



ISTITUTO NAZIONALE DI GEOFISICA E VULCANOLOGIA

## **Geological report at the seismic station IV.BIOG – Ariano Irpino (AV)**

### **Report geologico per il sito della stazione sismica IV.BIOG – Ariano Irpino (AV)**

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Subject: <b>Final report illustrating the geological setting for station IV.BIOG</b>	



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## 1. INTRODUCTION

The geological description is related to the site of studied seismic station. The coordinates are reported in Table 1.

**Table 1.** \*

CODE	NAME	X [ITRF]	Y [ITRF]	ELEVATION [m]
IV.BIOG	Ariano Irpino (Av)	4639830.044	1254753.362	676.9
ADDRESS	Via Camporeale Area P.I.P. - Ariano Irpino (AV) Italy			

\* Coordinates from RING INGV (Dec. 2019)

## 2. TOPOGRAPHIC AND GEOLOGICAL INFORMATION

Topographic information related to the site are reported in Table 2. Table 3 summarizes all available geological maps from literature for geological analyses.

**Table 2.**

Topography	Description	Topography Class	Morphology Class	EC8 Class
	Flat surfaces, isolated slope and reliefs with slope $i \leq 15^\circ$	T1	P*	C

\*According to nomenclature of ITACA (Dec. 2019)

**Table 3.**

<b>Geological map</b>	<b>Source</b>	<b>Scale</b>
IV.BIOG	Geological map of Italy 1:100.000- sheet 174 - Ariano Irpino	1:100.000

In Table 4 Geological, Lithotechnical Units are described and are concerned to maps of following chapters. The term “deduced” means the result comes from an interpretation of a preexisting data according to the nomenclature of Seismic Microzonation classification; Technical Commission MS, 2015.

