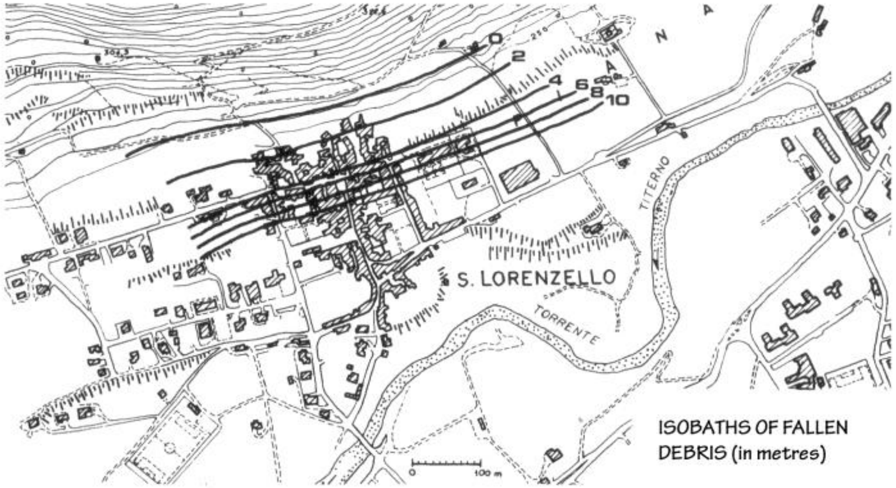
Paolo Beneduce, Ferruccio Ferrigni

THE INVISIBLE SITE: HOW DID THEY KNOW?

When trying to reconstruct and update the community's earthquake culture, the experts at once asked themselves this question: what did the first inhabitants of the village, who chose the site and then opted to expand on one side rather than the other, know about the seismicity of the area?

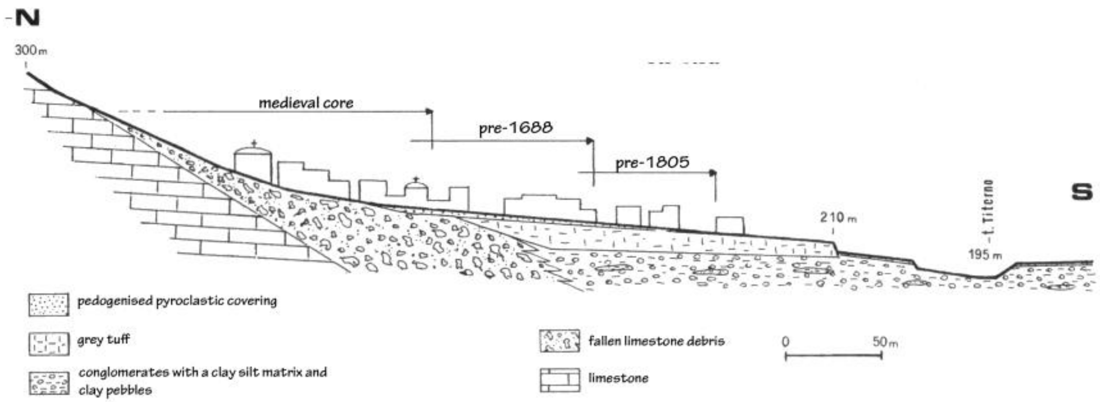
To reconstruct this aspect of the system's earlier earthquake culture a model of the subsoil was built using present-day knowledge and then, in a search for clues as to how an understanding of the subsoil affected the choices made by the community, it was compared with presumptive models of older times and finally with analyses of the architecture, with observed anomalies and the spread of further housing construction.

