa.eu/codelist

INSPIRE Annex II/GE Geophysics Core 3.0
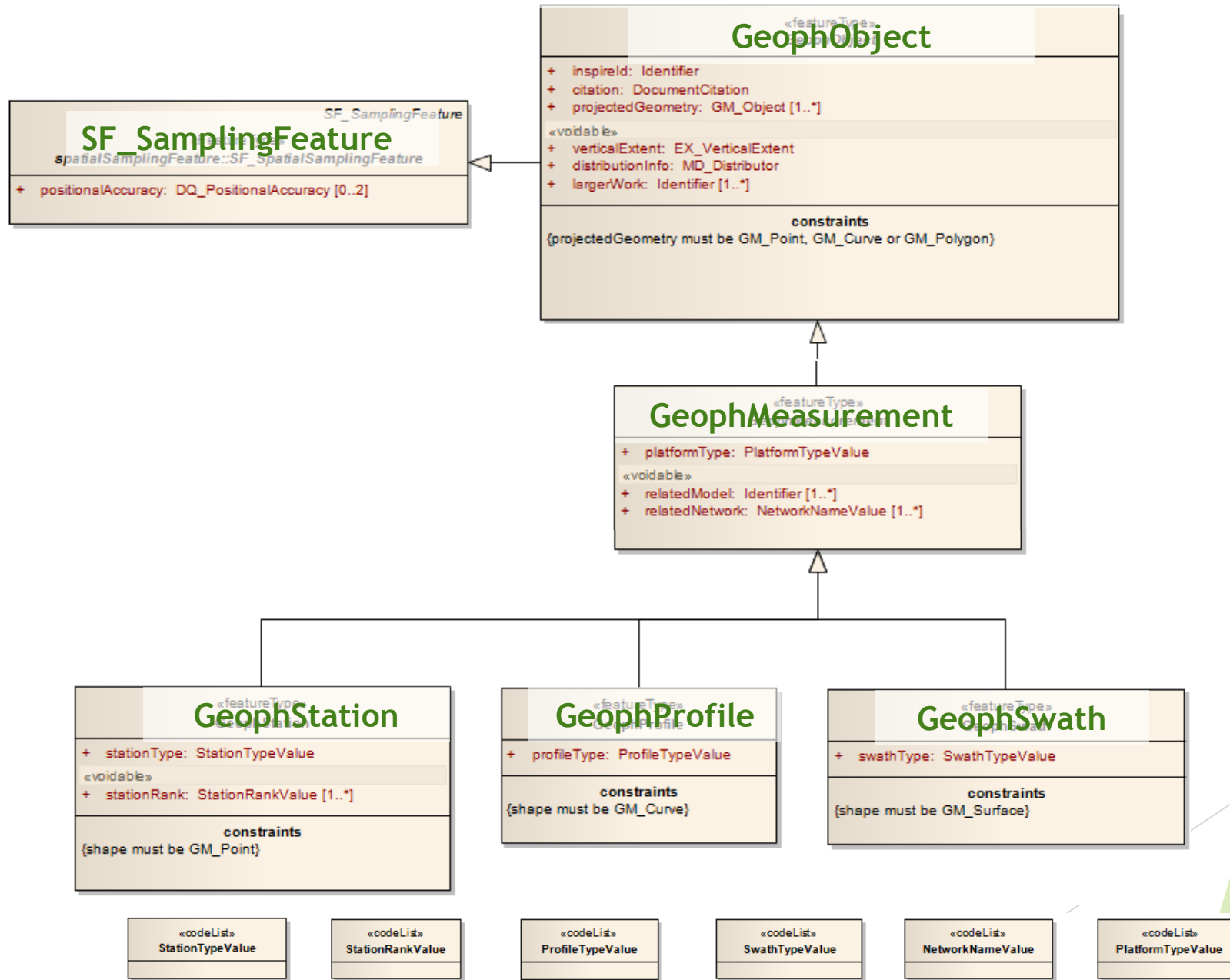
INSPIRE Annex II/GE Geophysics Core 3.0
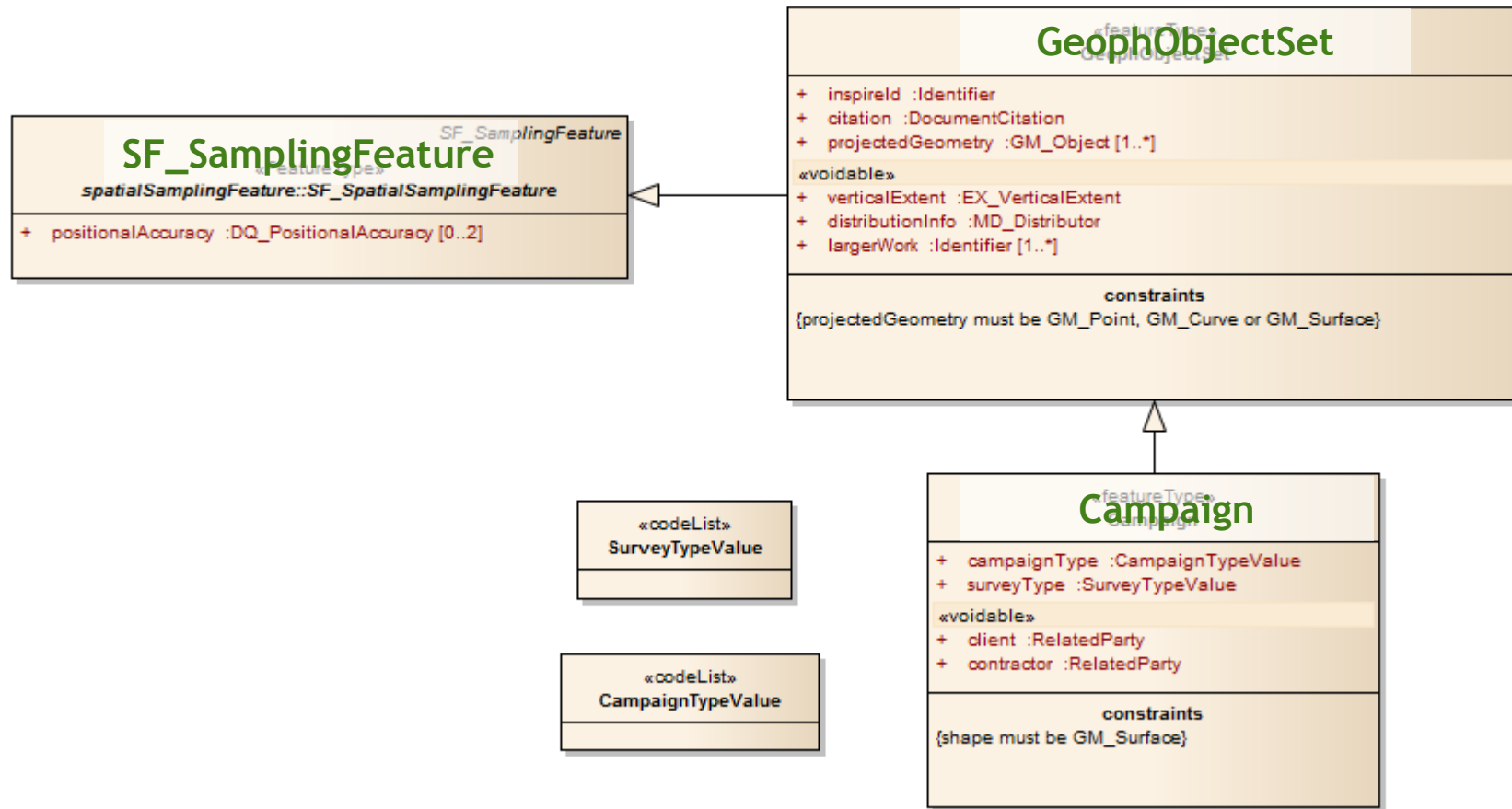
INSPIRE Legal Level (Obligations)

