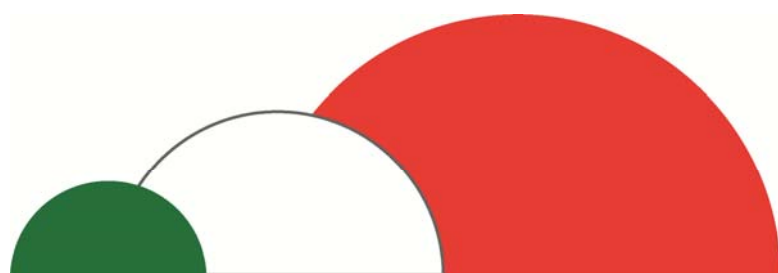


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# *Epitome*

**Volume 4, 2011**



## **Geoitalia 2011**

**VIII Forum Italiano di Scienze della Terra  
Torino, 19-23 settembre 2011**



**REGIONE  
PIEMONTE**



**MUSEO REGIONALE  
DI SCIENZE NATURALI**

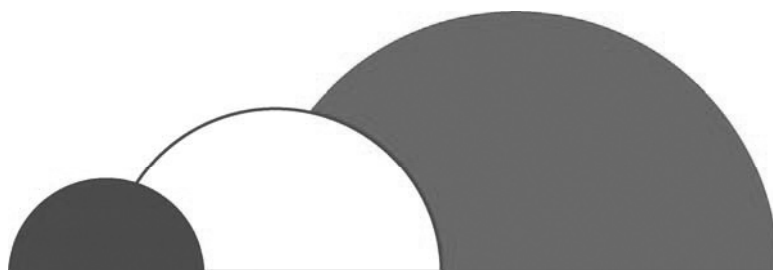
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**Federazione Italiana di  
Scienze della Terra, Onlus**

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natural hazards (mass movements, floods) in Italy, reliability of the temporal information can be highly variable, depending upon the type of source and the degree and amount of available information. Nevertheless, the sinkhole database we produced represents a valid starting point for examining in greater detail the temporal occurrence of phenomena in Apulia, with particular reference to their relation with different types of triggering factors.

### C3-9 Orale La Vigna, Francesco

10.1474/Epitome.04.0258.Geoitalia2011

#### A PRELIMINARY SINKHOLE SUCEPTIBILITY MAP OF THE LATIUM REGION

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*Key terms: sinkhole hazard evaluation; hydrogeology; probabilistic approach*

Several and frequent studies were internationally presented about landslide susceptibility, meanwhile in literature is missing a broad diffusion of studies regarding sinkhole susceptibility. That's why sinkhole recurrence depends on several geological conditions related to specific geological and hydrogeological context (sinkhole prone area) that vary case by case. Notwithstanding this regionalization problem of sinkhole recurrence, in the central Apennine sedimentary basins (Italy) a certain number of geological, geomorphologic and hydrogeological conditions (sinkhole predisposing issues) can be considered in common between the surveyed sinkholes. Eventually this could be compared with similar geological conditions and sinkhole occurrence in the rest of Italy or in other countries.

In this case study is presented a probabilistic approach regarding the Latium Region deriving from the comparison between the regional sinkhole inventory realized during a precedent project and the dataset of the new Hydrogeological Map of Latium Region (scale 1:100,000). Indexed elements, chosen because associated to the majority of sinkhole phenomena, are: outcropping lithologies, slope value, foothills distance of carbonate ridges (in a plain), main faults (even if buried), gas sources, hydrothermal springs, piezometric gradient and land use. These indexed elements were weighted and combined in a matrix which preliminary result is the sinkhole susceptibility map of Latium Region. When definitively validated, this approach could be suitable for local authorities to planning more targeted studies in major hazard areas.

### C3-10 Orale Margiotta, Stefano

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#### INTEGRATION OF MORPHOLOGICAL, STRATIGRAPHICAL AND GEOPHYSICAL DATA FOR SINKHOLE HAZARD ASSESSMENT IN THE CASALABATE AREA (LECCE, ITALY)

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*Key terms: SINKHOLES; MORPHOLOGY; STRATIGRAPHY; GEOPHYSICS; SALENTO*

In the Apulia region, the low-lying coasts of the Salento peninsula are significantly affected by land subsidence and sinkhole phenomena on both the Adriatic and Ionian coastal territories. Sinkholes are observed at different evolutionary stages, from those occurring at present to other relict features creating peculiar coastal morphologies. The study of sinkholes, specifically addressed to the understanding of their mechanism of formation, is of great importance for the safety of coastal settlements. Long stretches of the Salento coastline were affected by urban expansion in the last decades with residents strongly increasing during the summer season. The construction of new houses, pipelines and roads in areas subjected to subsidence and/or sinkhole phenomena results in great economic losses.

Casalabate, in the province of Lecce, is a small town located along the Adriatic coast that suffered a sequence of eight sinkhole events in the last 20 years. The local stratigraphy is well documented by many borehole data and the area is particularly suited to the investigation of the sinkhole hazard.

The critical analysis of core data integrated by detailed field mapping allowed the recognition of the local bedrock represented by the Pleistocene Gravina calcarenites overlain by Holocene organic-rich marsh deposits and sandy beach and coastal dune deposits. Due to their critical geotechnical properties, the occurrence of organic-rich marsh deposits is of particular importance in the overall stratigraphy. The sites affected by sinkholes in the past 15-20 years were subjected to specific geophysical surveys, consisting of combined georadar (GPR) and electrical resistivity tomographies (ERT). These surveys highlighted the effectiveness of GPR in identifying active sinkholes and lithologic changes and of ERT as an optimal descriptor of the geometry of sinkholes, thus indicating their evolution.