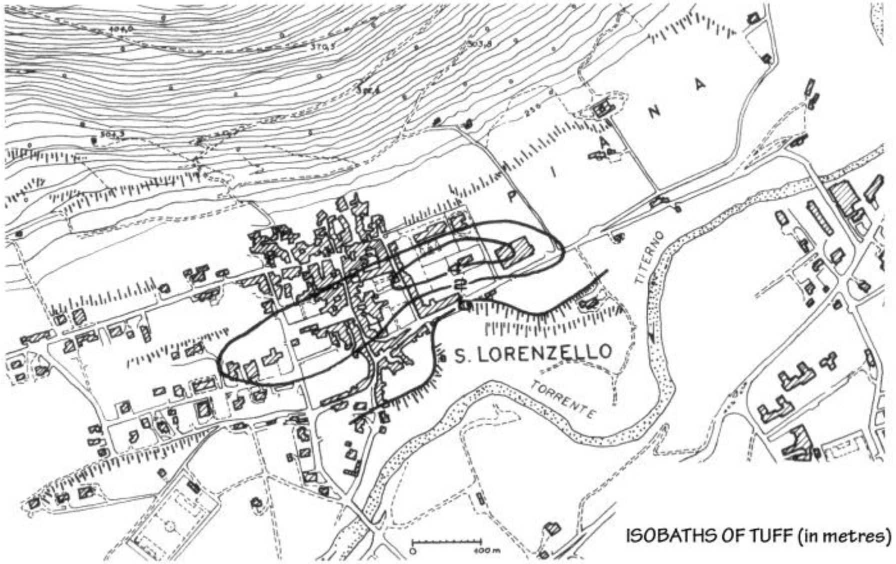


What we know today

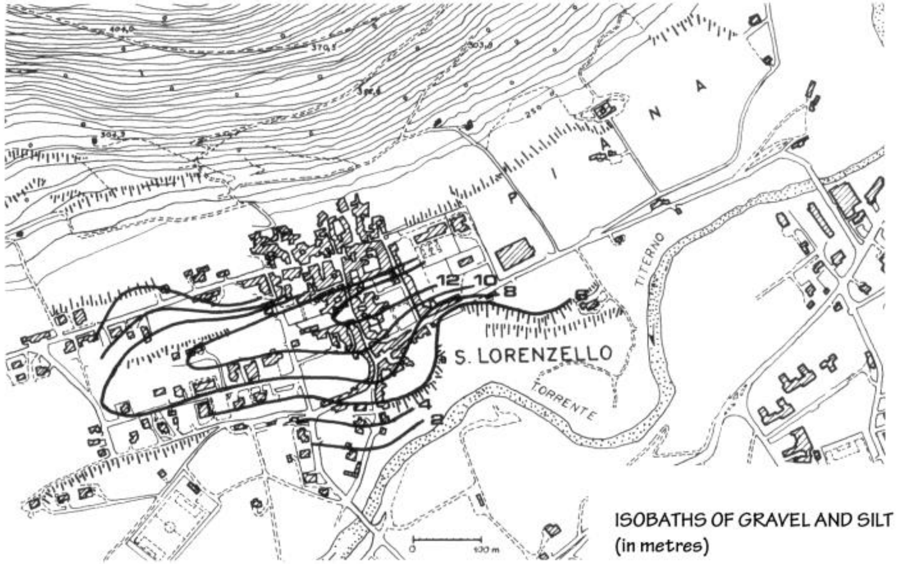
The historic centre of San Lorenzello is located on a river terrace of the middle course of the Titerno. The stratigraphy of the terrain is known from mapping its surface geology and a series of exploratory drillings. It is made up of gravel, fluvial in origin, mixed with alluvium and sand, with a large amount of lenticular clay, grey tuff, a pedogenised pyroclastic covering, and fallen deposits of limestone debris not cemented by limestone.

The stratigraphic relationships between these types of rock change as one moves away from the river towards the mountain. Close to the river, the river gravel is overlain by tuff, whilst closer to the mountain the tuff is finer, lying directly on fallen limestone debris which in turn overlies the limestone which crops out at altitude. The maps on the next few pages contain data from field surveys and show the depths of the rock types mentioned (isobaths) and their thicknesses (isopaques). The north-south geological section through the centre shows the existing stratigraphic formations.