Geophysical Station
- Gravity Station (observatory, 1st, 2nd order base stations)
- Magnetic Station (observatory, 1st, 2nd order base stations)
- Seismological Station (observatory, 1st, 2nd order base stations)
- Magnetotelluric Soundings (MT)
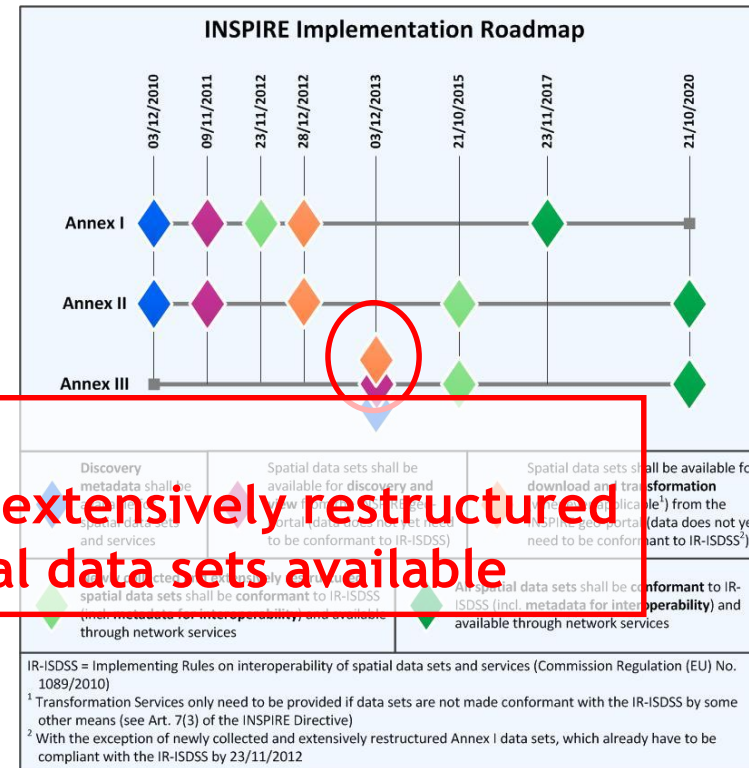- Vertical Electric Soundings (VES)

Geophysical Profile
- Seismic Line
- Borehole logging
- Multielectrode DC Profile

Geophysical Swath
- 3D Seismics

Campaign
- Airborne geophysical survey
- Ground gravity survey
- Ground magnetic survey
- Seismological survey

INSPIRE Implementation Roadmap

21/10/2015
Newly collected and extensively restructured
Annex II and III spatial data sets available

IR-ISDSS = Implementing Rules on interoperability of spatial data sets and services (Commission Regulation (EU) No. 1089/2010)
[1] Transformation Services only need to be provided if data sets are not made conformant with the IR-ISDSS by some other means (see Art. 7(3) of the INSPIRE Directive)
[2] With the exception of newly collected and extensively restructured Annex I data sets, which already have to be compliant with the IR-ISDSS by 23/11/2012