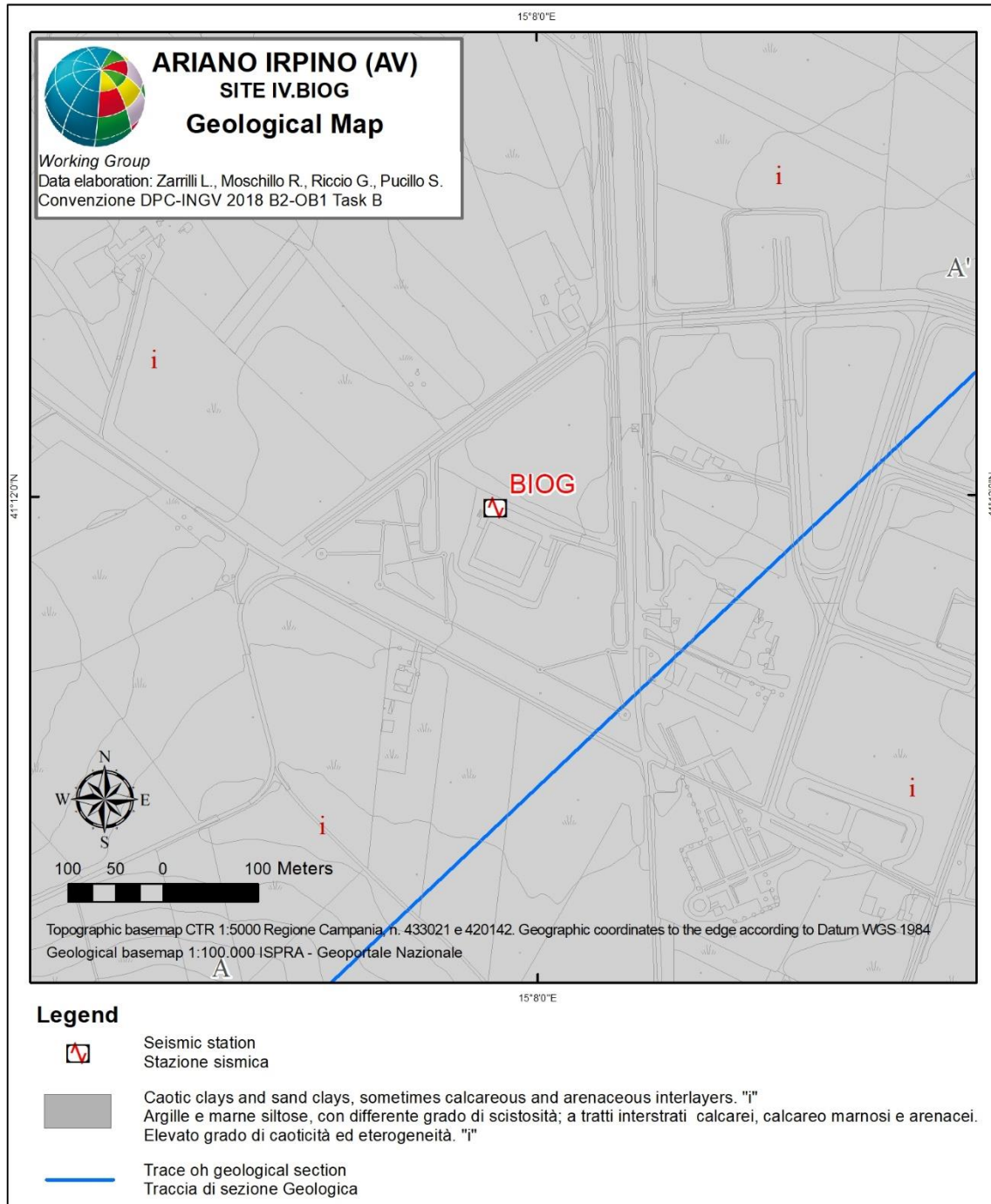
**Table 4**

<b>GEOLOGICAL UNITS</b>		<b>LITHOTECHNICAL UNIT</b>	
<i>deduced. According to the nomenclature of geological map of Italy 1:100.000- sheet 174 - Ariano Irpino.</i>		<i>(MZS) original</i>	
<b>code</b>	<b>description</b>	<b>code</b>	<b>description</b>
i	predominantly silty clays and marls with different degrees of schist, sometimes calcareous and arenaceous interlayers.	SFCO	Over-consolidated fractured/altered



### 3. GEOLOGICAL MAP

In Figure 1 Geological Map is reported in a 1kmx1Km square around the station.

