

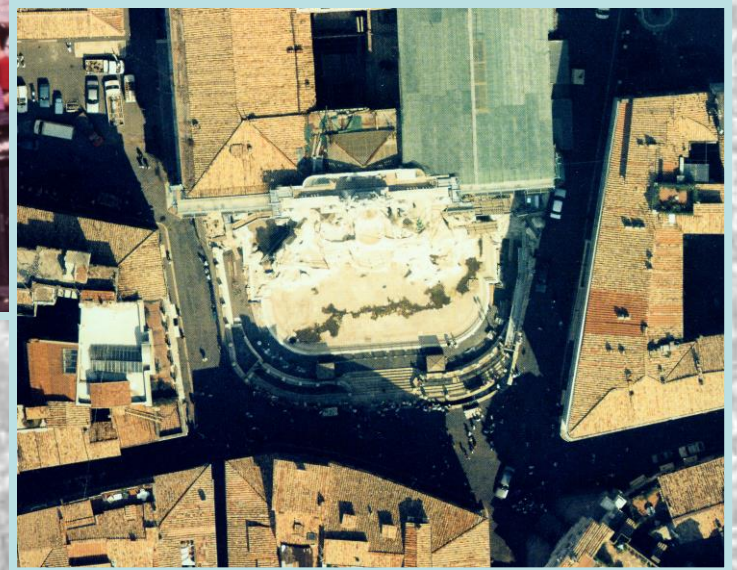
# The Link Between Rome's Geologic Setting to its Past, Present, and Future

Grant Heiken

Freeland, Washington, USA



Trevi Fountain—Nicola Salvi, 1732-1762



## Quirinal





**Viminal**

**Esquiline**

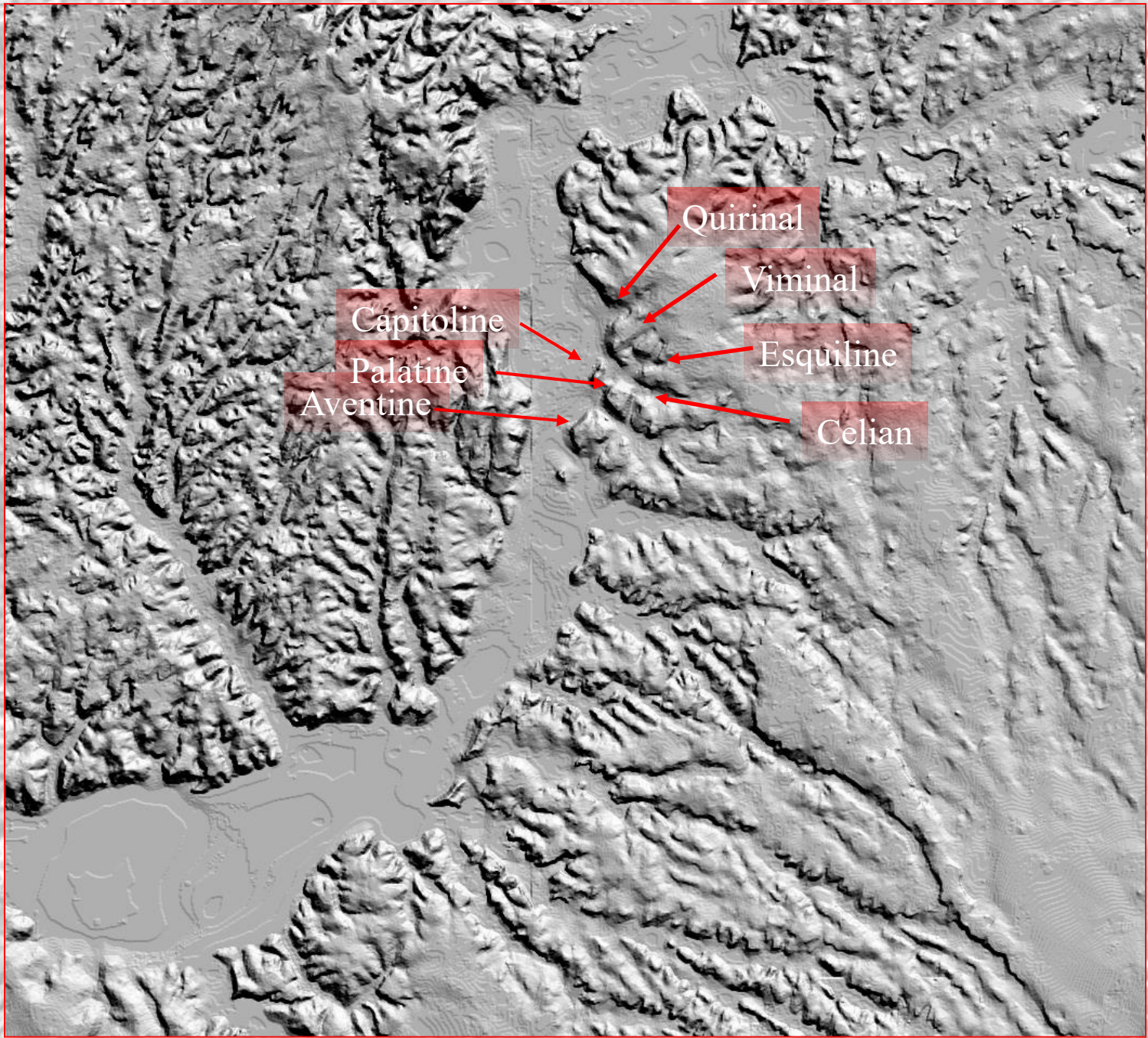
**Capitoline**

**Palatine**

**Celian**  
(back of Palatine)

**Aventine**





Capitoline

Palatine

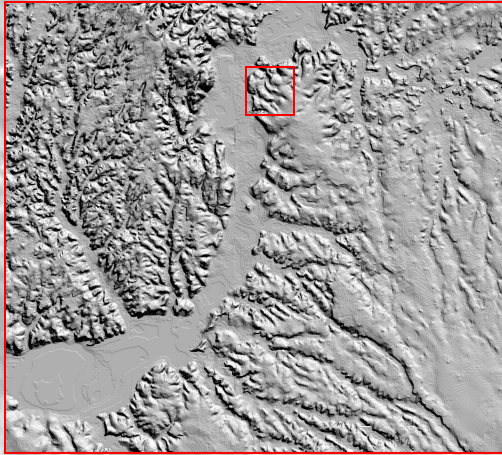
Aventine

Quirinal

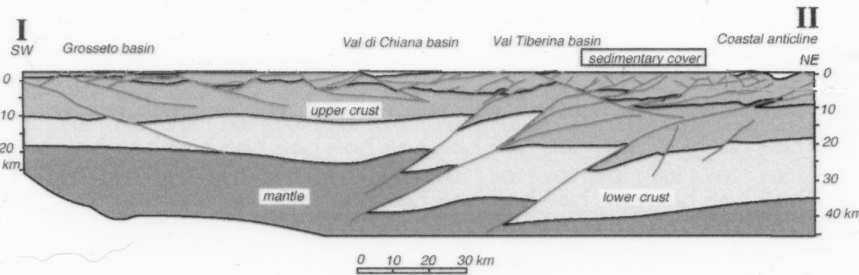
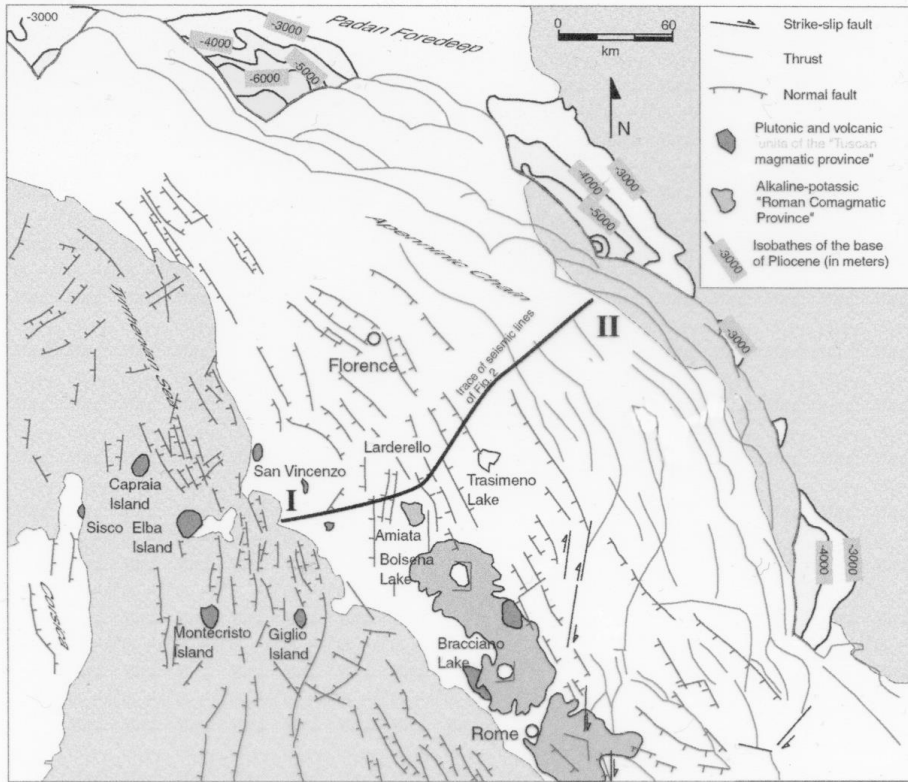
Viminal