INSPIRE Core Example
Gravity Station

sampledFeature		sweet:EarthLithosphere
relatedObservation		
shape		POINT()
inspireId		
	namespace	http://mfgi.hu/inspire
	localId	GRAV_BASE_4500
citation		
	title	KISKUNFÉLEGYHÁZA, 4500 Gravity Base
	date	
projectedGeometry		POINT()
verticalExtent		
	minValue	2.1
	maxValue	1365
distributionInfo		
	organisationName	MBFH
	url	http://mbfh.hu
largerWork		
	namespace	http://mfgi.hu/inspire
	localId	CMP_GRAV_BASE_2015
relatedModel		
platformType		ground
relatedNetwork		UEGN
stationType		gravityStation
stationRank		1stOrderBase

http://inspire.ec.europa.eu/codelist/PlatformTypeValue

http://inspire.ec.europa.eu/codelist/NetworkNameValue

http://inspire.ec.europa.eu/codelist/StationTypeValue

http://inspire.ec.europa.eu/codelist/StationRankValue

INSPIRE Core Example
Seismic Line

sampledFeature		sweet:EarthLithosphere
relatedObservation		
shape		LINESTRING()
inspireId		
	namespace	http://mfgi.hu/inspire
	localId	SLN2D_DUNA-4
citation		
	title	DUNA-4 2D Seismic Line
	date	1996.10.17
projectedGeometry		LINESTRING()
verticalExtent		
	minValue	0
	maxValue	3000
distributionInfo		
	organisationName	MBFH
	url	http://mbfh.hu
largerWork		
	namespace	http://mfgi.hu/inspire
	localId	CMP_SLN_DUNA_1996
relatedModel		
platformType		ground
relatedNetwork		
profileType		seismicLine

http://inspire.ec.europa.eu/codelist/PlatformTypeValue

http://inspire.ec.europa.eu/codelist/ProfileTypeValue
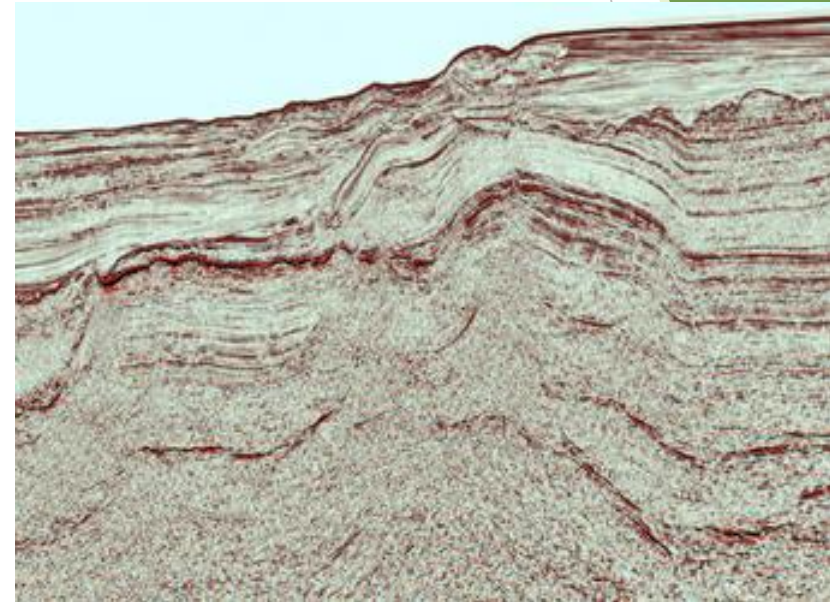
INSPIRE Annex II/GE Geophysics Extension 3.0
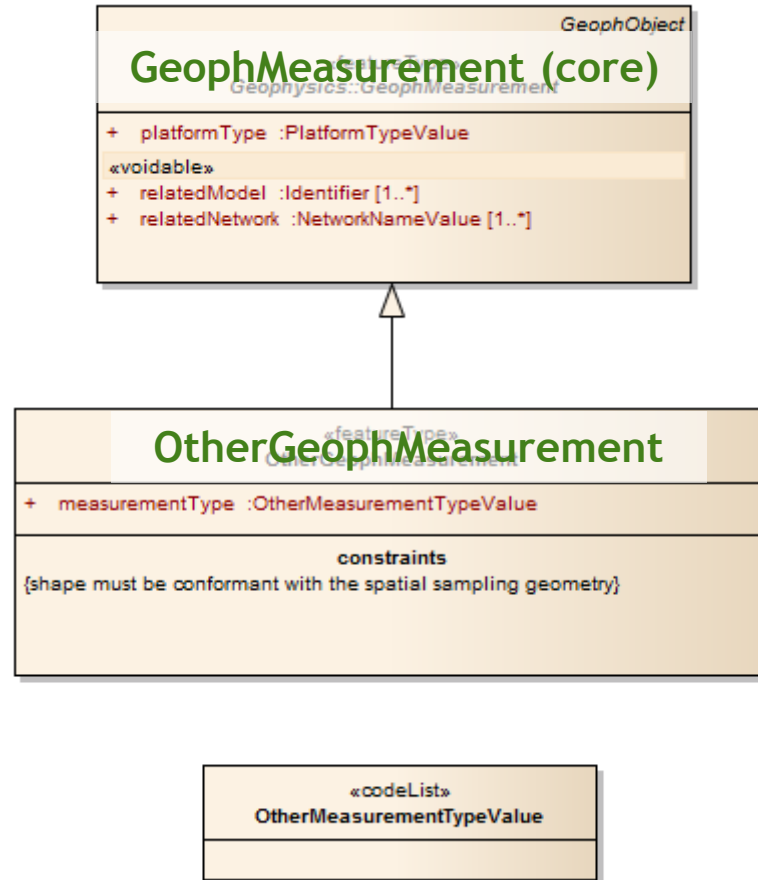
The "official" extension ge_gp.xsd schema (2.0) is outdated and wrong. Do not use it! Instead use O&M with appropriate MD_Metadata elements

INSPIRE Technical Level (Possibilities)

Geophysical Station
- Gravity survey station
- Magnetic survey station
- Radiometric station
- Seismological station
- Time-domain em sounding
- Frequency domain em sounding

Geophysical Profile
- Cone penetration test
- Flight line
- Georadar profile
- Vertical seismic profile (VSP)