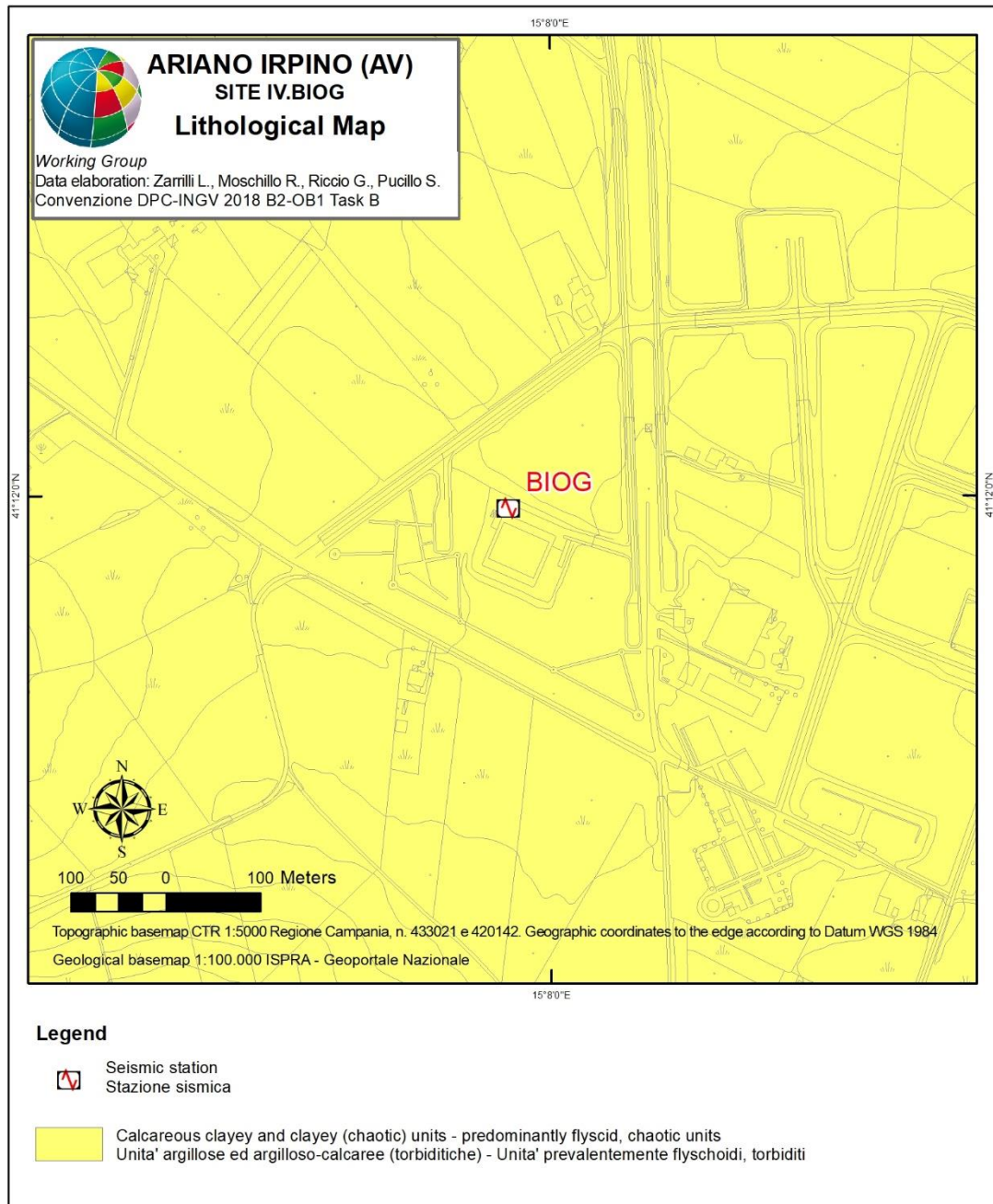


**Figure 1.** Geological map of seismic station IV.BIOG. Scale 1:5.000. Geological units are established according to the nomenclature of geological map of Italy 1:100.000 (Sheet 174-Ariano Irpino).