Esquiline

Celian



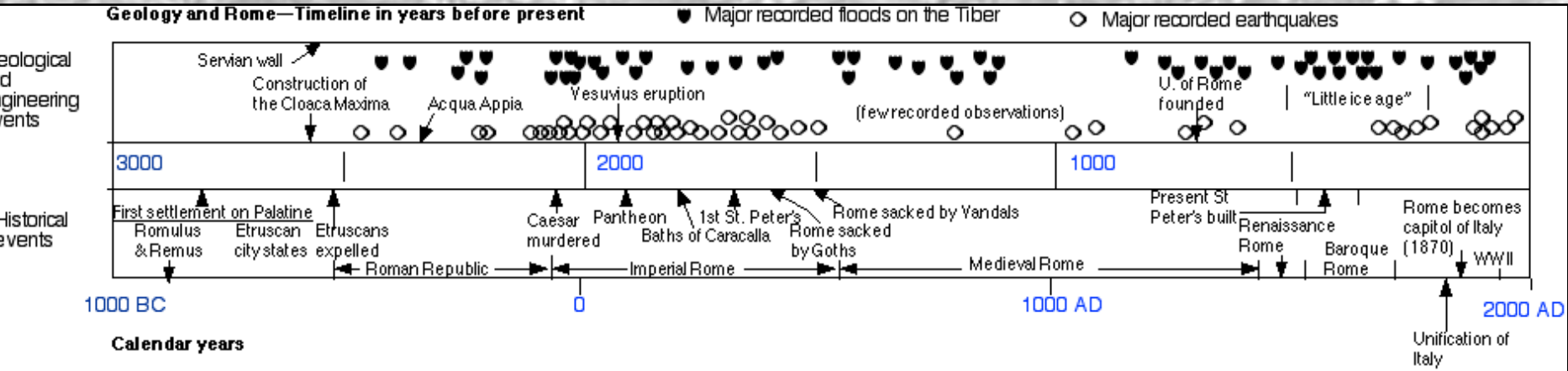
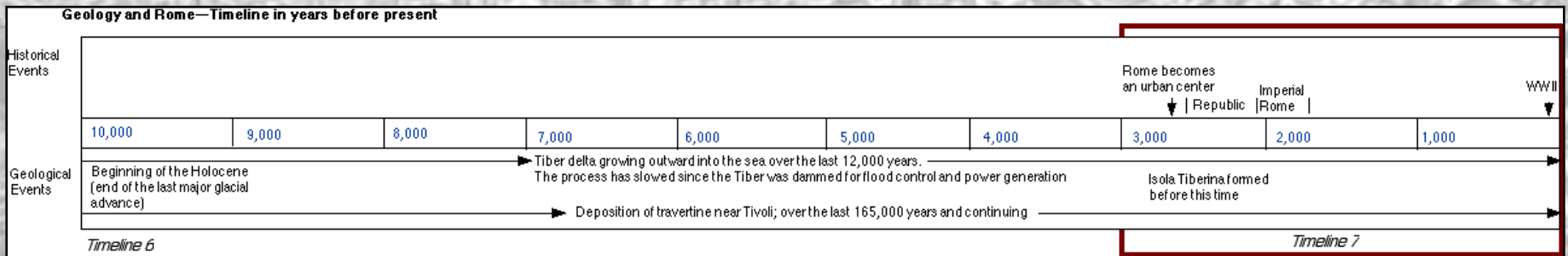
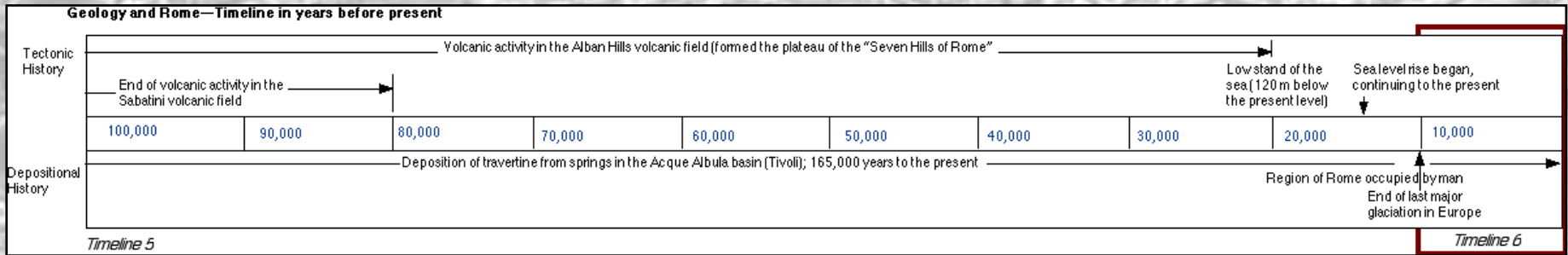
# Tectonics and Roman History



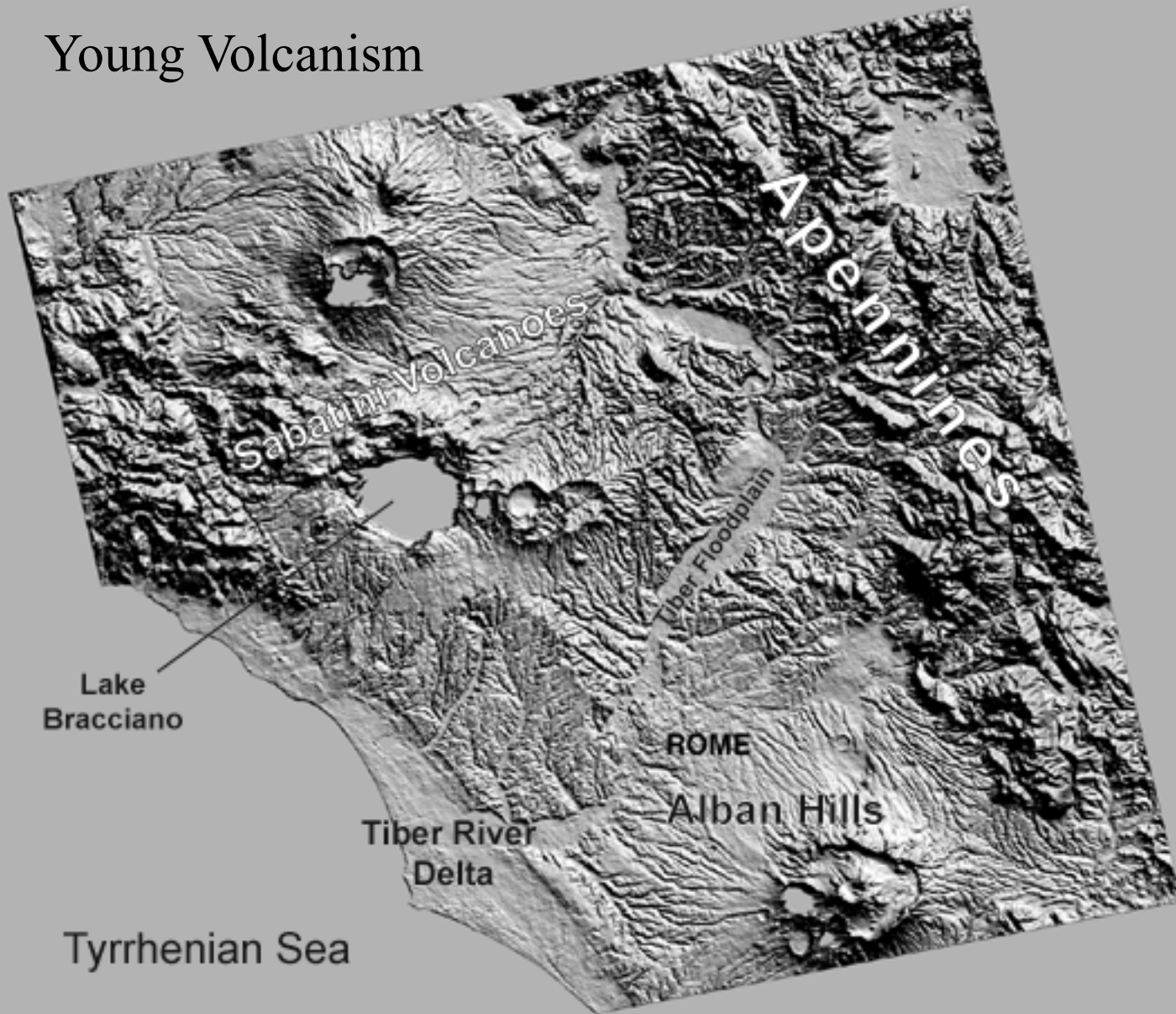
□ Roman Colony

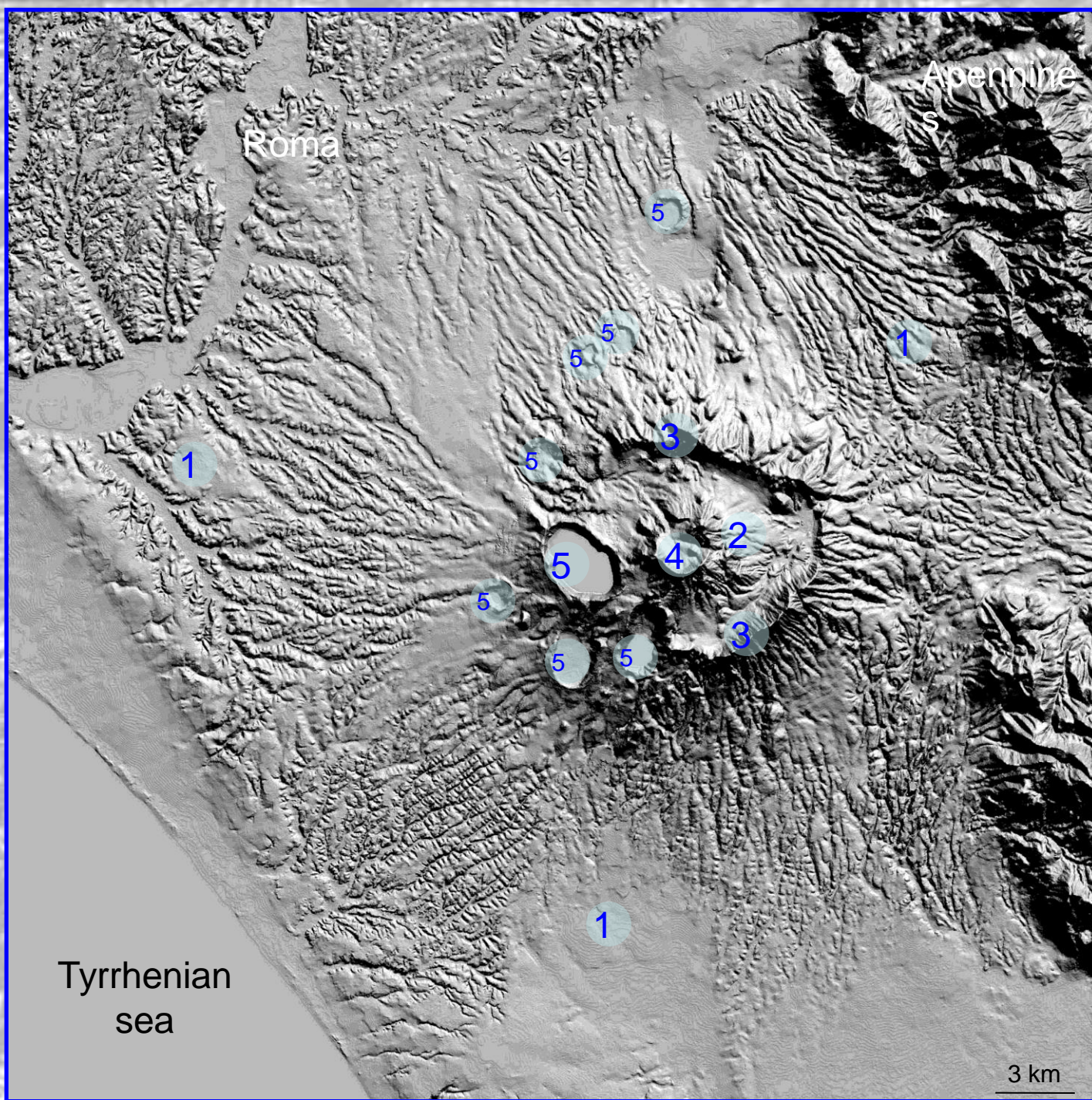
● Important pre-Roman sites





# Young Volcanism

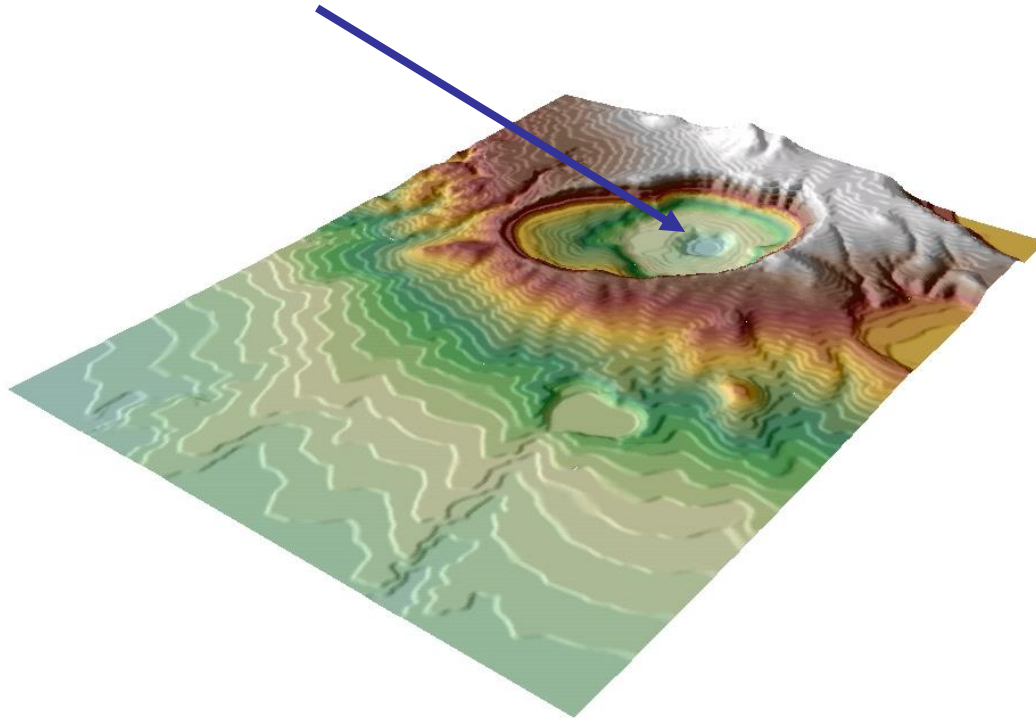




The main features of the Colli Albani volcano are:

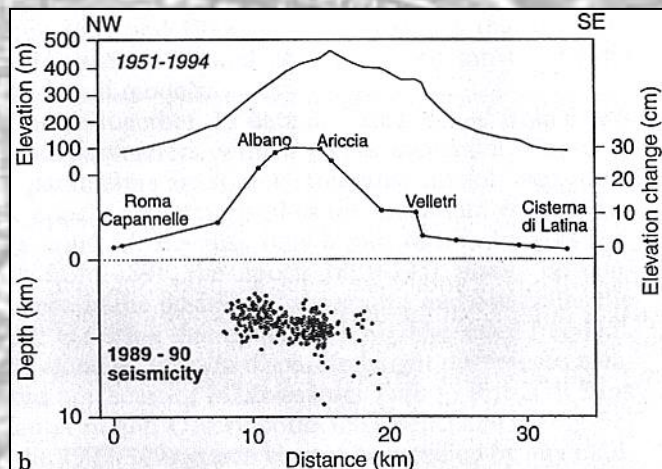
1. The 1600 km<sup>2</sup> ignimbrite plateau
2. The 8 km x 8 km central caldera
3. The WNW and SE caldera wall
4. The central stratovolcano
5. The flanking tuff rings and maars

## The most recent crater

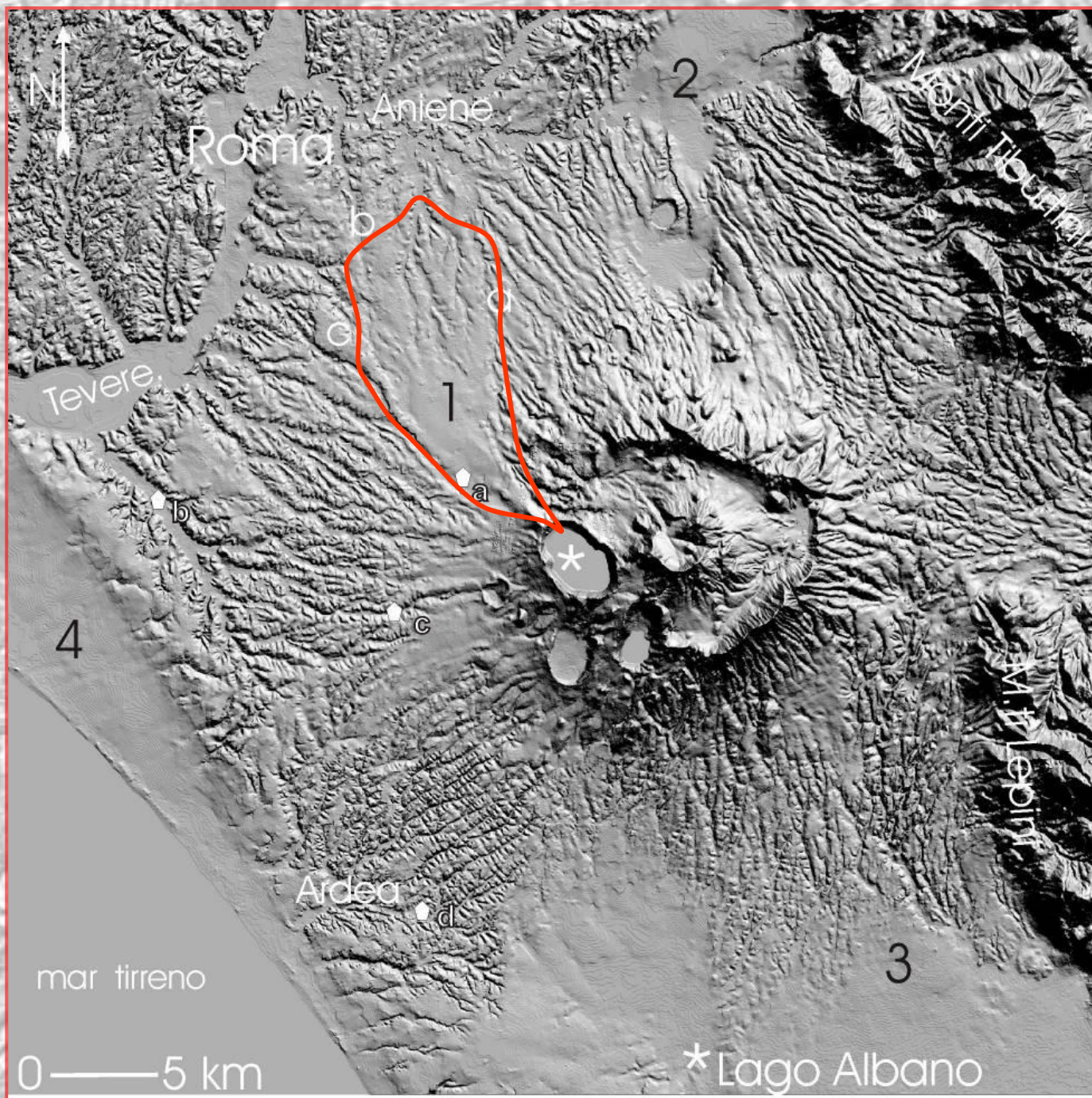


The most recent activity of the volcano formed the polygenetic Albano maar, hosting the deepest volcanic lake in Italy (-173 m).

The Holocene activity of this maar has been described only recently (Funciello et al., 2002, 2003, Giordano et al., 2005)



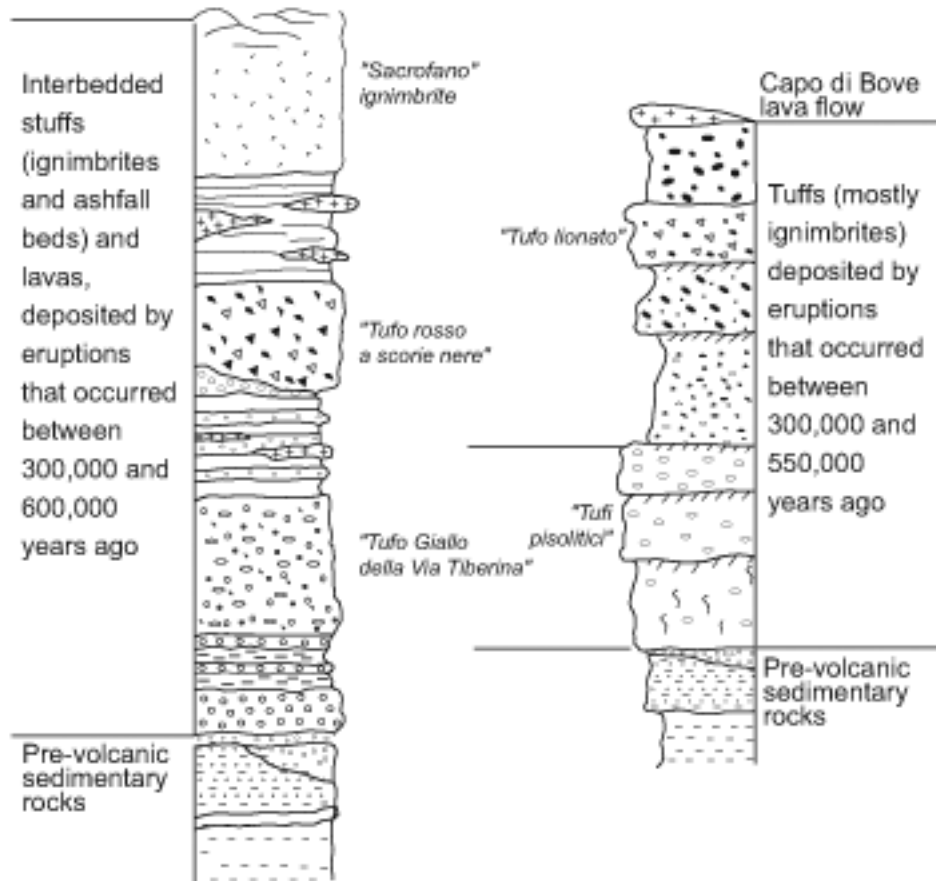
The bathymetry of the lake shows the location of the most recent crater. During the last 40 yrs, 30 cm of uplift have been detected across the maar and seismic swarms (Chiarabba et al., 1997)

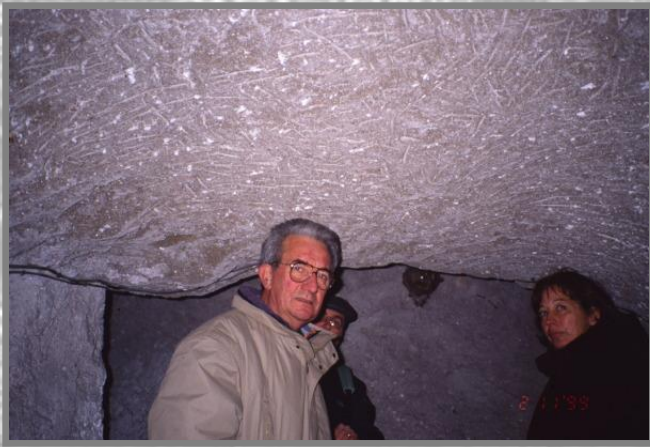




West side of the Tiber  
(from the Sabatini volcanic field)

East side of the Tiber  
(from the Alban Hills)