Geophysical Swath
- radar interferometry
- sonar

And a Lot More …

Campaign
- 1D,2D,3D resistivity survey
- Borehole logging survey
- CPT survey
- Georadar survey
- Magnetotelluric survey
- Sonar survey
- VSP survey
- Time-domain EM survey
- Frequency domain EM Survey

Model
- LayerModel
- SurfaceModel
- SurfaceGridModel
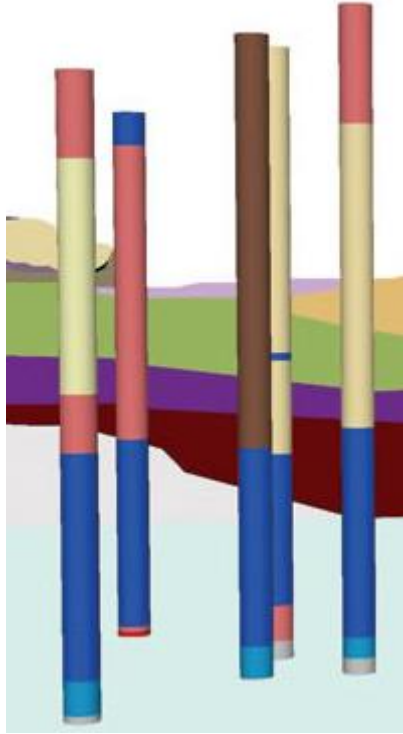- SolidModel
- SolidGridModel

16	geophStation	seismological station	surveyStation	Technical (EU)	seismology	●
17	geophStation	time-domain em sounding		Technical (EU)	EM	●
18	geophStation	vertical electric sounding		Legal (EU)	EM	○
19	geophProfile	borehole logging		Legal (EU)	borehole geophysics	●
20	geophProfile	cone penetration test		Technical (EU)	borehole geophysics	○
21	geophProfile	flight line		Technical (EU)	airborne geophysics	〜
22	geophProfile	georadar profile		Technical (EU)	EM	〜
23	geophProfile	multi-electrode dc profile		Legal (EU)	EM	〜
24	geophProfile	seismic line		Legal (EU)	seismics	〜
25	geophProfile	vertical seismic profile		Technical (EU)	borehole geophysics	〜
26	geophSwath	3d seismics		Legal (EU)	seismics	▮
27	geophSwath	radar interferometry		Technical (EU)	remote sensing	▮
28	geophSwath	sonar		Technical (EU)	remote sensing	▯
29	surveyType	1D resistivity survey		Technical (EU)	EM	▭
30	surveyType	2D resistivity survey		Technical (EU)	EM	▭
31	surveyType	2D seismic survey		Technical (EU)	EM	▭
32	surveyType	3D resistivity survey		Legal (EU)	EM	▮
33	surveyType	3D seismic survey		Technical (EU)	EM	▭
34	surveyType	airborne geophysical survey		Legal (EU)	airborne geophysics	▭
35	surveyType	borehole logging survey		Technical (EU)	borehole geophysics	▭