## 5. LITHOLOGICAL MAP

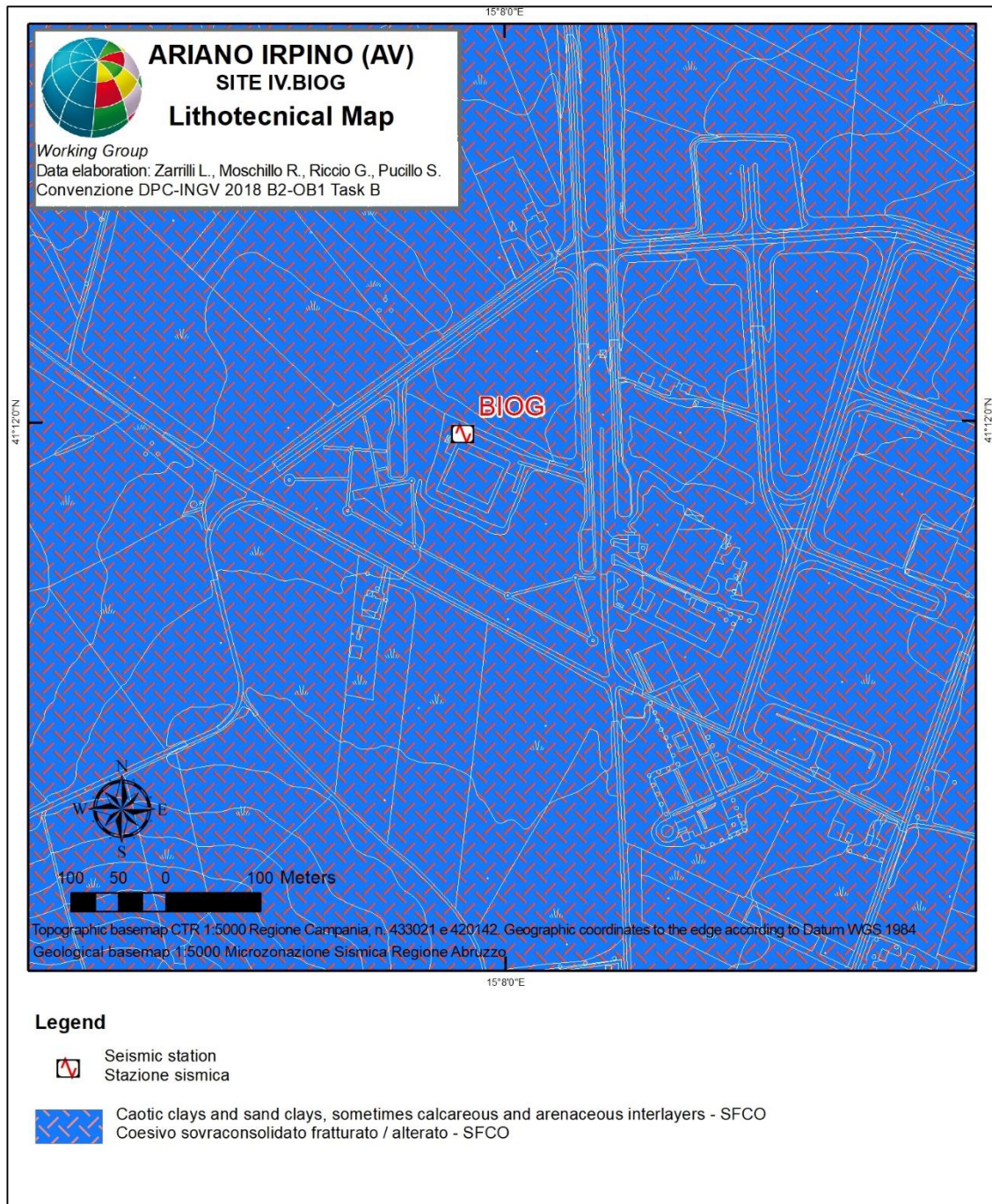
In Figure 2 Lithological Map is reported in a 1kmx1Km square around the station.



**Figure 2:** Lithological map of station IV.BIOG Scale 1:5.000. The codes of the lithological units are assigned according to the nomenclature of the Lithological map ISPRA 1: 100.000.

## 5. LITHOTECHNICAL MAP

In Figure 3 Lithotechnical Map is reported in a 1kmx1Km square around the station.