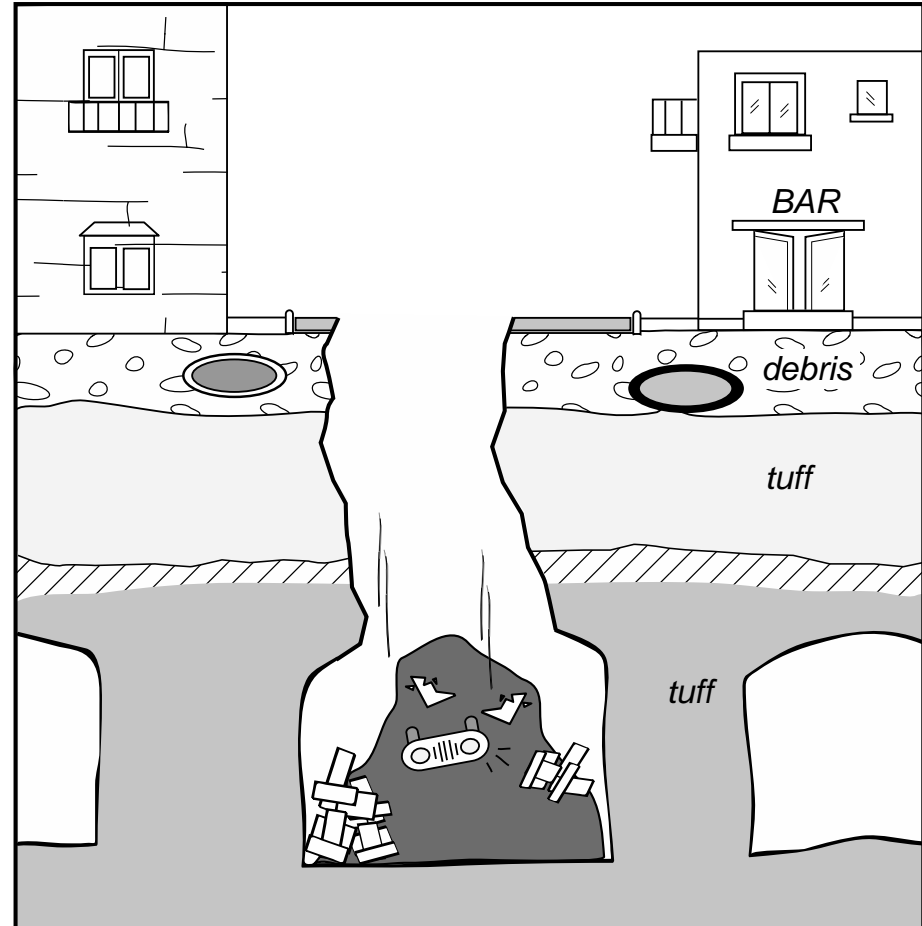
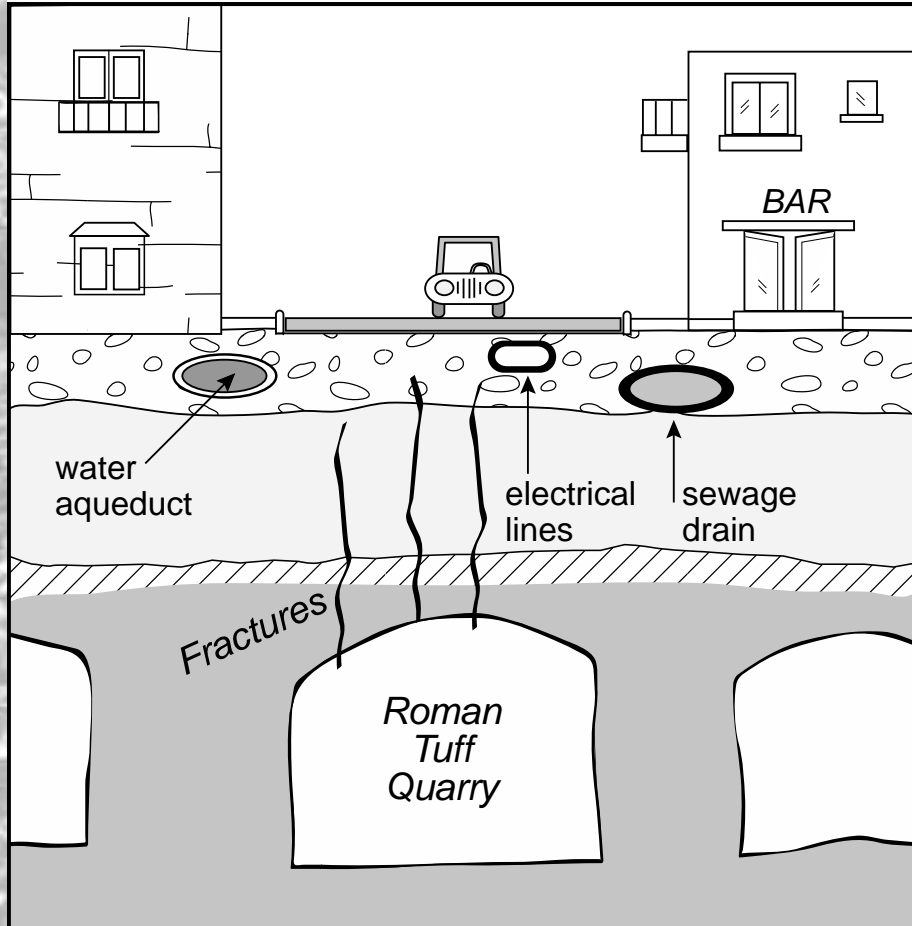


Tuffs from underground quarries



Quarries and catacombs





← Aventine

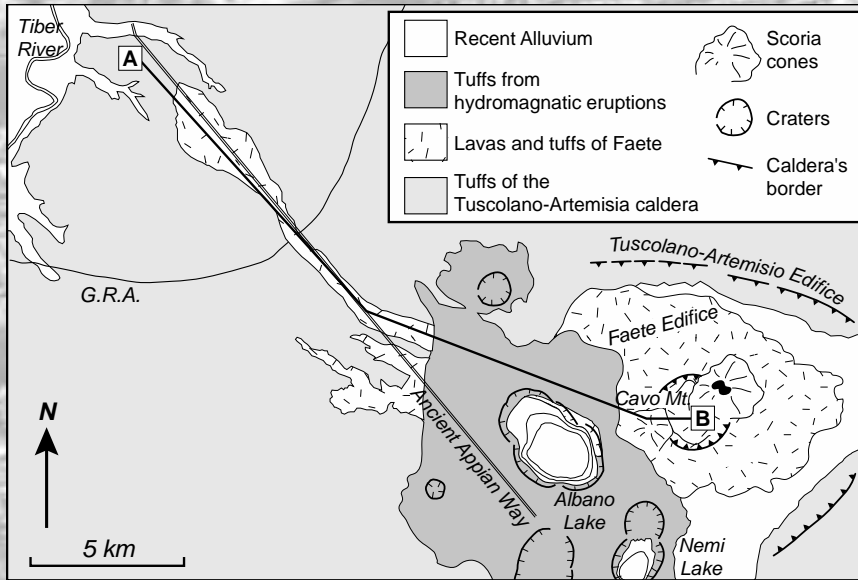




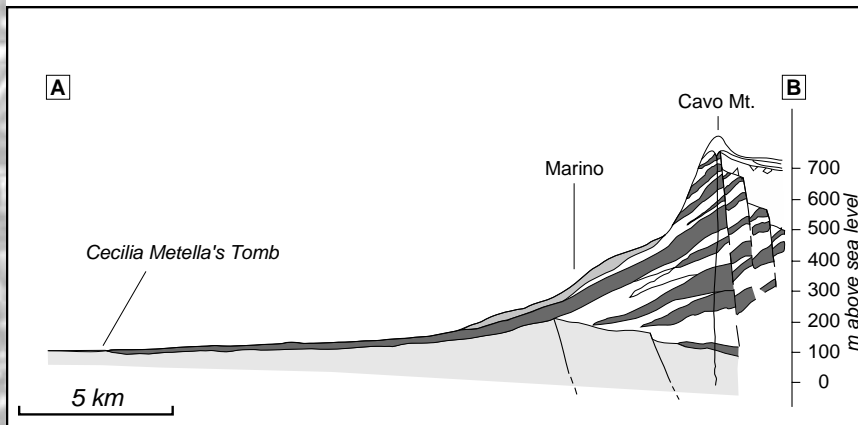
Pozzolana  
concrete



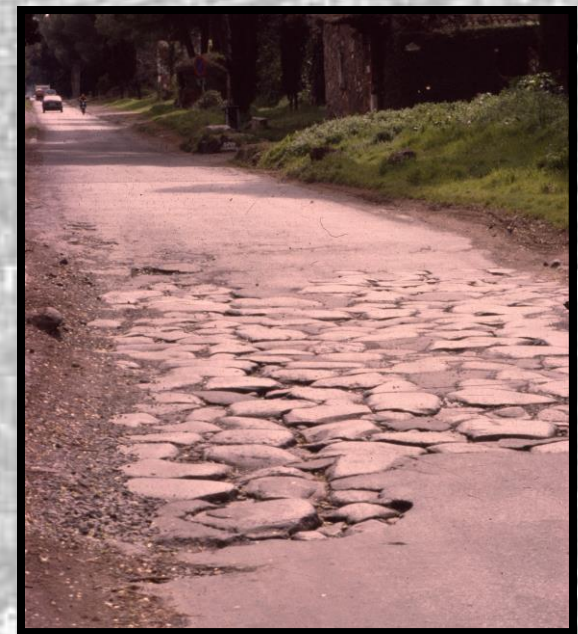
# Road Building



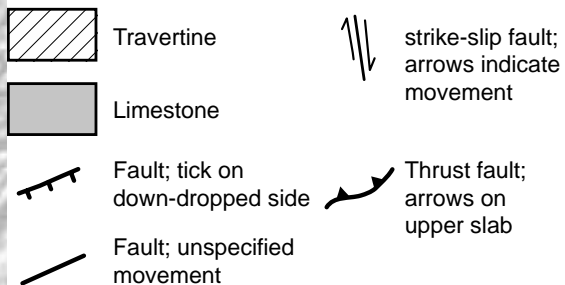
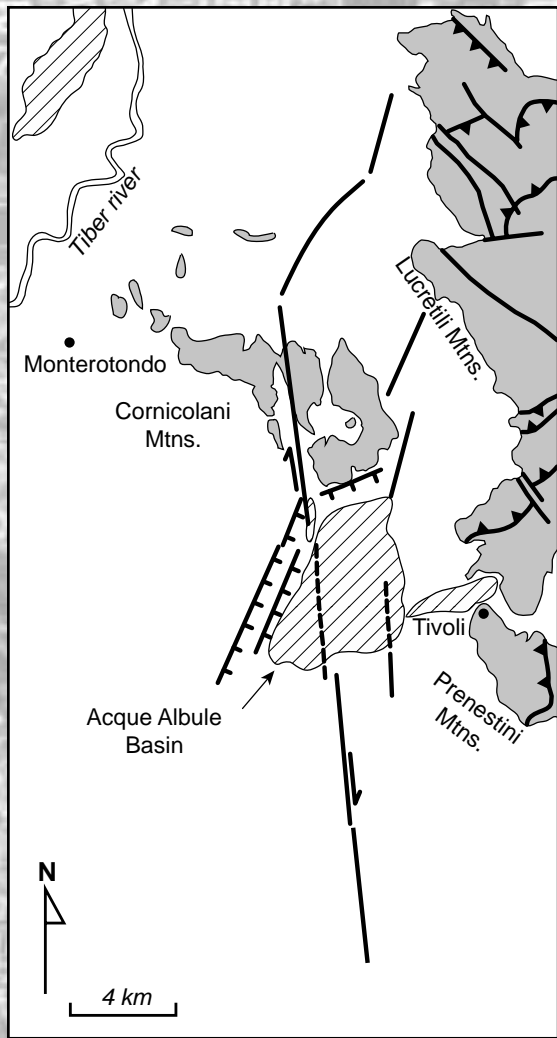
Porta Maggiore