http://geonetwork.mfgi.hu/InspireLayersStyleGeophysics.html
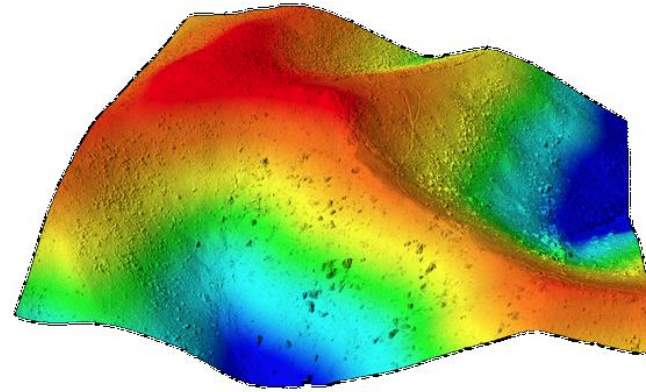
Observations and Measurements (OM)
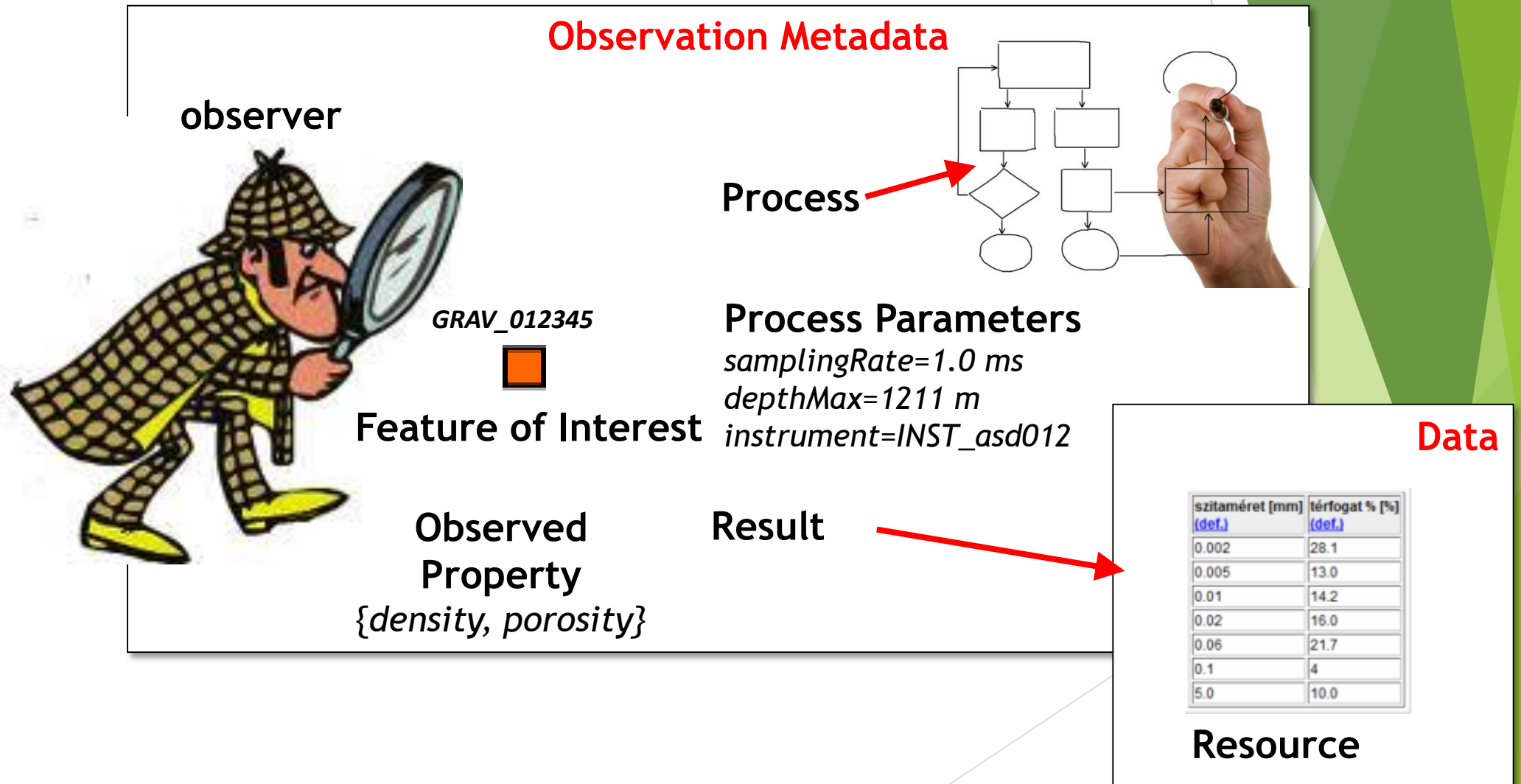
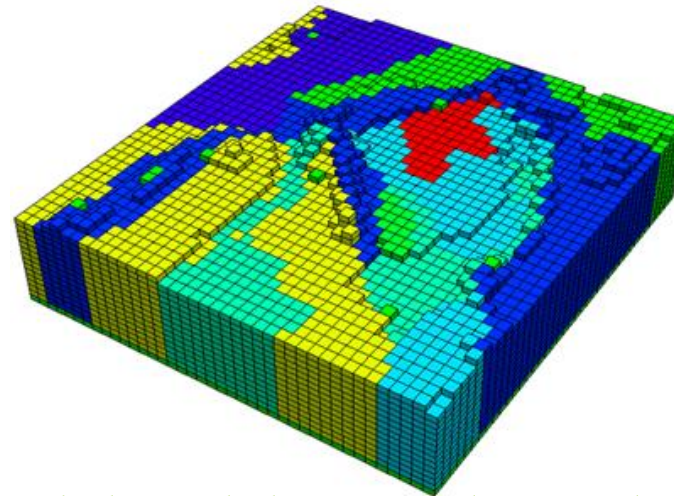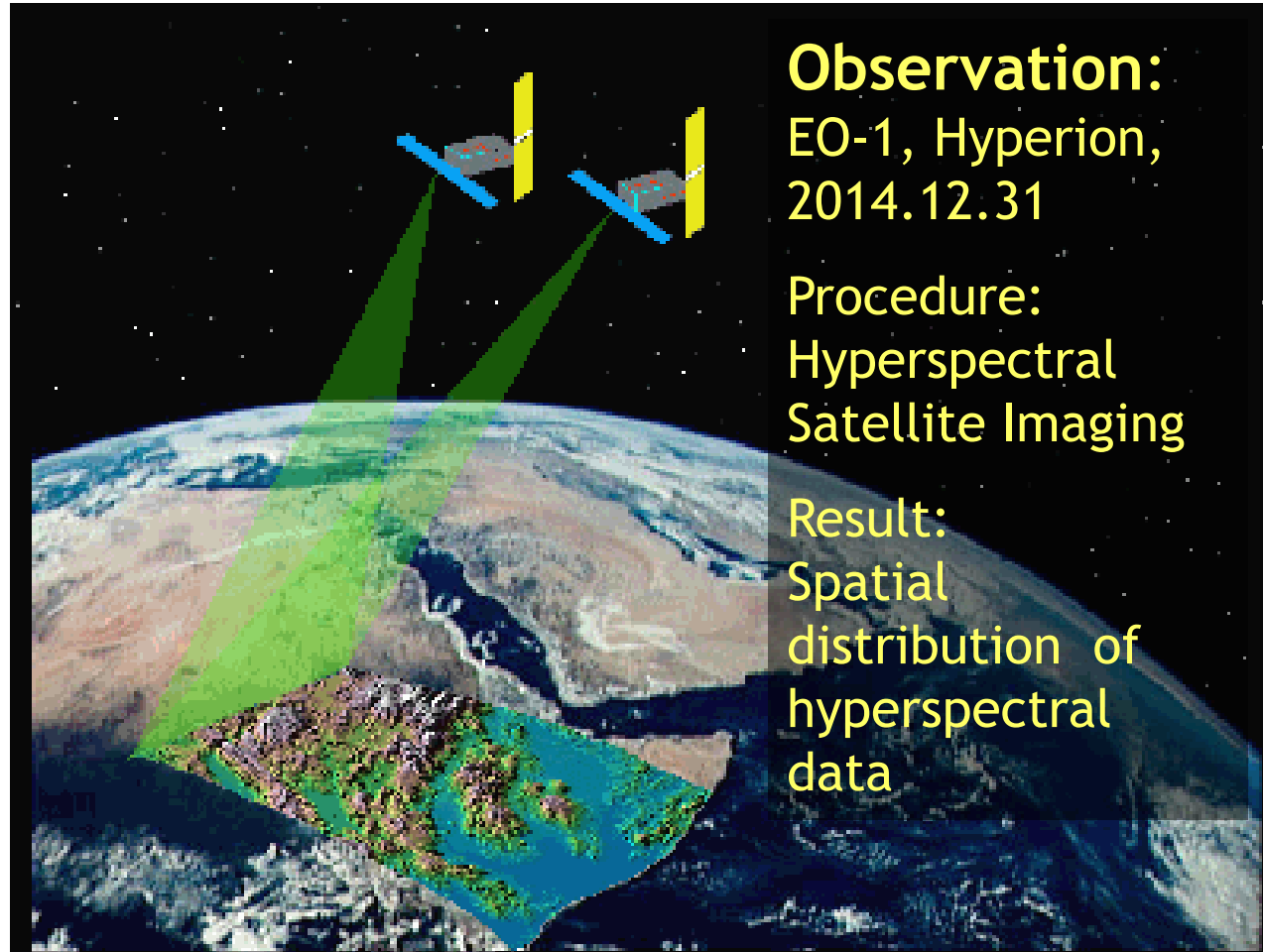# Sampling Features in Geophysics