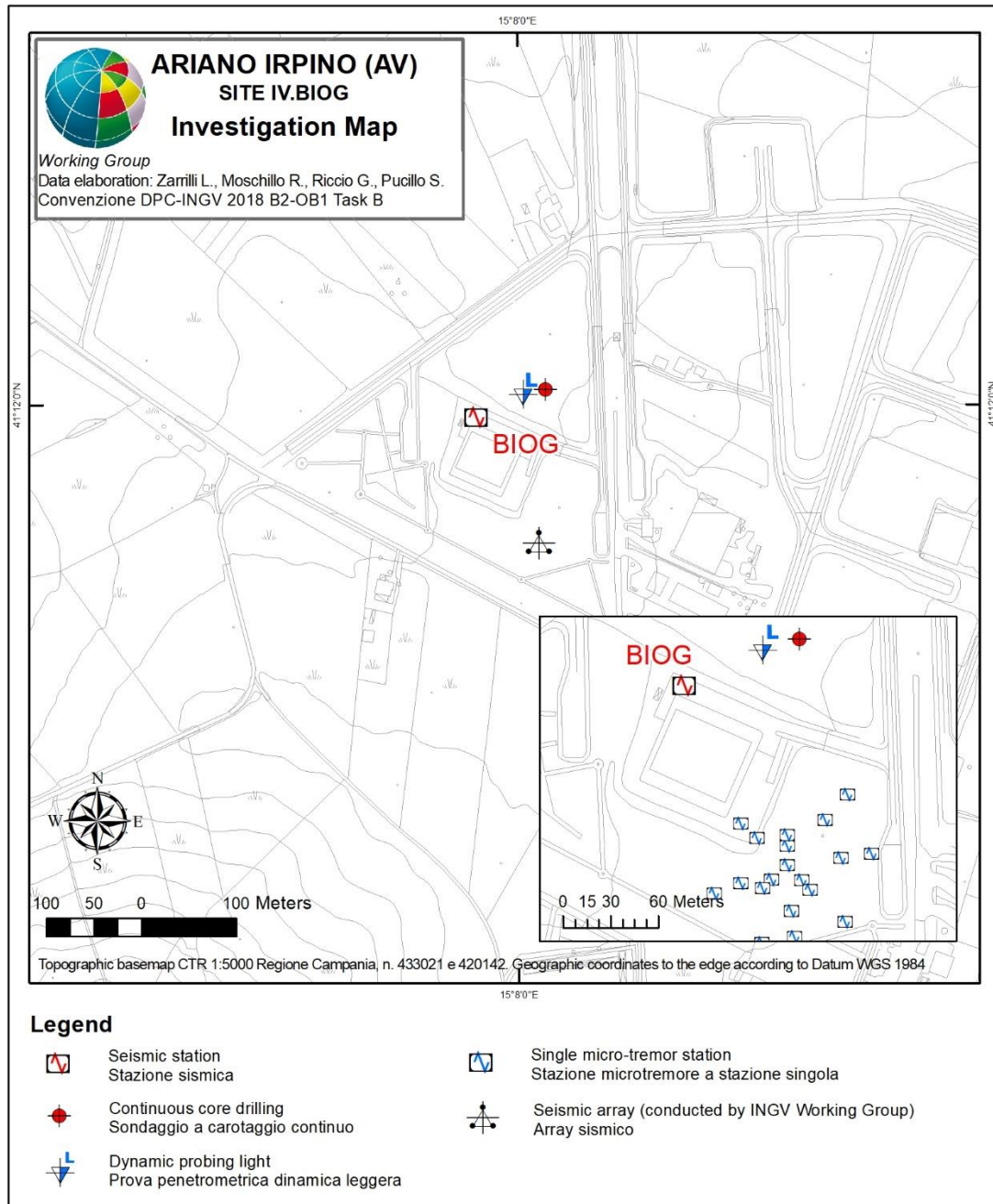


**Figure 3:** Lithotechnical map of the seismic station IV.BIOG. Scale 1:5.000. The lithotechnical units are deduced according to the nomenclature of Seismic Microzonation (Technical Commission MS, 2015)

## 6. SURVEY MAP

Figure 4 shows the survey Map reported previous geotechnical investigations used for the characterization of the area, finalized to the realization of buildings near INGV seismic and GPS station (BIOG) and and geophysics surveys conducted by INGV Working Group.

Convenzione DPC-INGV 2019-21, All.B2- WP1, Task 2: "Caratterizzazione siti accelerometrici" (Coord.: G.Cultrera, F. Pacor)  
Cite as: Working group INGV "Agreement DPC-INGV 2019-21, All.B2- WP1, Task 2", (2019). Geological report at the seismic station IV.BIOG - Ariano Irpino (AV) . <http://hdl.handle.net/2122/12983>



**Figure 4:** Map of the surveys near the station IV.BIOG. Scala 1: 5.000. The box at the bottom right contains a zoom of the area with the detail of the inside investigations conducted in the area.





## 7. GEOLOGICAL MODEL

### 7.1 General description

The area affected by the present work is characterized by the presence of marine Pliocene deposits resting on Miocene flysch sediments and/or on soils attributable to the Lagonegrese Units.

During the geological survey of the area the following stratigraphic terms were identified:

- Continental Quaternary deposits
- Ariano Unit (Blue gray Clays)
- Varicolored Clays Unit

The area under examination is characterized by outcrops of predominantly clayey lithotypes attributable to the complex of varicolored Argilloscists.