Capo di Bove lava flow



Via Appia



# TRAVERTINE

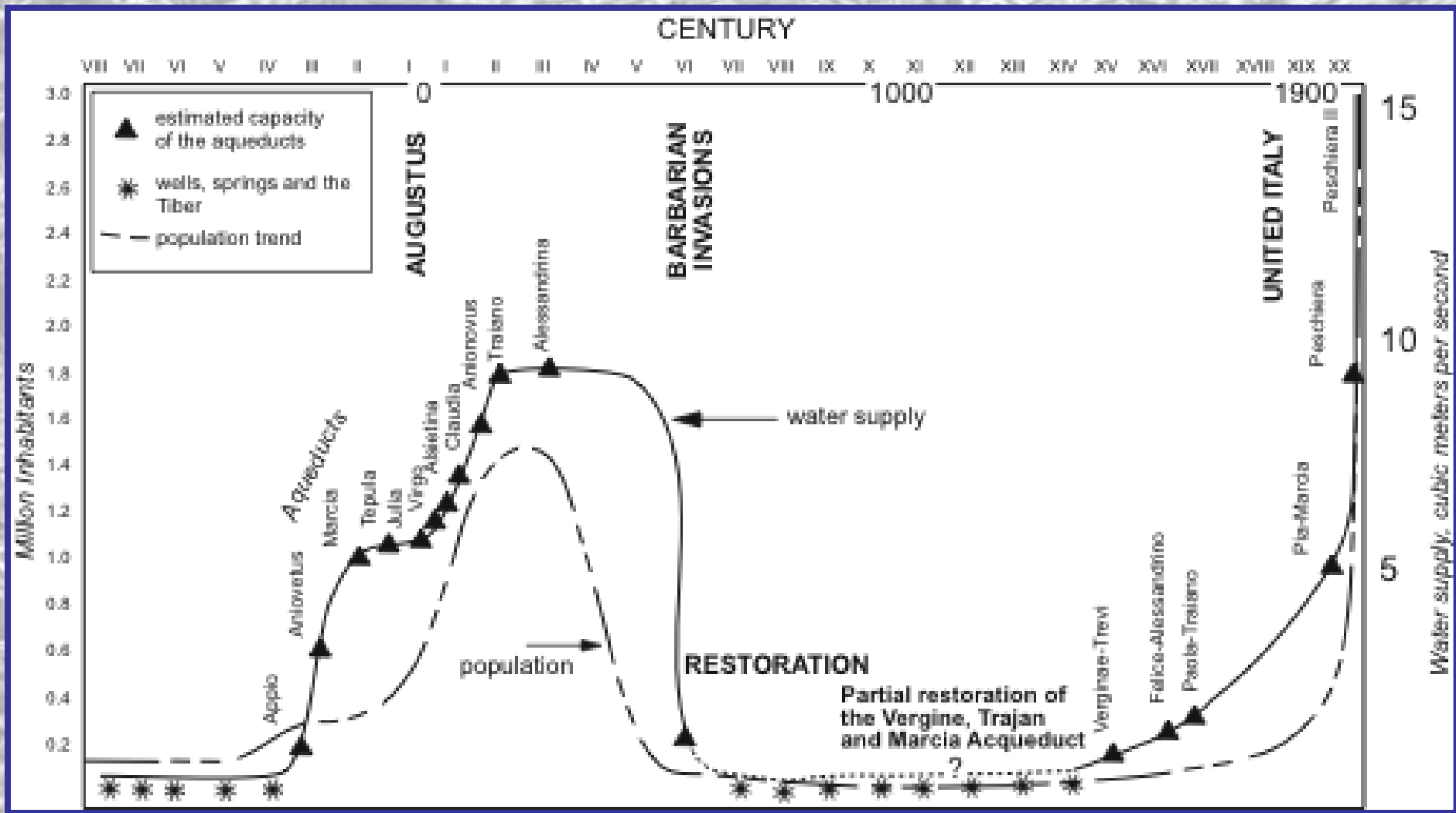
Travertine Quarry  
Bagni di Tivoli



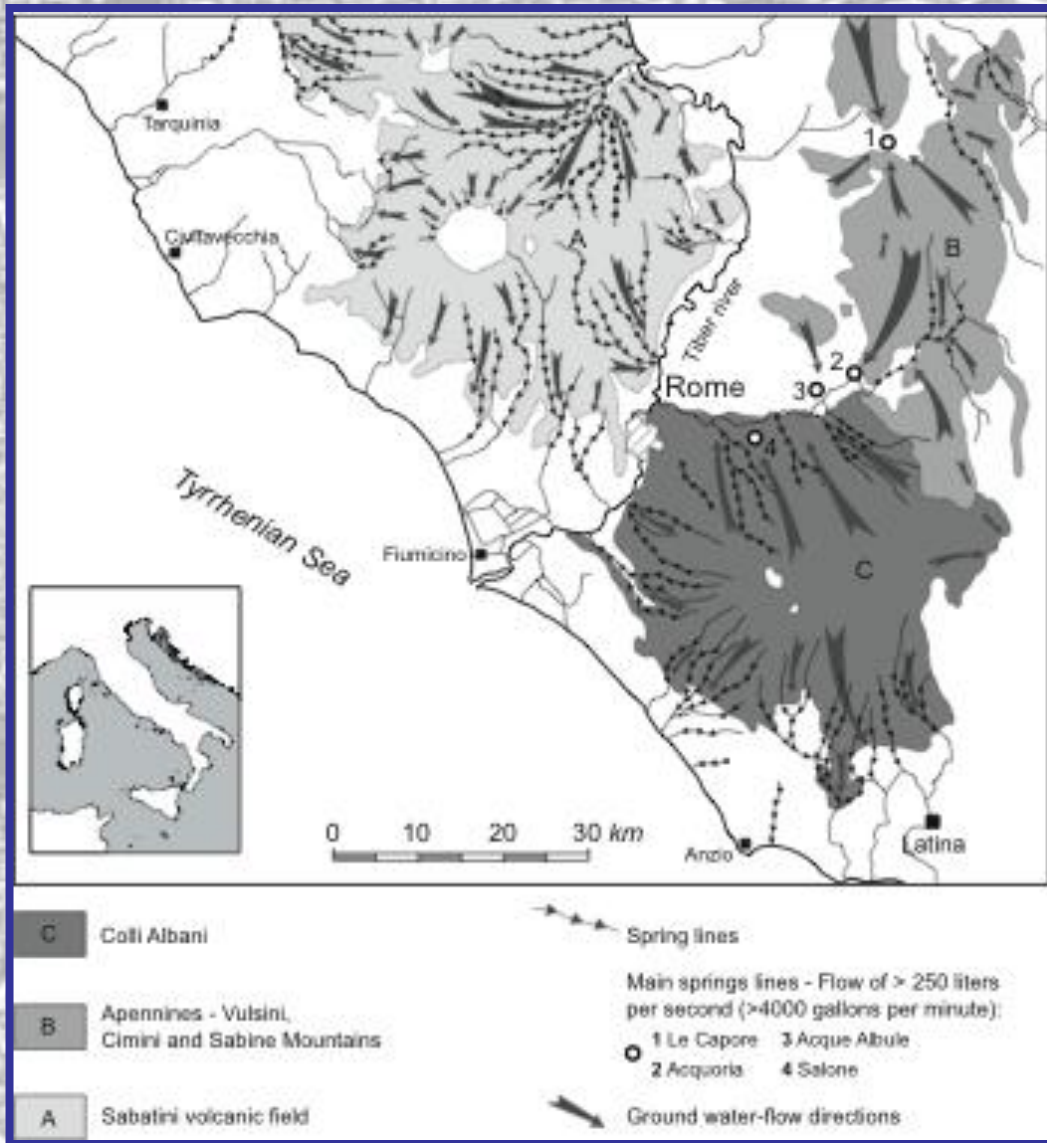
Ponte Cestio—46 BCE

A key to  
Rome's  
success—  
Clean water



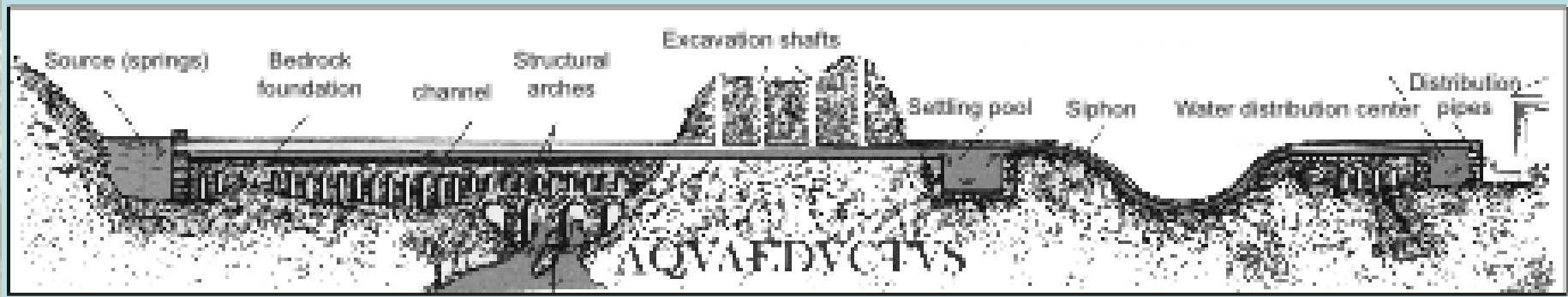


Funiciello and Rosa, 1995



Corazza and Lombardi, 1995

# Aqueducts and thermal baths

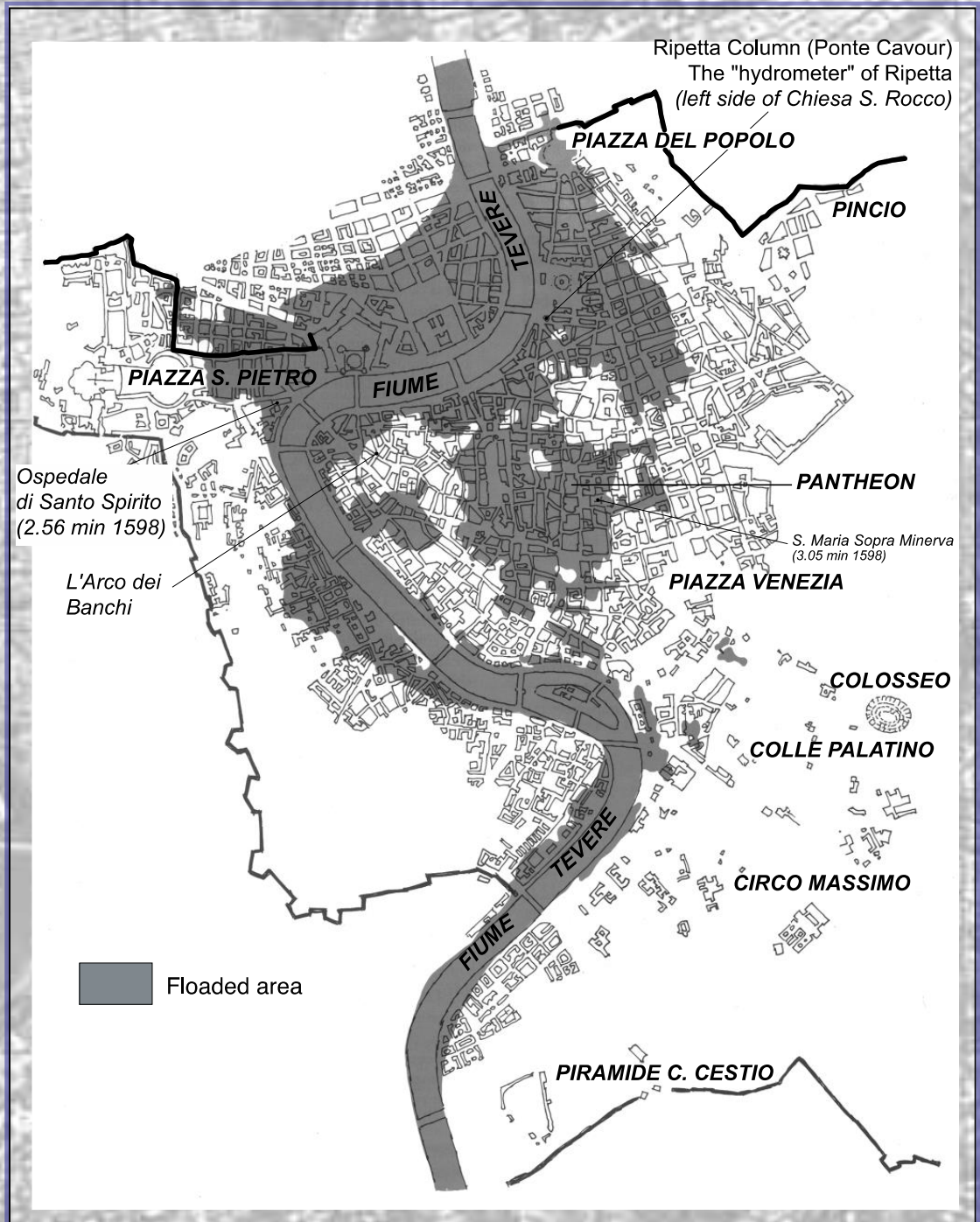


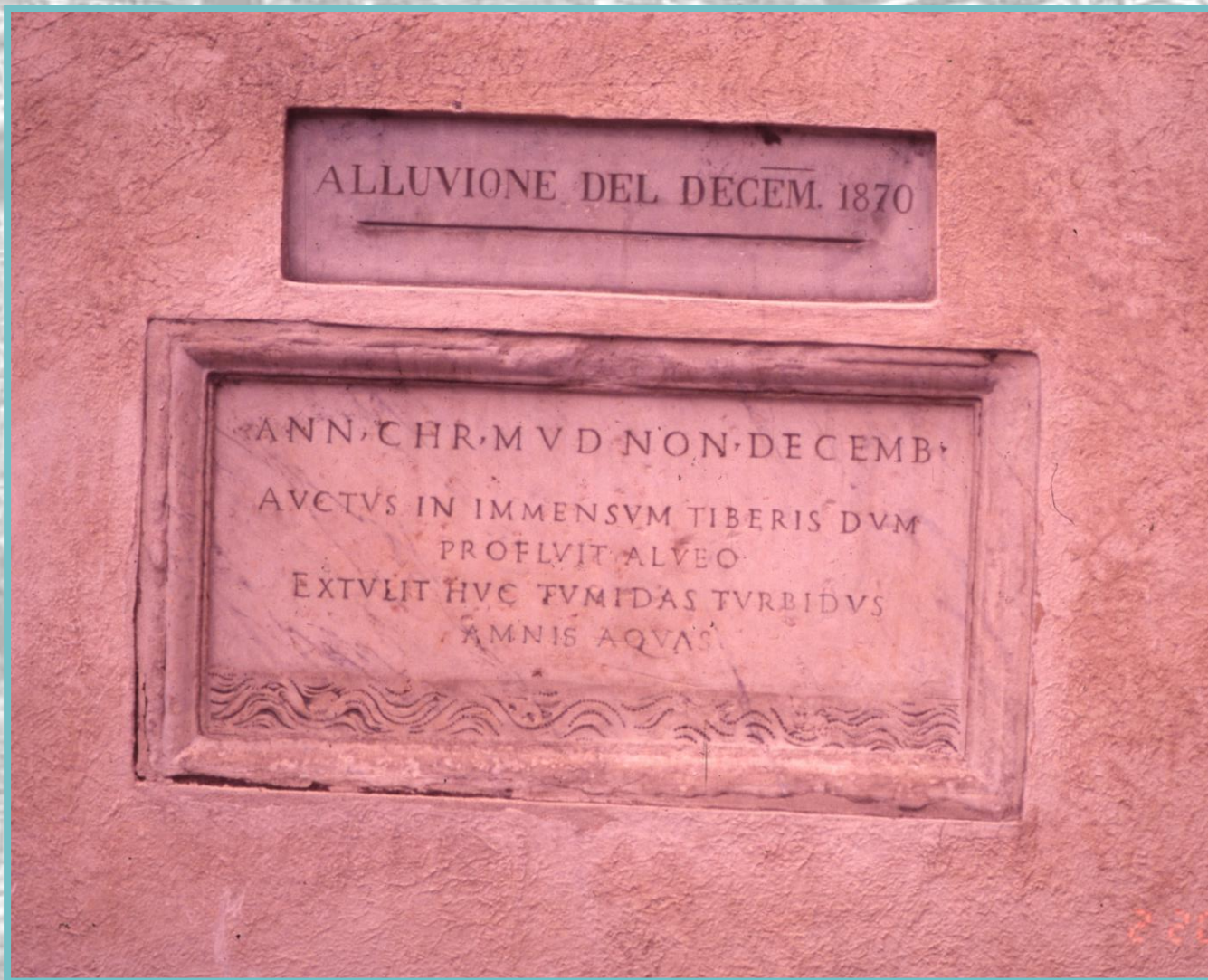
Piazza Navona  
Flood of 1870