Curve Model - Sampling Curve
Borehole Data

Surface Model - Sampling Surface
DEM

Solid Model - Sampling Solid
Seismic Velocity Cube

What on earth is a Sampling Feature?

reflectance

observedProperty   procedure

Sampled feature

Observation:
EO-1, Hyperion,
2014.12.31

relatedObservation

result

Sampling Feature

Coverage
of hyperspectral data
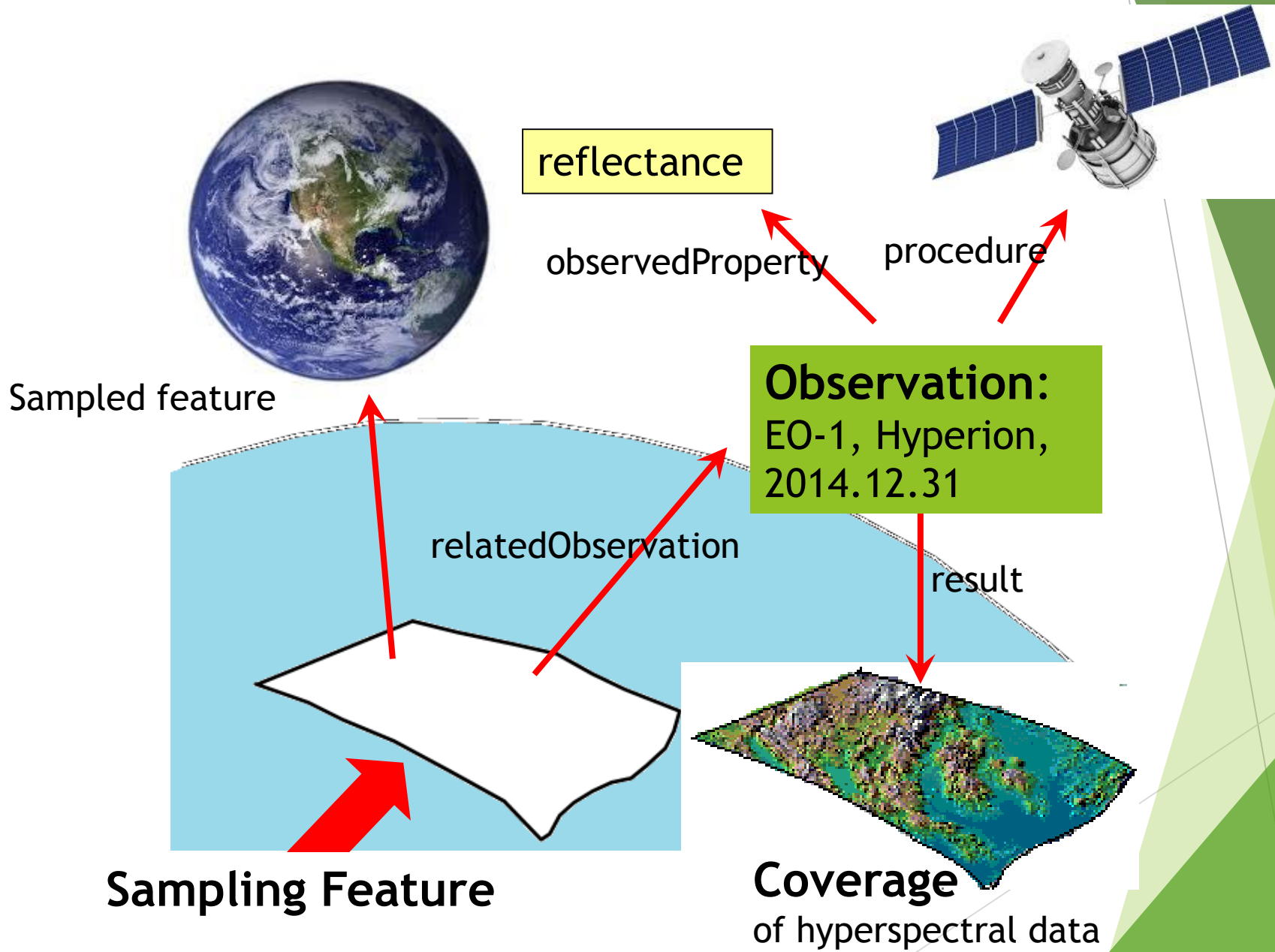
The SF-OM Object Chain
Key to Harmonize Geophysical Data and Results

Sampling Feature	Related Observation →	Observation	result →	Resource

Artifacts

- Geophysical measurements
- Geochemical measurements
- Meteorological measurements
- Monitoring facilities
- 1D, 2D, 3D Models

Assigning values to properties

- Data acquisition
- Processing
- Interpretation

Spatial distribution of simple or complex properties

- Point Coverage
- Curve coverage
- Surface coverage
- Solid coverage
- Industry standard resources
    - segy, las, edi, etc.