The integration of the geophysical, stratigraphical and morphological studies indicate that the main mechanisms of sinkhole formation are the cover collapse and the cover suffusion, and allowed a preliminary zonation of the sinkhole hazard.

### C3-11 Poster Di Filippo, Michele

10.1474/Epitome.04.0260.Geoitalia2011

#### DEFINITION OF SINKHOLE PRONE AREAS AND THEIR MONITORING. A CASE STUDY IN LATIUM (PIANURA PONTINA)

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*Key terms: sinkholes; gravity survey; risk*

In Italy, natural sinkhole phenomena which are not connected to karst

processes are relatively frequent. In the southern plain of Latium (Pontina area) for example, several small subcircular lakes are described, whose formation is thought to have been caused by erosional processes related to vertical turbulence and/or piping in alluvial sediments. At the present it is impossible to think about an estimation attempt for the hazard/risk due to the complete lack of adequate information about the whole plain.

A gravity survey carried out some years ago in whole plain shows several negative gravity anomalies. Later, in the last decade, some negative gravity areas were also studied by microgravity surveys. Microgravity results show that these phenomena could tend to develop in different geological settings, from the apex of the alluvial fans down to the lower alluvial plain, generally within relatively short distances from streams and artificial channels.

Gravity information set can allow us to select a peculiar areas to be submitted to further intensive monitoring and surveys such as:

- 1) microgravity surveys to detect negative gravity anomalies;
- 2) high-resolution geophysical surveys;
- 3) continuous areal leveling to detect the (negative and positive) vertical motion;
- 4) gas seepage monitoring;
- 5) water seepage monitoring.

In terms of hazards, at the present, it should at least ask whether the sinkholes on the inner side of embankment body could also evolve towards underseepage phenomena, where negative gravity anomalies was detected.

### C3-12 Poster Liguori, Vincenzo

10.1474/Epitome.04.0261.Geoitalia2011

#### SINKHOLES IN GESSOSO SOLFIFERA FORMATION (CENTRAL SICILY): HISTORICAL RESEARCH

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*Key terms: sinkholes; mines; Gessoso Solfifera Formation; evaporite dissolution*

The Sicilian sinkhole areas, are diffused on central zone of the island. Indeed in these areas the sinkholes have a higher probability of occurrence and a greater genetic diversity, because there are the evaporite rocks. This is because evaporites have a higher solubility and, commonly, a lower mechanical strength. The evaporite environment is very sensitive to changes in the local hydrology and hydrogeology, so that human factors such as groundwater extraction, drainage, and irrigation can act as triggering factors to collapse events. The presence of mining-related cavities (workings, shafts and tunnels) or karstic (solution cavities and sinkholes in evaporitic rocks) within the top 100 m in the rock mass restricts land utilisation, and their migration to the surface may damage property or services or cause loss of life.

The Sicilian sinkholes develop in chalks and the salts. In the central-southern Sicily there is a thick formation of evaporitic rocks, deposited during the salinity crisis, happened in the Mediterranean sea in upper Miocene.

The salt in these layers is white coloured and normally has an average grade in NaCl superior to 98%, which is comparable to the best of such layers in the whole world. In some mines KCl salts are extracted. Given the remarkable mining importance of the products of the Gessoso-Solfifera Formation, since the antiquity, different mining centers for the extraction of potassic salts and/or of rock salt have been developed and the greatest of them falls into the provinces of Enna and Caltanissetta. Among the many existing mines in the Sicilian territory at the moment, only two are active. All the others are disused and abandoned, sometimes without any control. These mines, built on more levels than one, had the typical structure of a gallery; chambers and pillars. The infiltration of waters in the subsoil has produced salts dissolution. This process has created a weakening of the hollow vaults of the mining tunnels producing, in extreme cases, sudden and local collapses. This contribution presents examples of sinkhole induced by human activities that cause fresh water to flow through salt formations. The Racalmuto mining basin, classified as one of the greatest in Sicily, is a concrete example of the geomorphologic modifications of the territory linked with the presence of the mines that are now abandoned. The sinkholes, occurring in these areas, are numerous and often situated in correspondence with the meeting points of the mining galleries. They have almost always sub-circular shapes and diameters varying in depth. The dimensions of the greatest sinkhole are approximately of 100 m in width and of 200 m in depth. The sinkholes currently individualized can be found in anthropic areas with road infrastructures and residences, and in sites used by man for cultivation and/or pasture. In many cases they are reasons for damages to houses and the activities that develop in the near areas. Anyway the key measures to prevent sinkholes in mining areas are to control the amount of mine drainage and if present reduce water level fluctuation.

As discussed above the need an accurate evaluation of the risk caused by this phenomenon, and a correct management programme of the territory are born. Before risk assessments for sinkhole damage and indemnification are developed, a data base must be created to predict the occurrence and distribution of sinkholes. Historical data are necessary to develop and calibrate risk-assessment models, and ancient sinks provide an important means of establishing confidence and continuity in the models. With high-quality data, local risk maps and estimates of sinkhole probability can be developed.

### C3-13 Poster Meloni, Fabio

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#### THE VALLECORSIA SINKHOLES (FR, LATIUM) BETWEEN HISTORY AND CURRENT EVENTS

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*Key terms: SINKHOLES; CARSISSMO; VALLECORSIA; MONTI AUSONI; LAZIO*

Lazio is a land particularly affected by catastrophic collapses. It shows some areas where the sinkholes appear to be sporadic and, on the