#### UNIT OF VARICOLORED CLAYS

The unit of Varicolor Clays is easily recognizable both for the lithotypes present and for the particular imprint given to the landscape.

In correspondence of the outcrops the Varicolored Clays appear in their usual way, as a heterogeneous and chaotic set, with the prevalence in some areas of the clay fraction - consisting of clays from the easy divisibility into more and more minute flakes, variously colored in black, gray, green, red wine - and in other parts from the stone fraction given by calcareous sandstones, or from fine-grained marly limestone, such as blocks, fragments, or whole packs of layers. Often, included in these soils, we find large blocks of Mesozoic limestones and crushed marl (olistolite) torn from the substrate during the advancement of the covering coulters. The stratigraphic position of the Varicolor Clays is not well definable due to their intercalation to several heights of the Miocene and limitedly Pliocene stratigraphic sequences; the latest studies concerning the geology of the southern Apennines, and in particular the areas in question, assimilate the varicolored clays under consideration to the lands attributable to the Red Flysch.



## STRUCTURAL GEOLOGY

According to what reported in the official geological cartography (Geological Map of Italy scale 1: 100.000) the area under examination is not affected by large tectonic discontinuities and, during the surface geological survey, no faults were identified or other tectonic elements, that could compromise the stability of the area.

The only contact of probable tectonic origin is present in the southern part of the surveyed area and puts the Pliocene Blue Clays in contact with the Varicolored Clays. (Geological map of Italy sheet 174 (Ariano Irpino)).

## Local GEOLOGY

As previously reported, in the study areas the "clayey-marly" member (Am) of the Varicolored Clays emerges extensively.

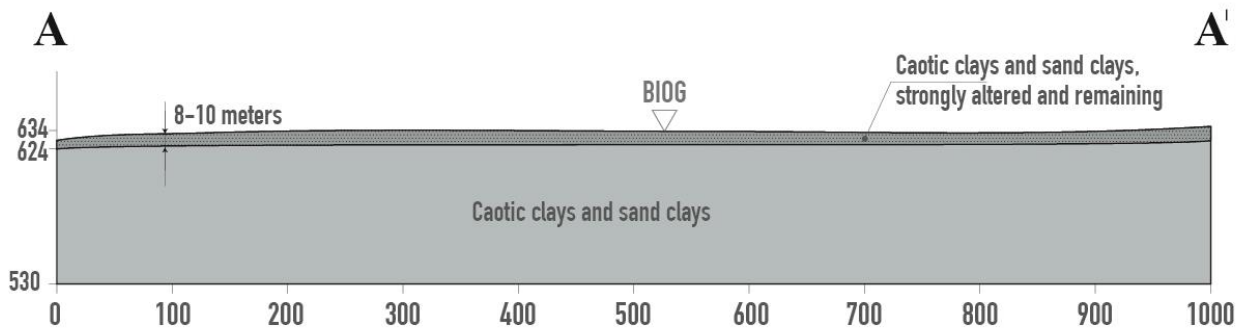
So, the whole area is characterized by the presence of a covering surface of agrarian soil and landfill of small and variable thickness (between 2 and 3 m), and black-brownish color, with volcanic elements: these are paleosoils derived from the alteration and rearrangement on site of the basic formations (varicolored clays complex).

Since the basement formations are represented by clays, the paleosoil cover assumes a clay-silty composition, with a high percentage of organic substances, it results, therefore, soft and yielding, very porous but at the same time not very permeable, for which it can absorb a lot of water and reach a very high degree of saturation.

The "Am" complex (Cretaceous - Miocene Inf.), which developed through late-orogenic processes of gravity-induced sliding, represents the local basement, At least for a depth of several hundred meters.

It is made up of clays and clayey marls with translucent surfaces of schistosity, of greyish color to reddish and greenish bands, to places with subordinate intercalations of marly limestone, calcarenites and calcilutites in layers and thin layers.