INSPIRE Annex II/GE
Geophysics Extension 3.0

Models

SF_SamplingFeature

SF_SamplingFeature

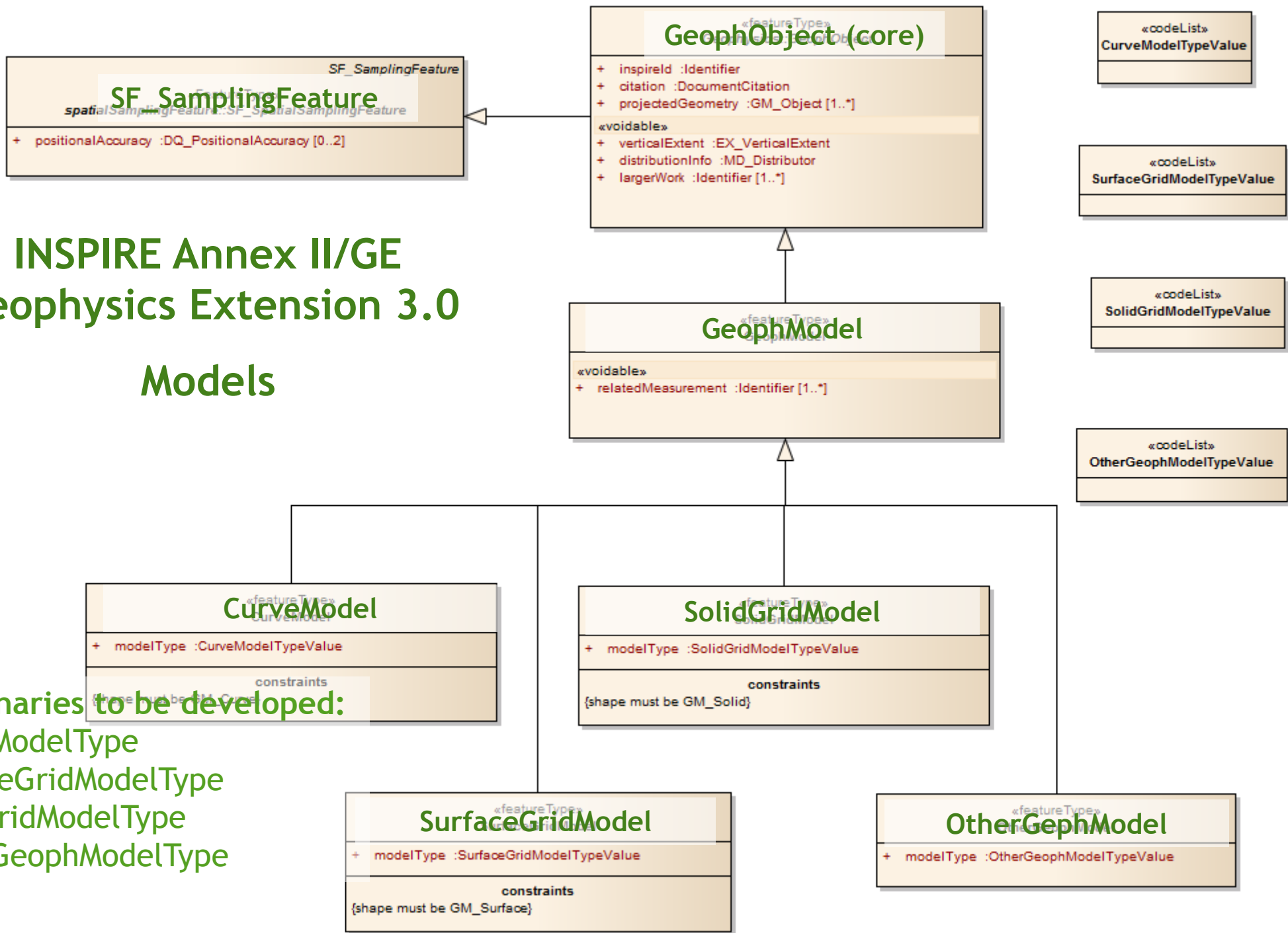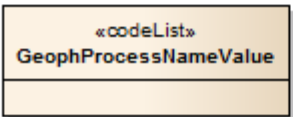*spatial*SamplingFeature::SF_SpatialSamplingFeature

+ positionalAccuracy :DQ_PositionalAccuracy [0..2]

GeophObject (core)

«featureType»
GeophObject

+ inspireId :Identifier
+ citation :DocumentCitation
+ projectedGeometry :GM_Object [1..*]

«voidable»
+ verticalExtent :EX_VerticalExtent
+ distributionInfo :MD_Distributor
+ largerWork :Identifier [1..*]

GeophModel

«featureType»
GeophModel

«voidable»
+ relatedMeasurement :Identifier [1..*]

«codeList»
CurveModelTypeValue

«codeList»
SurfaceGridModelTypeValue

«codeList»
SolidGridModelTypeValue

«codeList»
OtherGeophModelTypeValue

CurveModel

«featureType»
CurveModel

+ modelType :CurveModelTypeValue

constraints
{shape must be ...}

SolidGridModel

«featureType»
SolidGridModel

+ modelType :SolidGridModelTypeValue

constraints
{shape must be GM_Solid}

SurfaceGridModel

«featureType»
SurfaceGridModel

+ modelType :SurfaceGridModelTypeValue

constraints
{shape must be GM_Surface}

OtherGeophModel

«featureType»
OtherGeophModel

+ modelType :OtherGeophModelTypeValue

Dictionaries to be developed:
CurveModelType
SurfaceGridModelType
SolidGridModelType
OtherGeophModelType