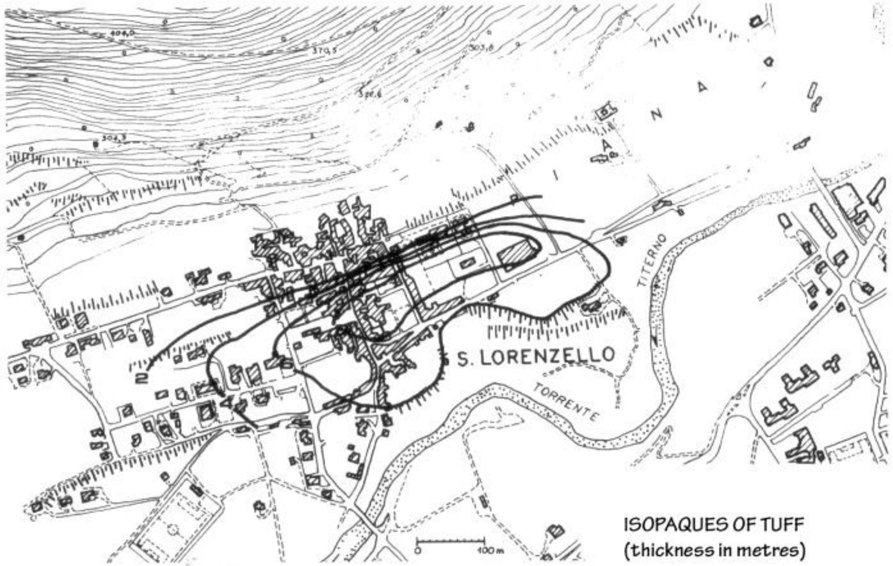




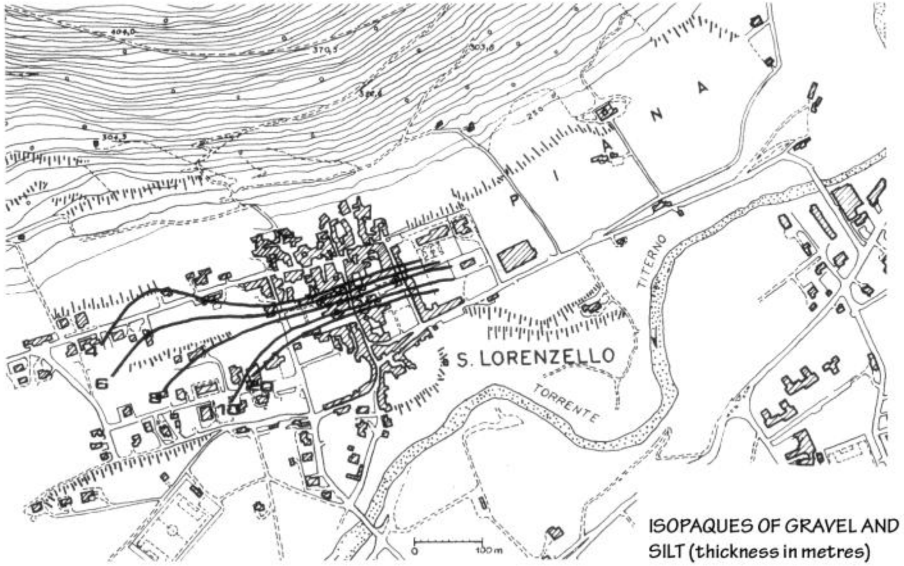
ISOBATHS OF TUFF (in metres)