Generally, but not in the area near BIOG station, the latter include lithoid terms from pre-Pliocene formations and olistoliths of extremely variable size (up to tens of millions of cubic metres).



**Figure 5:** Geological cross section: A-A'.

## 7.2 Geological Section

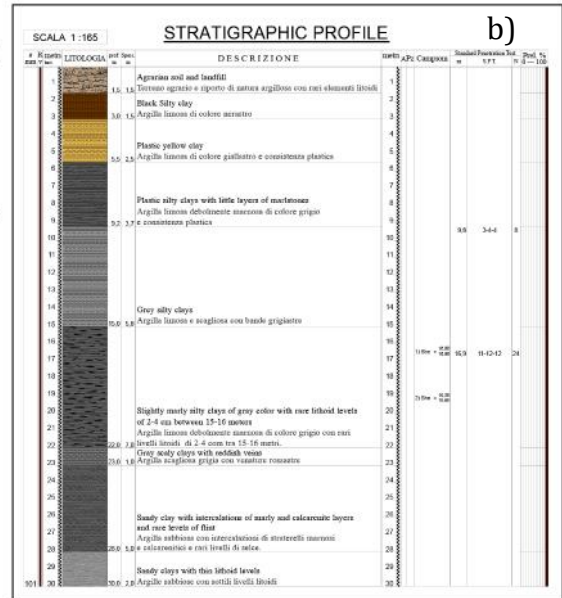
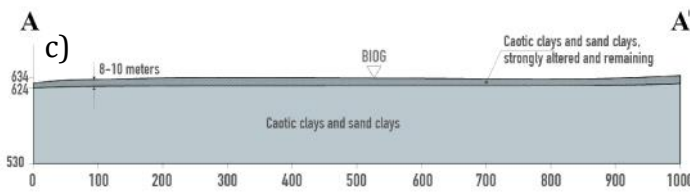
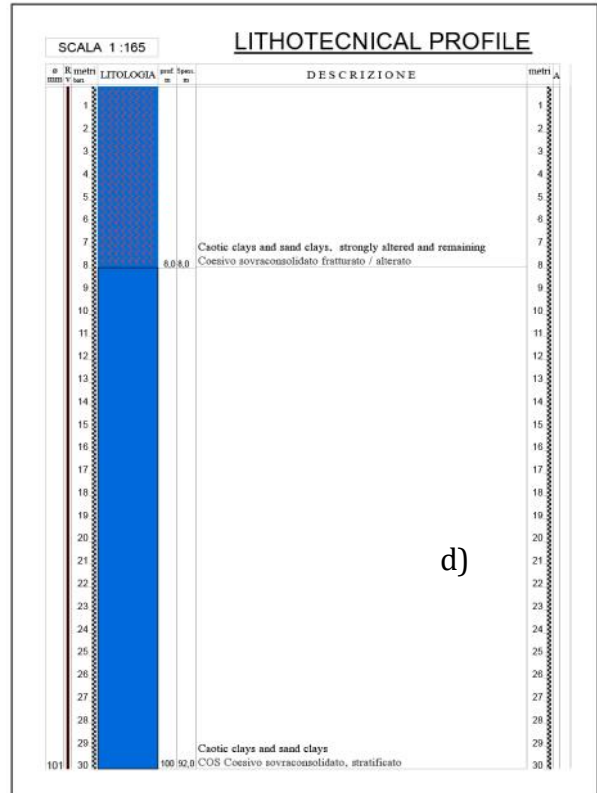
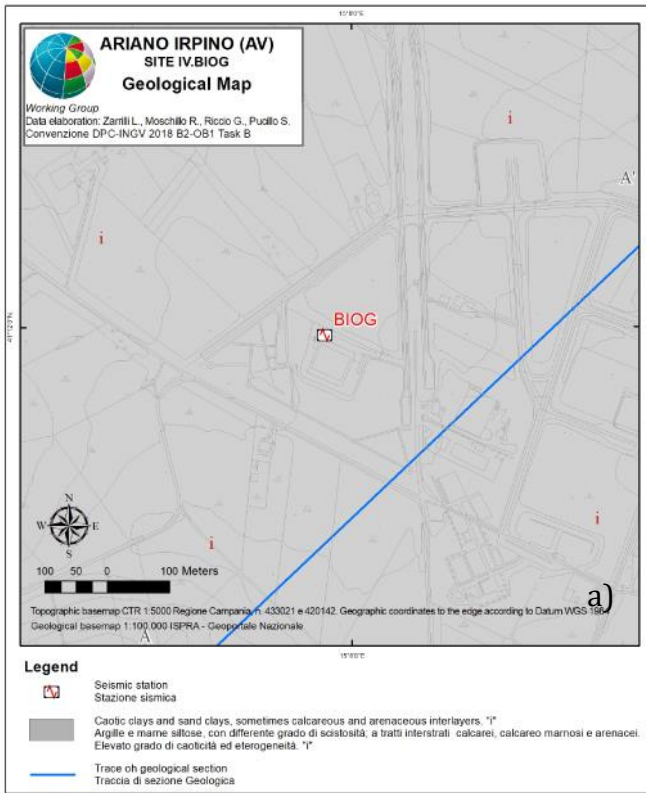
A knowledge of the station site subsurface is available, thanks to a stratigraphic continuous core drilling and geophysics surveys conducted by INGV Working Group.