# Central Roma Flood of 1870





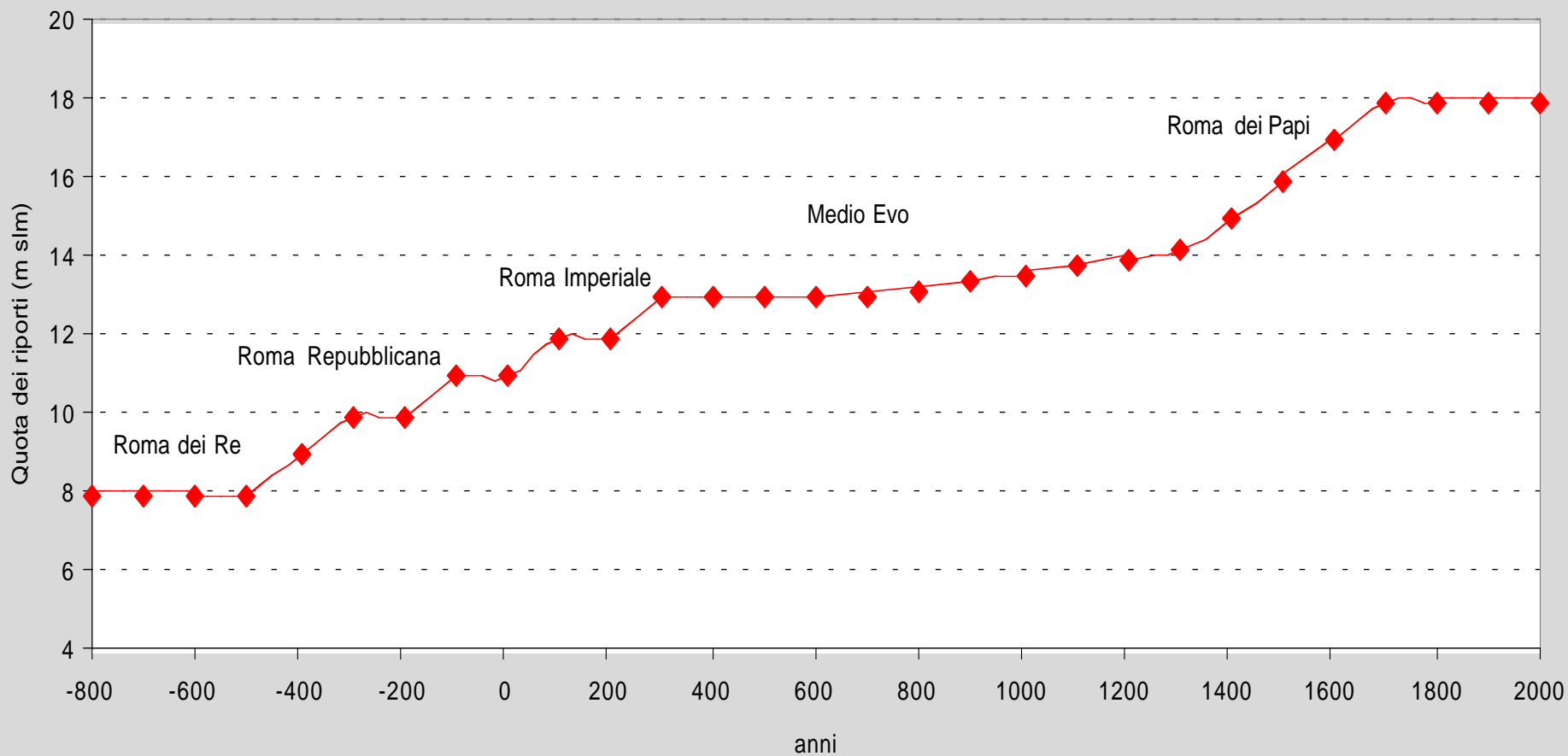
Plaque, façade of Church of Santa Maria Sopra Minerva  
Flood of 1870. Water depth of 3.95 meters

Millenia of  
debris and  
trash



# VARIAZIONE DELLA QUOTA DEI RIPORTI (area campo Marzio)

## Variation in debris thickness (Area of Mars drill ground)

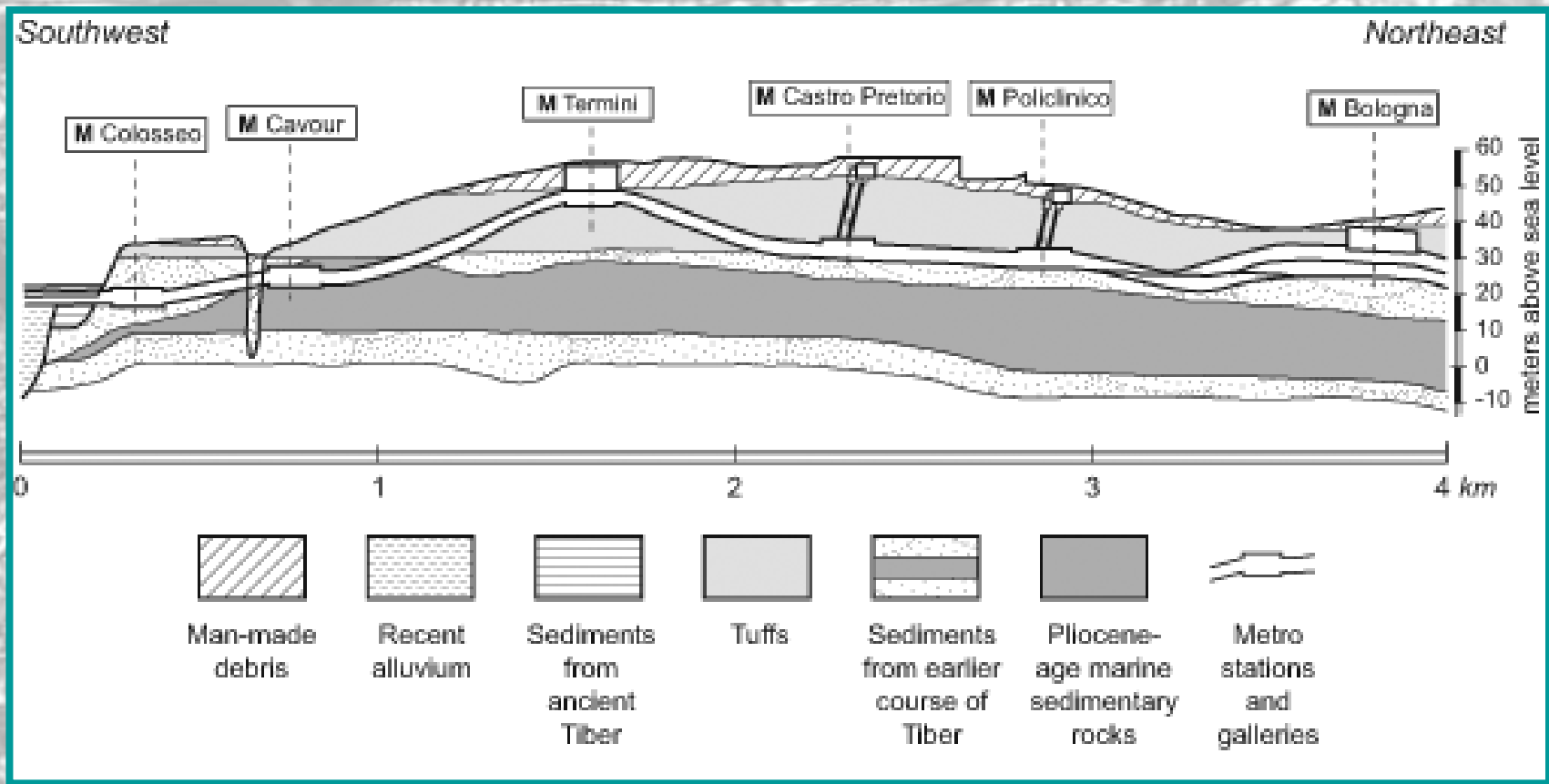




Piramide—  
Memorial pyramid of  
Caius Cestius, 12 BCE



12<sup>th</sup> C. Church of San Clemente (overlies the 1<sup>st</sup> C. BCE Temple of Mithras)



