Banca Dati del Continuum geologico interregionale delle Regioni Emilia-Romagna, Marche, Toscana e Umbria

Database and continuous geological map of Emilia-Romagna, Marche, Tuscany and Umbria Regions

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MAIN TOPICS

On May 2012 Emilia-Romagna, Tuscany, Umbria and Marche Regions arranged an agreement to achieve:

- Creation of an interoperable and integrated geological database starting from the geological data of the four Regions;

- Close cooperation during acquisition, preservation and diffusion of Geological and Geothematic application;

Emilia-Romagna, Marche, Tuscany and Umbria Regions have been cooperating since 90s in CARG National Project to improve geological knowledge.
WORK ORGANIZATION: MAIN TASKS

1. ANALYSIS OF EXISTING BIBLIOGRAPHY

2. CREATION OF A TECTONIC MAP OF THE NORTHERN APENNINES

3. PRELIMINARY GEOLOGICAL LEGEND FOR EMILIA–ROMAGNA, TUSCANY, UMBRIA AND MARCHE REGIONS

4. IDENTIFICATION OF AN INITIAL AREA ON WHICH APPLY THE PRELIMINARY GEOLOGICAL LEGEND (MARECCHIA–CONCA HYDROGRAFIC BASIN)

5. CREATION OF A GEOLOGICAL CONTINUOUS DATABASE FOR THE PROTOTYPE AREA
1. ANALYSIS OF EXISTING BIBLIOGRAPHY

Collection of existing material (scientific publications, geological maps, technical offices material) and analysis of the different sources:

- **SCIENTIFIC PUBLICATIONS**
  Most important Italian and international bibliographic databases, such as: GEOREF, Documentation Centre of the Italian Geological Society, Science Direct, Google Scholar, etc..

- **GEOLOGICAL MAPS**
  - Geological mapping from CARG Project (SGI)
  - Geological mapping from geological project of the four Regions
  - Geological Map of Italy 1:100 000 scale (SGI)
  - Geological maps at various scale in scientific publications
  - Geological database 1:10 000 scale of each of the four Regions
2. CREATION OF A TECTONIC MAP FOR THE NORTHERN APENNINES

Tectonic map of the Northern Apennines (1:500 000 scale) in which lithostratigraphic units are organized and divided into Paleogeographic domains, tectonic units, sequences.
3. PRELIMINARY GEOLOGICAL LEGEND FOR EMILIA-ROMAGNA, TUSCANY, UMBRIA AND MARCHE REGIONS

Starting from the analysis of CARG project – sheets 1:50 000 available on ISPRA website http://www.isprambiente.gov.it/ Media/ carg/ index.html

AIMS

- Creation of a unified geological legend for the entire transregional area;

- Analysis of all 82 CARG sheets’s legends included in the Emilia–Romagna, Tuscany, Marche and Umbria Regions;

- Identification of 430 lithostratigraphic units, many of which are further divided into members and lithofacies;

- Lithostratigraphic units grouped at various hierarchical levels based on the Tectonic Map of the Northern Apennines
4. APPLICATION OF THE PRELIMINARY GEOLOGICAL LEGEND AT MARECCHIA-CONCA BASIN

Hydrographic basin that includes portions of territory of Emilia–Romagna, Marche and Tuscany Regions and the whole San Marino Republic.

SOURCES OF GEOLOGICAL DATABASE

- DB Emilia Romagna Region 1:10 000 scale
- DB San Marino Republic 1:10 000 scale
- DB Marche Region 1:10 000 scale
- DB Tuscany Region (Continuous Geological Map) 1:10 000 scale
- Emilia-Romagna CARG sheet 266 – Mercato Saraceno 1:50 000 scale (F. 266-Mercato Saraceno)
- CARG sheet 256 - Rimini
CRITICAL ISSUES

1. Extent and limits between geological databases
   CARG sheet 266–Rimini/DB Marche Region 1:10 000 scale

2. Attribution of lithostratigraphic units and contact between adjacent CARG sheets

INABILITY TO PERFORM GEOLOGICAL SURVEYS

NEED TO WORK ONLY WITH EXISTING DATABASES AND GEOLOGICAL MAP
PRODUCTS

1. GEOLOGICAL MAP OF MARECCHIA–CONCA BASIN AND RELATED GEOLOGICAL LEGEND

LEGENDA GEOLOGICA
Bacino Marecchia-Conca

18 dicembre 2013

43 formazioni + litofacies
2. GEOLOGICAL MAP OF MARECCHIA–CONCA BASIN WITHOUT QUATERNARY DEPOSITS

NEED TO OBTAIN A CONTINUOUS POLIGONAL LAYER REPRESENTATIVE OF THE GEOLOGY UNDER LANDSLIDES AND QUATERNARY DEPOSITS POLYGONS

WITH QUATERNARY DEPOSITS
CRITICAL ISSUE

NEED TO DRAW CONTACTS UNDER QUATERNARY COVERS

WITHOUT QUATERNARY DEPOSITS
3. GEOLOGICAL DATABASE OF MARECCHIA–CONCA BASIN

REFERENCE DATABASE
DATABASE OF THE CONTINUOUS GEOLOGICAL MAP OF TUSCANY REGION 1:10 000 SCALE (BDG - RT)

BDG – RT is an object-oriented database management system in which information is represented in the form of objects, aims at improved management of large amounts of geological information and geothematic and allows to support all the geological data related to the Marecchia–Conca basin.

AIM
CREATION OF A CONTINUOUS AND HOMOGENEOUS GEOLOGICAL DATABASE UNDER QUATERNARY DEPOSITS, STARTING FROM 5 DIFFERENT DATABASES

The first testing of the geological database stores data related to the area of the Marecchia–Conca basin.
GEODATABASE DESIGN

1) REQUIREMENTS ANALYSIS
Identify essential information and differences with the previous geological database of Tuscany (database CARG) in order to manage the entire data in the BDG-RT db.

2) CONCEPTUAL DESIGN Schema of specific database for continuous geological map starting from the BDG-RT structure.

3) LOGICAL SCHEMA DESIGN
Defining of database schema, primary keys, topological constraints between different classes of objects.

4) PHYSICAL SCHEMA DESIGN
for the implementation of the preliminary version of the database
DATABASE MODEL

Geological database of CARG project usually stored landslides in Layer 18 with ULF, while DGPV are stored in Layer 11, which collects geomorphological elements.

In the new BDG-RT, ULF, landslides and DGPV are stored in 3 different classes with polygonal geometry: “ULFAreale”, “FranaCart” and “DGPV”.

LAYERS
- ULFAreale
- LimiteGeologico
- FranaCart
- ULFQuaternario
- DGPV
Geological data organised in a GEODATABASE inside 2 different FEATURE DATASET: Geology and Geomorphology

Creation of TOPOLOGY Feature Classes for geometric correction on polygonal and linear feature classes
VALIDATION OF TOPOLOGY

Topology rules on polygon and line feature, depending on the spatial relationship between feature classes, allow to fix errors on geometry such as:

- **Polygon Overlapping/Gap** (feature included: ULFAreale, ULFQuaternario, FranaCart, DGPV)

- **Line Overlapping** (feature included: LimiteGeologico)
- Entire management of geological data and operations/changes on database totally carried out using ESRI ArcGIS

- Conversion database (GDB) in public format Shapefile (ESRI Shapefile) and SpatiaLite to ensure greater distribution of data through open source GIS applications (QGIS)

- Provided specific styles for the proper cartographic representation for display on QGis, through the creation of manageable styles (.sld, .svg, .qml)
Thank you for your attention!