Looking at results we can see that the shallower portion (8/10 m) consists in black clays and sandy/silty clays altered and reworked, including sandy or argillaceous silts. Practically this level represents the altered substrate.

Under this cover, there is the substrate represented basically by marly clays, previously named *“the clayey-marly” member* (Am) of the Varicolored Clays.

## 7.3 Subsoil model

A subsoil model is built up a depth of 100 m for the area around the IV. BIOG station (Figure 6) based on geological information, and data extracted from a private geological and geotechnical report. According to structural and all literature data the substrate consists of the varicolored clays complex. The geological model proposed in this report is in agreement with the velocity profile obtained from data analysis of geophysics surveys (array) conducted by INGV Working Group.



**Figure 6:** Geological Map (a). Subsoil model under the IV.BIOG seismic station according to continuous core drilling (b). Geological cross section (c). Lithotechnical Profile according to Seismic Microzonation (MS). (d).



## 8. REFERENCES

Commissione Tecnica per la Microzonazione Sismica (2015). Microzonazione sismica. Standard di rappresentazione e archiviazione informatica, Versione 4.0b (Commissione tecnica inter-istituzionale per la MS nominata con DPCM 21 aprile 2011)

CTR (Carta tecnica regionale – Regione Campania)

<https://sit2.regione.campania.it/servizio/carta-tecnica-regionale>

EN 1998-5 (2004). Eurocode 8: Design of structures for earthquake resistance - Part 5: Foundations, retaining structures and geotechnical aspects, CEN European Committee for Standardization, Bruxelles, Belgium.

Geological Map of Italy - 1:100.000 - Sheet 174 - Ariano Irpino. ISPRA

[http://193.206.192.231/carta\\_geologica\\_italia/tavoletta.php?foglio=174](http://193.206.192.231/carta_geologica_italia/tavoletta.php?foglio=174)

Geological report supporting the project to expand the structure for the Genetic Research Institute “Biogem” – Via caporeale – Ariano Irpino (AV) - Dott. Geologo Egidio Grasso

INGV Working Group geophisic report IV.BIOG – Camporeale-Ariano Irpino.

<http://hdl.handle.net/2122/12955>

Luzi L, Pacor F, Puglia R (2019). Italian Accelerometric Archive v3.0. Istituto Nazionale di Geofisica e Vulcanologia, Dipartimento della Protezione Civile Nazionale. doi: 10.13127/itaca.3.0.

Notes attached Geological map of Italy sheet 174 (Ariano Irpino) and geological survey

Norme Tecniche per le Costruzioni (NTC08). Ministero delle infrastrutture e dei Trasporti (2008). Decreto Ministero Infrastrutture. GU Serie Generale n. 29 del 04-02-2008 - Suppl. Ordinario n. 30.

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