Introduction. Although the Italian seismic compilations are among the best and back-in-time extended catalogues of the world, with earthquakes on record even before the Common Era (e.g., 461 BC in Rome), we have surely lost the memory of dozen strong events of the historical period, mostly in the first millennium AD. In the lack of written sources, the only way to infer the occurrence of an ancient earthquake in a settlement is to gather as much evidence as possible from archaeological excavations. This happens usually by investigating the existence of collapses/ restorations/ reconstructions of buildings, the general re-organization of the urban texture or, even, the abandonment of the settlement. Exceptionally, this goal is achieved thanks to the discovery of epigraphs mentioning more or less explicitly the effects of the earthquake.

Here we present the case of Buccino, the former Roman municipium of Volcei, a settlement located since the Iron Age close to the Apennine divide, between Campania and Basilicata regions (Fig. 1). This sector of the chain is dominated by active NE-SW extension, mainly accommodated by NW-SE normal faults which sourced some among the strongest earthquakes of the Apennines. Indeed, Buccino was heavily damaged (8 MCS degree) by the 1980 Irpinia earthquake (Mw 6.9), with the thirty-year reconstruction activities providing an amazing opportunity to rediscover the buried remains of the Roman town. As the seismic history of Buccino was known to be quite destructive, at least relatively to the past six centuries [e.g., earthquakes in 1466, 1561 and 1857; Is 8-10 MCS: Galli et al. (2006), Castelli et al. (2008), Galli and Peronace (2014)] the recognition of widespread, seismically induced damage to the ancient structures was not an unexpected discovery, allowing the extension of our information well behind the memory of the written Modern sources.
The late third century BC event (Santo Stefano sanctuary area). Due to the presence of everlasting soil creep and earth flow, the sacred area of Santo Stefano (NE of Buccino), occupied since the 8th century BC, actually provided not-univocal indication of coseismic damage. However, these might consist of widespread collapses and destruction layers of 4th century BC buildings, indicating an abrupt end of the settlement on the terraces occupied by the sanctuary and by the necropolis in the last decades of the 3rd century BC. In the uppermost terrace, a farm was built over the sanctuary walls, suggesting the overall abandonment of the sacred site, which was successively buried by alluvial and colluvial deposits.

The first century AD event (Volcei). During the reconstruction works following the 1980 earthquake, many indications of coeval collapses, butti (stacks of archeological debris), fills and leveling of destroyed buildings were found everywhere in Buccino. Moreover, there was evidence of restoring and/or rebuilding of several houses, with the reutilization of architectural elements from the previous buildings, such as architraves and epigraphs, beside the existence of a coeval epigraph mentioning explicitly the restoration made after a collapse due to an earthquake. In the whole, all the indications point to an event falling in the second half of the 1st century AD, as summarized in the forthcoming points (see Fig. 2 for sites location).

- Forcella palace. Here the indications consist in a dumping grave containing domestic pottery (lamps and dishes) datable within the first half of the 1st century AD. As no sigillata chiara A pottery (early second half of 1st century AD) was found within the grave, the dumping age should falls at the onset of the second half of the 1st century AD.
- Castle. Over the southern side of the main 12th century Norman tower (i.e., Mastio, resting over the basement of a Roman temple), the excavations found a broad, wall-supported rubble fill, made by domestic material, bricks, tiles and limestone blocks. The fill, which was sealed upward by a concrete pouring, contains sigillata italic and Africana chiara A pottery, the latter datable at the end of the 1st century AD (max 60-70 AD). At the bottom of the fill, a coin of Emperor Tiberius (23-30 AD) provides a certain post quem term for
the rubbles mass which, in turn, was likely leveled between the late 1st and the early 2nd century.

- **Sotto San Nicola street.** Here another dumping grave of both building and domestic rubble has been found. It contains vases and lamps datable within the first half of the 1st century AD (i.e., sigillata italic, pareti sottili), being thus coeval with the Castle area fill.

- **Amendola square.** In this place three different dumping graves, all overlaid by a restoration floor, contain pottery shards with pareti sottili (early 1st century AD). Amongst these, the relic of a pot was found, with the skeleton of a dormouse still inside. At least one of the building facing the Decumanus was restored in the 2nd century AD, when also a porticus with four pillars was added to the house. One of the pillar supported a Osco-Latin epigraph, likely recalling the restoration of a nearby vicum venerlum [sic] in the 2nd century (G. Camodeca and A. La Regina, pers. comm.). We dated some charred materials belonging to the wooden structure of the porticus, which was finally buried by the whole collapse of this building in the Early-High Middle Age. The calibrated age (110-330 AD, 2σ cal.) fits the period of general restoration of the town, providing the ante quem term for the collapse.