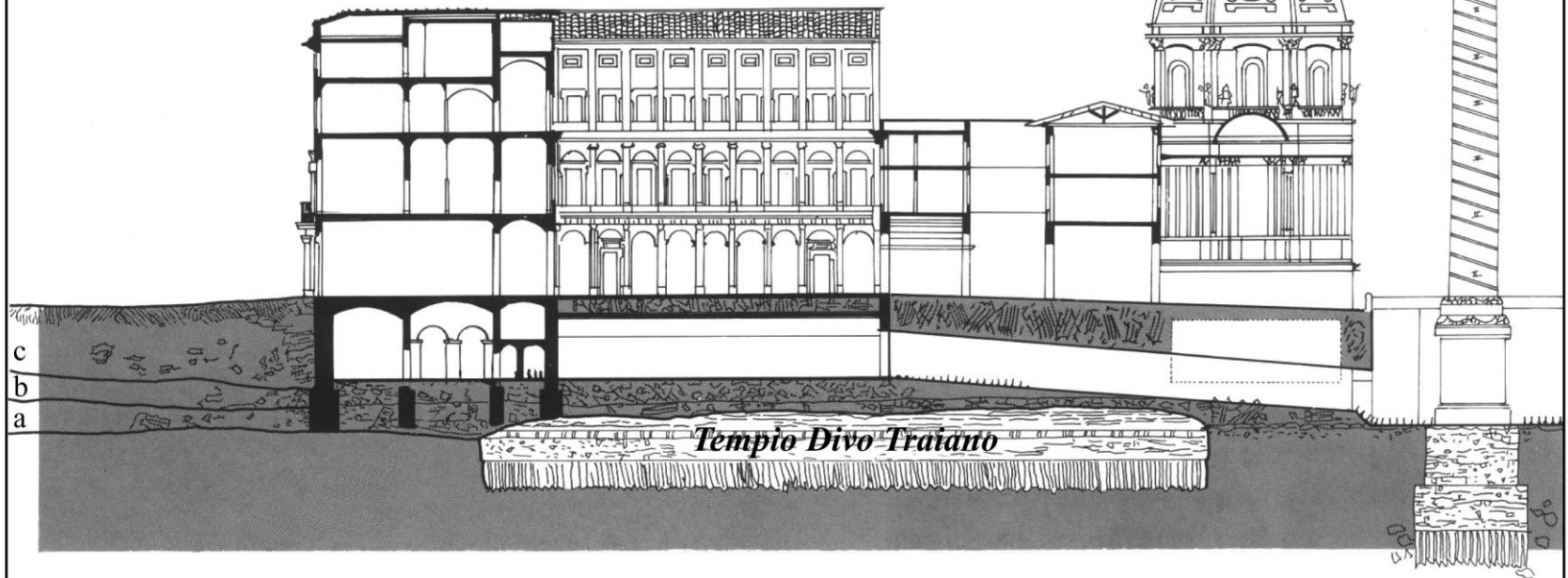
Cross section along Metro Line B. Ravine near Cavour Station is filled with 20 m of man-made debris

*Chiesa SS. Nome di Maria*

*Colonna Traiana*

- a - Roman debris
- b - Medieval debris
- c - Debris since the Renaissance

*Palazzo Valentini*



*Tempio Divo Traiano*

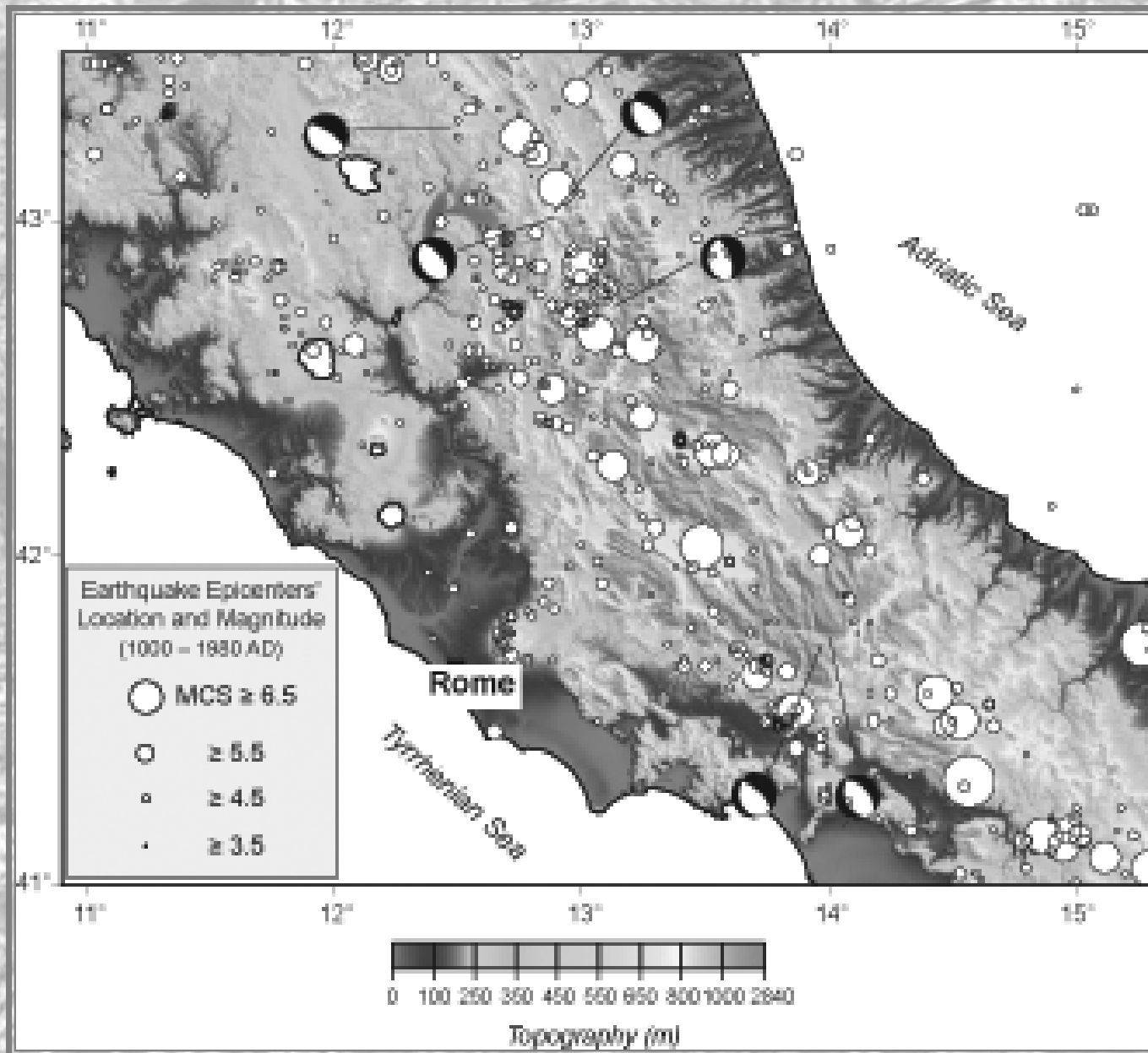
Palazzo Valentini (offices of the Provincia de Roma)



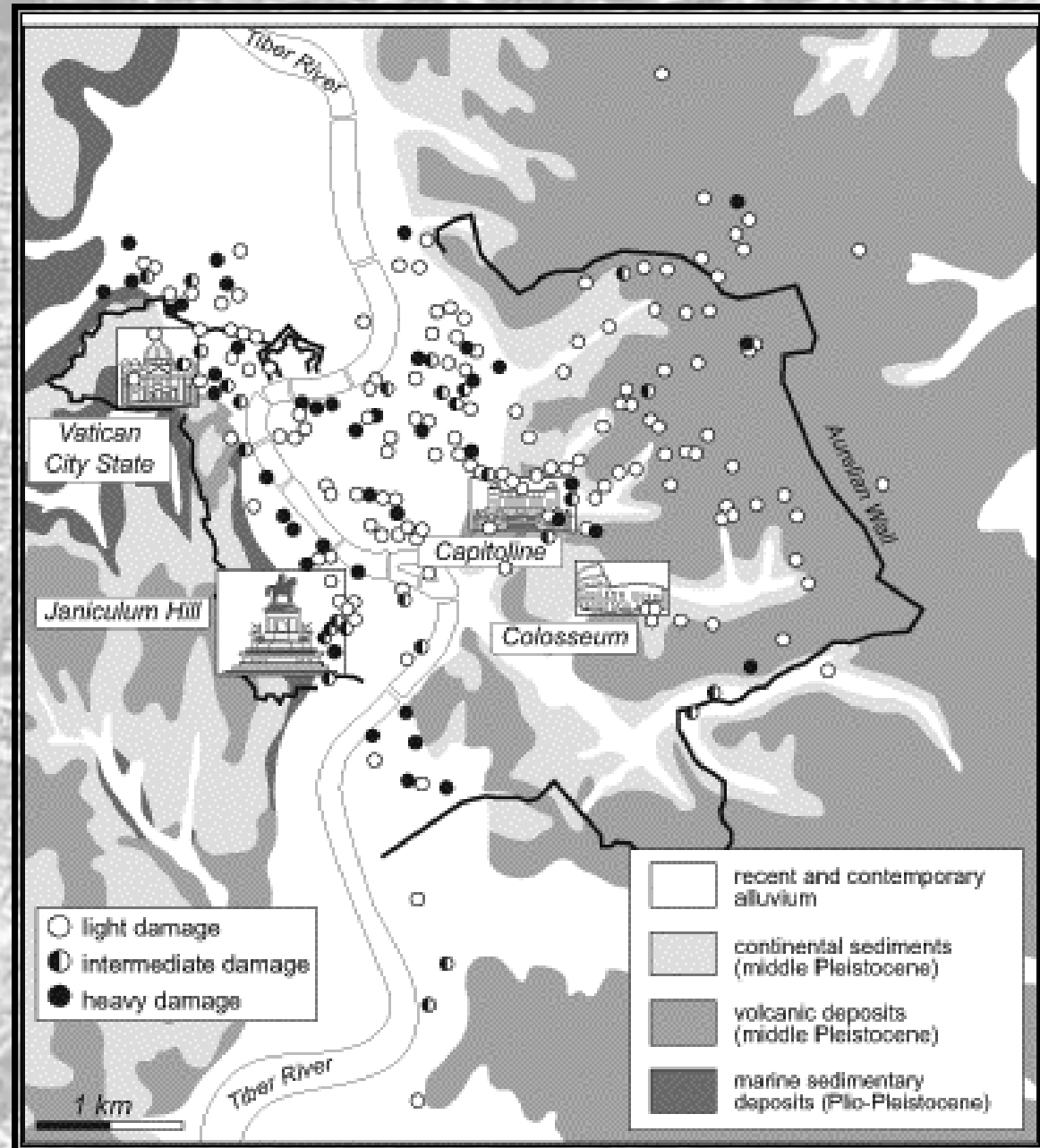
Monte Testaccio—mound of broken Amphorae accumulated between CE 145 And CE 255—53 million amphorae!