INSPIRE Annex II/GE Geophysics Extension 3.0

Process, Observation/result

Process
OM_Process
Processes::Process

«voidable»
+ inspireId :Identifier
+ name :CharacterString [0..1]
+ type :CharacterString
+ documentation :DocumentCitation [0..*]
+ processParameter :ProcessParameter [0..*]
+ responsibleParty :RelatedParty [1..*]

GeophResult
«dataType»

+ geophResource :GeophResource [1..*]

GeophResource
«dataType»

+ resource :CI_OnlineResource
«CodedValue»
+ resourceType :ResourceTypeValue

«codeList»
GeophProcessParameterNameValue

«codeList»
ResourceTypeValue

«codeList»
GeophPropertyNameValue

Dictionaries to be developed:
GeophProcessParameterName
GeophPropertyName
GeophProcessName
ResourceType

«codeList»
GeophProcessNameValue

INSPIRE Extension Example - SurfaceGridModel

sampledFeature		sweet:EarthLithosphere	→ **Inversion**
relatedObservation		http://mfgi.hu/inspire/OBS_SGM_GRD_Resistivity10.1	
relatedObservation		http://mfgi.hu/inspire/OBS_SGM_GRD_Resistivity10.2	→ **Interpolation**
shape		POLYGON(())	
inspireId			
	namespace	http://mfgi.hu/inspire	
	localId	SGM_GRD_Resistivity10	
citation			
	title	Resistivity Distribution in NW Hungary at 10 m depth	
	date	2004.12.17	
projectedGeometry		POLYGON(())	
verticalExtent			
	minValue	7	
	maxValue	15	
distributionInfo			
	organisationName	MFGI	
	url	http://mfgi.hu	
largerWork			
	namespace	http://mfgi.hu/inspire	
	localId	CMP_GRD_Resistivity.hu	
relatedMeasurement			
modelType		horizontalParameterGrid	
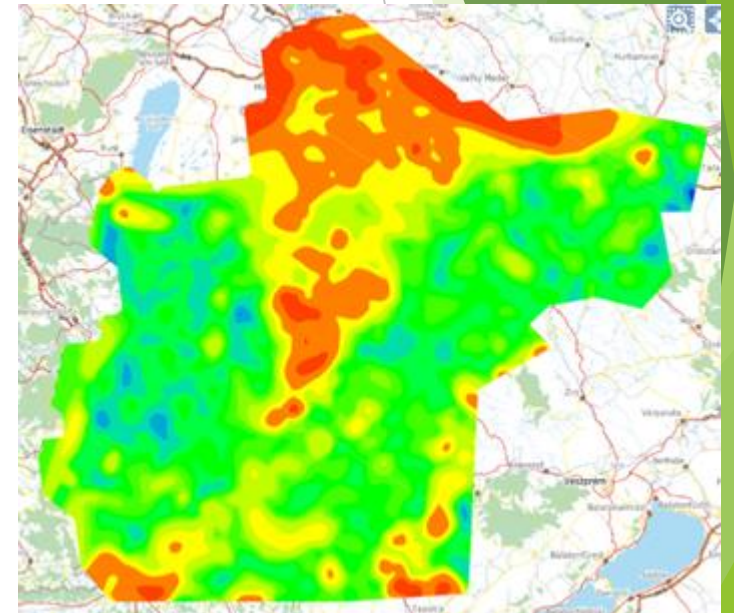
INSPIRE Extension Example - Observations

Observation – 1D Inversion

identifier		http://mfgi.hu/inspire/OBS_SGM_GRD_Resistivity10.1
name		1D Inversion
featureOfInterest		http://mfgi.hu/inspire/SGM_GRD_Resistivity10
observedPorperty		resistivity
phenomenonTime		2004-10-28T10:00:00.0
resultTime		
parameter		
parameter		
process		
result		
	resource	

Observation – Interpolation

identifier		http://mfgi.hu/inspire/OBS_SGM_GRD_Resistivity10.2
name		Interpolation
featureOfInterest		http://mfgi.hu/inspire/SGM_GRD_Resistivity10
observedPorperty		resistivity
phenomenonTime		2004-10-30T10:00:00.0
resultTime		2004-10-30T11:00:00.0
parameter		interpolationMethod="Kriging"
parameter		cellSizeX=500
parameter		cellSizeY=500
process		http://mfgi.hu/inspire/PRC_Kirgging
result		
	resource	SGM_GRD_Resistivity10.grd
	resource	SGM_GRD_Resistivity10.srf
	resource	link to a WMS service

For online Observation examples check:
http://www.europe-geology.eu/groundwater/groundwater-map/shallow-seismics/

INSPIRE Extension Example - Process

inspireId		
	namespace	http://mfgi.hu/inspire
	localId	PRC_1D_ResistivityInversion
name		1D Resistivity Inversion
type		mathematical optimization
documentation		
	title	1D Inversion of DC resistivity data
	date	1988.01.01
	url	http://mfgi.hu/precess/PRC_1D_ResistivityInversion
processParameter		inversionType
processParameter		inversionMethod
responsibleParty		
	individualName	Kovács Béla
	organisationName	ELGI
	email	kovacs.bela@elgi.hu

Open Issues

- Schema for extention 3.0
  - To be done by JRC
- Dictionaries (properties, processes, process parameters)
  - To be done by the community (geoERA)
- Description of Processing Chains (Data acquisition >> processing >> interpretation)
  - Quick win: join all results and link it to one SF
  - Exact solution: describe each sub SF and show how they are related (input, output)
- Supporting 3D Geologic models
  - Joint use of INSPIRE Geology, Geophysics and GeoSciML
- Linked Data, Semantic Web
  - Joint use of structured metadata (INSPIRE XML resources) and semantic information (OWL/RDF/SKOS)
- Recreate GEOMIND
  - To be done by US, but how to get funding?

Thank You for the Attention