- **Thermal baths.** Between the 1st and the 2nd century AD, the thermal baths were restored, their orientation was changed, whereas the floors were completely remade with mosaics.

- **Macellum.** In the same period, in the area of the macellum the two tholoi were dismantled, the macellum itself was abandoned, its remains were leveled and occupied by new workshops.

- **Salimbene house.** During the archaeological excavation, the abrupt collapse of a 1st century BC room ceiling has been found and removed. This has allowed to observe that the incannucciato ceiling collapse rest directly over the mortar floor, where it buries pottery shards of the 1st century AD (Fig. 3, left panel).

- **Caesareum temple.** Here, in the same period, an opus caementicum cistern was built for supporting the damaged retaining wall of the temple. Damages to this temple are testified also by an epigraph, as hereafter described.
Epigraph of Otacilius Gallus. This epigraph (Fig. 2), probably an architrave, recalls the collapse of the Caesareum, which was built around 50-60 BC. The text is: OTACILIVS EX TESTAMENTO OTACILI GALLI PATRIS CAESAREVM/ [TERRAE MOTV] CONLAPSVM P(ecVnia) [S(Va) R(estitVit)]. CVIVS OPER[IS] DEDICATIONE/ [DEDIT DECVRIONIBVS] (sestertios) XXX, AVGVSTA[L]IBVS (sestertios) XX, VICANIS (sestertios) XII, VX[ORIBVS]/ DECVRIONVM (sestertios) XVI, AVGVSTALIVM (sestertios) VIII, VICANORVM (sestertios) IIII. If the integration of the missing text is correct (Bracco, 1977), the Caesareum was destroyed by an earthquake occurred before the end of the 1st century AD, and then restored by Otacilius in the 2nd century (G. Camodeca, pers. comm.).

In the whole, the archaeological data evidence an abrupt discontinuity within the urban texture of the Roman Volcei, followed by a reconstruction phase focused between the 1st-2nd century AD. The great abundance of domestic pottery, tiles, bricks, stones in the dumping graves, summed to the existence of leveled rubble fills are the proof of extensive building collapses in the town. Moreover, the discovery of the pot with the dormouse, ready to be cooked when it was buried under the rubble, and the Otacilius’ epigraph, attesting the collapse of the Caesareum, are strong indications concerning the occurrence of this event. At the end, a further indication which could be evocative of a tragedy related to this earthquake derives from the funerary monument of Gresia Tertia, located only 10 km away from Volcey. Here, recent archaeological investigations unearthed an epigraph datable within the 1st century, where an infelix mater cries the death of her family, namely all the four sons and the father. Even if the cause is not declared, the simultaneous death of five person of the same family could really be related to the collapse of their house.

The Early-High Middle Age event(s). The evidence of this traumatic event are represented by the synchronous and total collapses of the buildings excavated below Amendola Square and in other neighboring insulae. Moreover, it is witnessed by the general abandonment of the surviving Late Antiquity buildings, which were still inhabited during the Langobardic period, and by the new urban topography that drifts apart from the Roman imprint, assuming a concentric...
path around the castle. It is difficult to provide a certain age for this earthquake, mainly because of the paucity of the Early Middle Age pottery. However, it could be constrained between the 7th-8th and the 12th century, even if we cannot exclude the occurrence of multiple events within this time span. **The set of indications can be summarized as follow.**

- **Amendola square.** The excavations have revealed the synchronous collapse of all the building surviving since the Late Roman times. Below the rubbles it has been possible to read the frozen history of these houses, with the different rezoning of each room during times, the wall restorations, the floors overlapping, the doorstep reutilization. The collapse affected all the masonry wall, the pillars of the porticus and the roofs which have been all found directly overlaying the floors (Fig. 3, right panel). This catastrophic collapse buried definitely also the *Decumanus* which was still in use and well maintained at least during the 7th century, as testified by the materials found in the ditches. At first glance, the collapse killed also a small sheep which was hit and buried by the rubble on the road *basoli*. The AMS collagen dating provided an age of 1034-1214 AD (2σ cal.). **Inside the porticated building,** beside the wall-plasters, the *incannucciato* ceiling, tiles and the masonry, it was possible to observe some walls and the four bricks-pillars which fell away from the road, burying *bande rosse* pottery (used all along the Early Middle Age).