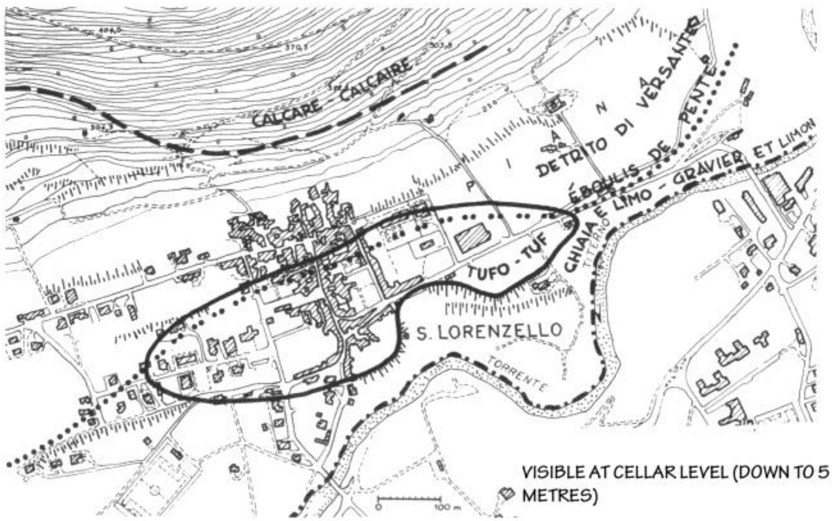
ISOBATHS OF GRAVEL AND SILT (in metres)



ISOPAQUES OF TUFF (thickness in metres)



ISOPAQUES OF GRAVEL AND SILT (thickness in metres)



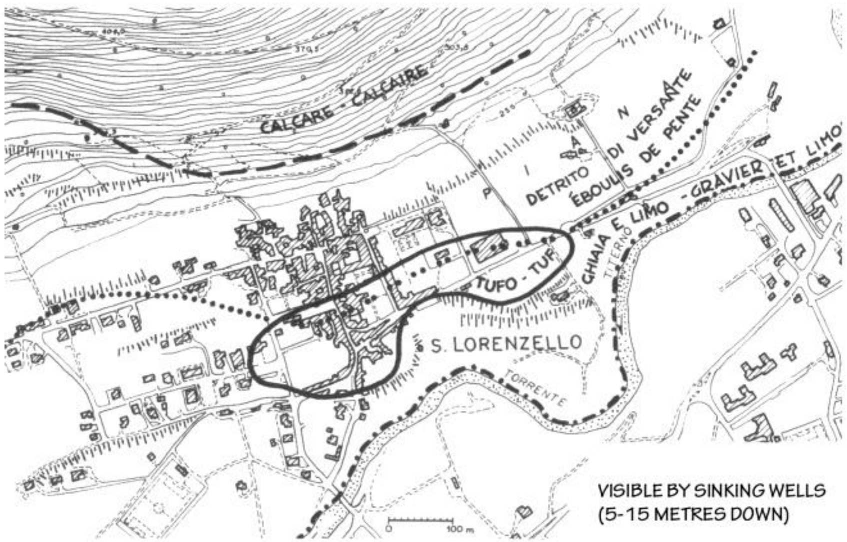
VISIBLE AT CELLAR LEVEL (DOWN TO 5 METRES)