- **Salimbene house.** An Early Middle Age cobble-wall was founded inside the fill burying the Roman buildings (Fig. 3). The pottery shards inside the foundation trench is the same as in Amendola Square, i.e. it contains *bande rosse* pottery. Therefore, this wall - successively collapsed over a nearby room - might suggest the onset of the reconstruction of the Early Middle Age Buccino after and over the earthquake rubble.

As aforementioned, the dating of these collapses is problematic. Indeed, whereas the pottery shards involved and buried by the collapses predate the second millennium, the AMS dating of the sheep buried under the rubble indicates the onset of the new millennium. This might suggest that an event occurred between the uppermost and lowermost limits of the two terms, i.e. around 1000 AD. Indeed, on October 25, 989, a powerful earthquake hit this region (see Figliuolo and Marturano, 2002). Damage was recorded up to Ariano Irpino, and to the far-away town of Benevento. The strongest effects were focused on the broad upper Ofanto Valley, where coeval sources are complemented by archaeoseismic evidence, and supported in places also by radiocarbon dating of materials buried under the collapses (Galli, 2010). This suggests that Conza, Ronza, Montella, Rocca San Felice, Sant’Angelo dei Lombardi, and Frigento experienced severe damage, as Buccino likely did. However, this framework is complicated by the presence of a late historical source who mentions an earthquake occurred at the times of Pope Callistus II (1119-1124), the destructions of which were still visible in Buccino, in the “*horti...nella parrocchia de S Maria Sollitta...*” (from a drawing of B. Bardario, 1589; Biblioteca Angelica di Roma). The period of Pope Callistus fully matches the AMS age of the buried sheep, although it is not consistent with the time-span suggested by the pottery. Nevertheless, considering the high frequency of earthquake occurrence in this region (Galli and Peronace, 2014), we cannot exclude that more than one event hit Buccino just before and after 1000 AD, cumulating damage and collapses of the highly vulnerable Middle Age buildings. As a matter of fact, in one of the house below Amendola Square, the archaeologists unearthed a small lime furnace that was operating at the time of the collapse. The furnace overlays a thin abandonment level on the floor, suggesting that men were working inside an uninhabited house. Thus, an attractive hypothesis, that does not claim to be conclusive, is that while works were in progress for repairing the damage of the 989 earthquake, another event caused the complete collapse of the buildings around 1120 AD and the definitive burying of the ancient Decumanus.

**Discussion and conclusions.** An unexpected and tragic event, such as the Mw 6.9 Irpinia earthquake, allowed to rediscover the buried relics of the Roman municipium of Volcei. The further amazing circumstance is that below the ruins of the last earthquake the archaeologists have found a palimpsest of constructions/ collapses/reconstructions attributable to as many
seismic events that, each time, have partly allowed the freezing of the buildings history below their own rubble. Although sometime the unraveling of this tangled skein of construction/destruction events is a very hard task, we have collected several indications from different sectors of the town that suggest the occurrence of different earthquakes striking Volcei/ Buccino in the past. Leaving aside the destruction of the sacred structures of Santo Stefano, occurred in the late third century BC event in an area widely affected by earth flow and landslides, our data indicate a strong, destructive event occurred in the second half of the 1st century AD. This earthquake, which is unknown to the seismological compilations, could be related to the one found by means of paleoseismological analyses across the Mount Marzano Fault System (MMFS in Fig. 1; Galli and Peronace, 2014), i.e. the same structure that caused the 1980 earthquake. Alongside the archaeoseismic indications, this event is recorded by an epigraph that, although incomplete, clearly mention the collapse of the Caesareum. A very speculative hypothesis concerning this event is suggested by its concurrence with the so-called Pompei earthquake in 62 AD. As the strong earthquakes sourced by the Mount Marzano Fault System always induce high intensity effects in the Naples area (e.g., 7 MCS degree in both 1694 and 1980 events), it could be possible that the damage quoted by the historical sources in the ancient Pompei, as in Naples, Ercolano and Nocera (e.g., Seneca in his Naturales quaestiones) was the far-field effects of the same Irpinia earthquake that struck Volcei.

Another disruptive event, or perhaps two occurred close-in-time, is supported by the collapses and reconstructions datable around the year 1000 AD, that we have associated to the known 989 earthquake and/or to an unknown event around 1120.

More archaeoseismic indications related to later earthquakes, such as the 1466, 1561 and 1857 events, were not presented here, but together with those that we have discussed strengthen the ability of archaeoseismology in identifying and dating strong shaking events which are not recorded, or are poorly constrained in the current seismic compilation.

References