What they knew in earlier times

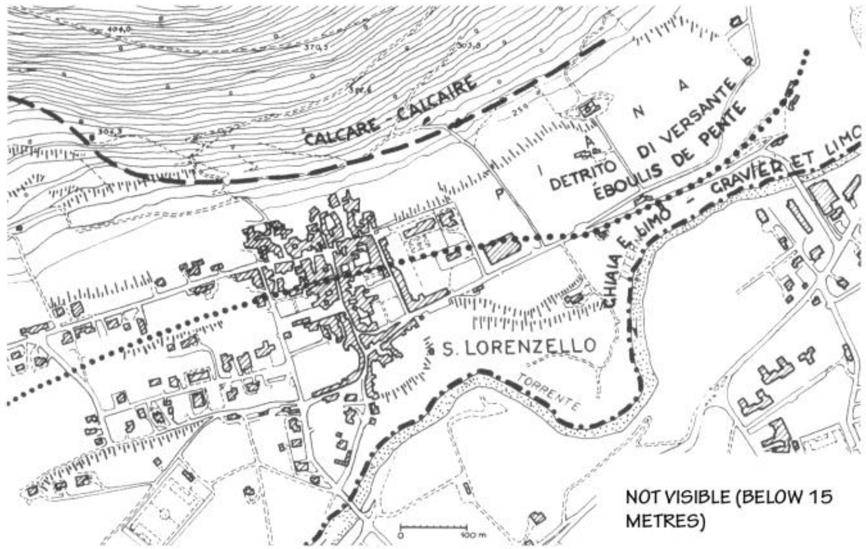
Earthquake culture in earlier times was necessarily empirical and global: earthquakes happened whether one chose safe sites or not.

We now know that the effects of an earthquake depend not only on its intensity but also and primarily on the nature of the terrain which determines seismic response. It used to be enough to say that one region "suffered" less than others for it to be classified immediately in the popular mind as "safe". But we should not forget that the community was also capable of having some direct understanding of the characteristics of the subsoil, at least of its upper surface. People could thus draw useful lessons from the seismic behaviour of different materials by observing how they reacted to earthquakes.

Information about the subsoil was doubtless gained during the digging of foundations, cellars and wells. We thus combined isobath maps (depth at which a given material is found) and isopaque maps (thickness of the stratum). We then compiled a new map showing what can (and could) be seen when foundations, a cellar or a well were dug at depths which, in San Lorenzello, vary from 0-5 m, 5-15 m or deeper.



VISIBLE BY SINKING WELLS (5-15 METRES DOWN)



NOT VISIBLE (BELOW 15 METRES)

From knowledge to an earthquake culture

In an effort to ascertain how understanding of the subsoil helped to shape the community's earthquake culture we superimposed a graph of seismic risk (prepared by the team of Prof. Luongo, Director of the Vesuvius Observatory in Naples) on to the stratigraphic section and its illustration of how the areas of settlement expanded in relation to major earthquakes. This operation gave the lie to one widely-held belief, threw up a number of hypotheses and confirmed the validity of the method.

It was found that the site of the first settlement was anything but safe, indeed it was dangerous. Later, however, the settled area spread towards increasingly safer areas. The risk curve prompted a debate which involved all the disciplines represented in the team and led to a global hypothesis concerning the history of San Lorenzello and its earthquake culture in relation to the site, which we outline below:

The medieval village occupies the highest part of the slope where the limestone starts to crop out. Because of this no foundations are needed and the fertile covering of tuff is preserved. The 1456 earthquake and especially that of 1688, however, show that despite these advantages the location is not very safe or has rapidly become unsafe (deforestation, cf. page 36). The highest part probably suffers more damage than the part lower down, partly because the seismic response of the terrain is more violent and partly because it is directly exposed to landslides down the mountain.

The sector of the village above the Via Muro Filippo is abandoned; rebuilding and further development tend to be towards the tuff, which is seen as safer. Moreover, it is possible to dig cellars into the tuff, which is not the case with limestone debris; and steady deforestation has led to more and more landslides, with rocks breaking away from the fractured ridge and often falling right down to the village (still the case today: cf. Mauro, *Danger signs*).

Clearly other factors have also influenced this process. For example, the water table tends to be higher the closer it is to the river, and this makes it easier to sink wells. The layer of tuff means that the materials obtained can be used in digging cellars for housing construction.

But this in no way invalidates the analysis and historical hypothesis we outline here. The earthquake culture of earlier times was not specialised. It was merely one aspect of the intelligent use of the rare resources available. All the more reason to review it using a global, systemic and multi-disciplinary approach.

THEORETICAL CURVE OF SEISMIC RESPONSE OF SITE