# Earthquakes

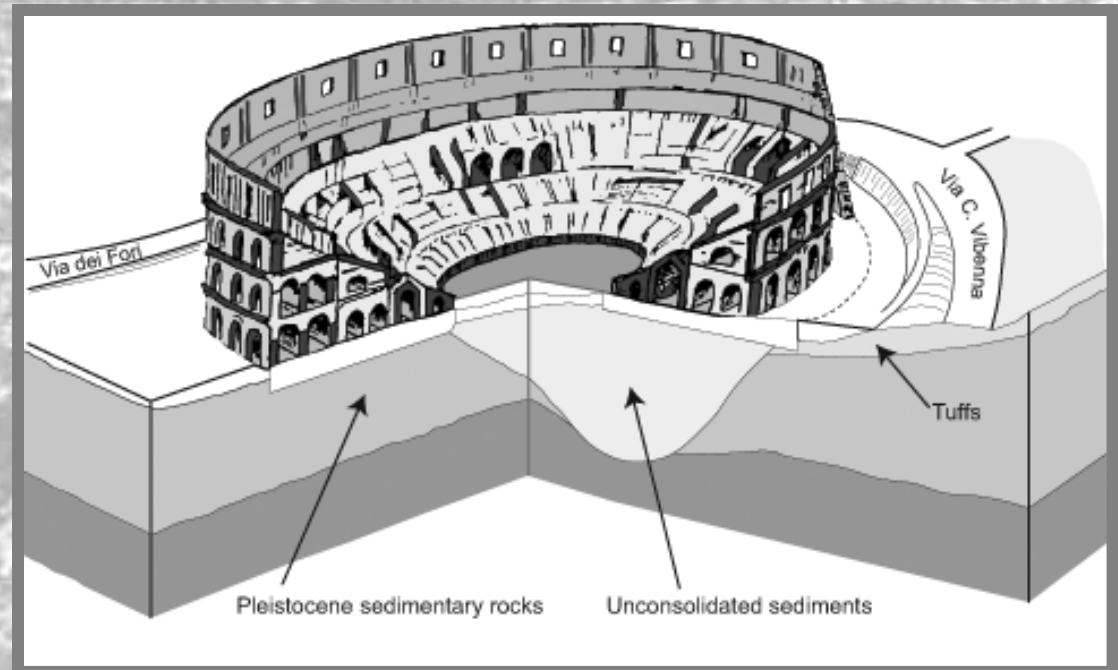


Damage to historical structures caused by earthquakes

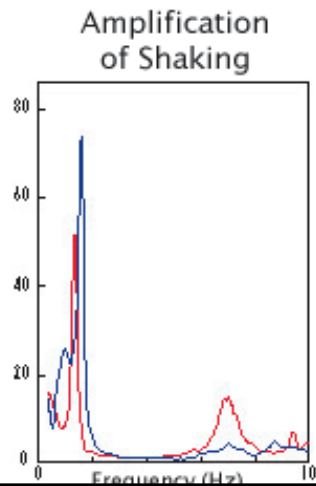
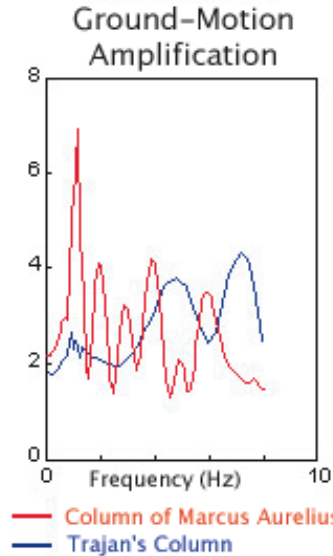




Colosseum (Flavian Amphitheater)  
Influence of underlying geology on degree of damage caused by earthquakes over the last 1900 years

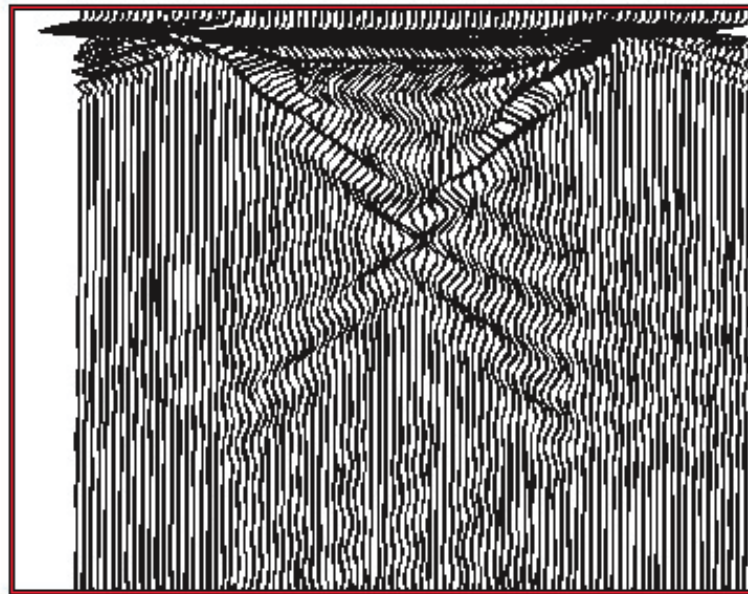
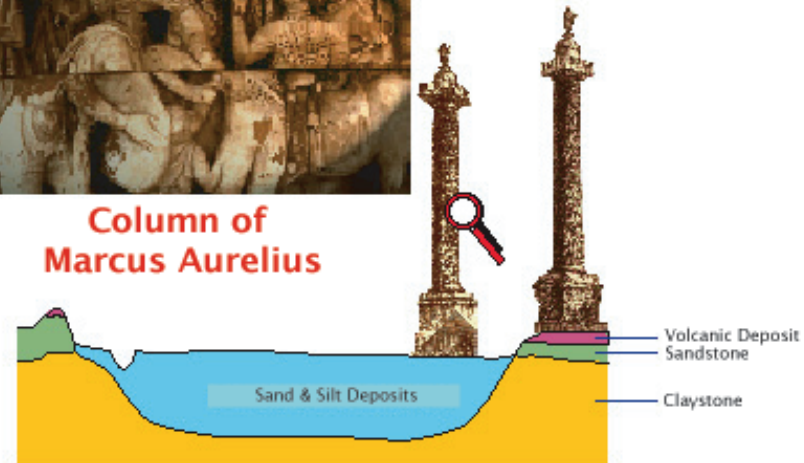


## From Rovelli



Column of Marcus Aurelius

Trajan's Column



**In Session 3—Jean-Luc Berenguer:**  
Seismic site effects in the city of Rome

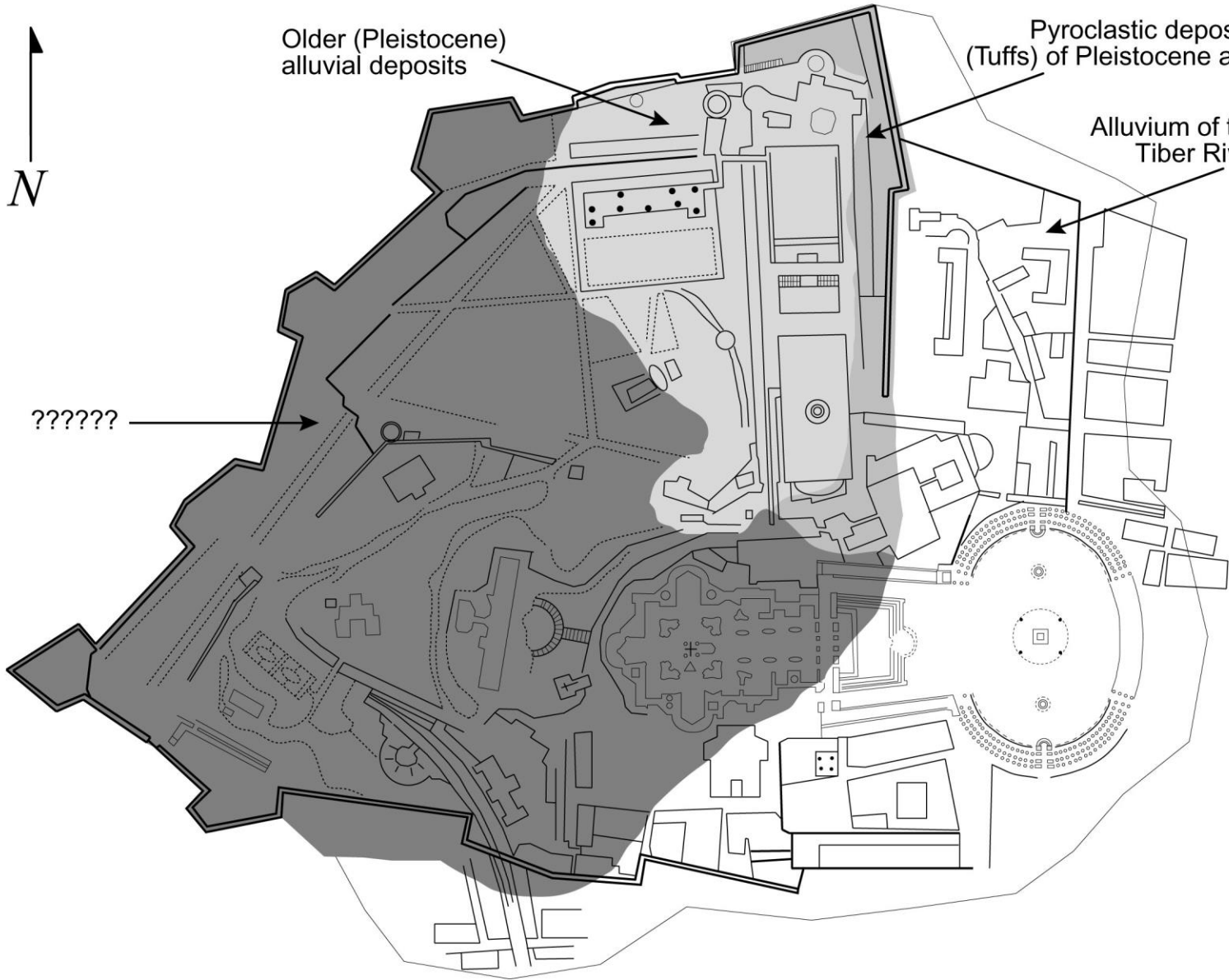


Older (Pleistocene)  
alluvial deposits

Pyroclastic deposits  
(Tuffs) of Pleistocene age

Alluvium of the  
Tiber River

???????



Learning from the Roman experience, what should be done by geoscientists to make cities more sustainable during the next century?

Earth scientists working for the cities, in integrated teams, which include environmental scientists, engineers, planners, and social scientists for science- and culture-based planning and management.

Provide the scientific basis for cost-benefit analyses of the value of sustainable growth and mitigation of disasters for decision-makers.  
Get the public, politicians and businesspeople involved.



Comune di Roma  
Ufficio di Protezione Civile



# CARTA GEOLOGICA DEL COMUNE DI ROMA

Volume 1


scala 1:10.000

a cura di Renato Funciello e Guido Giordano

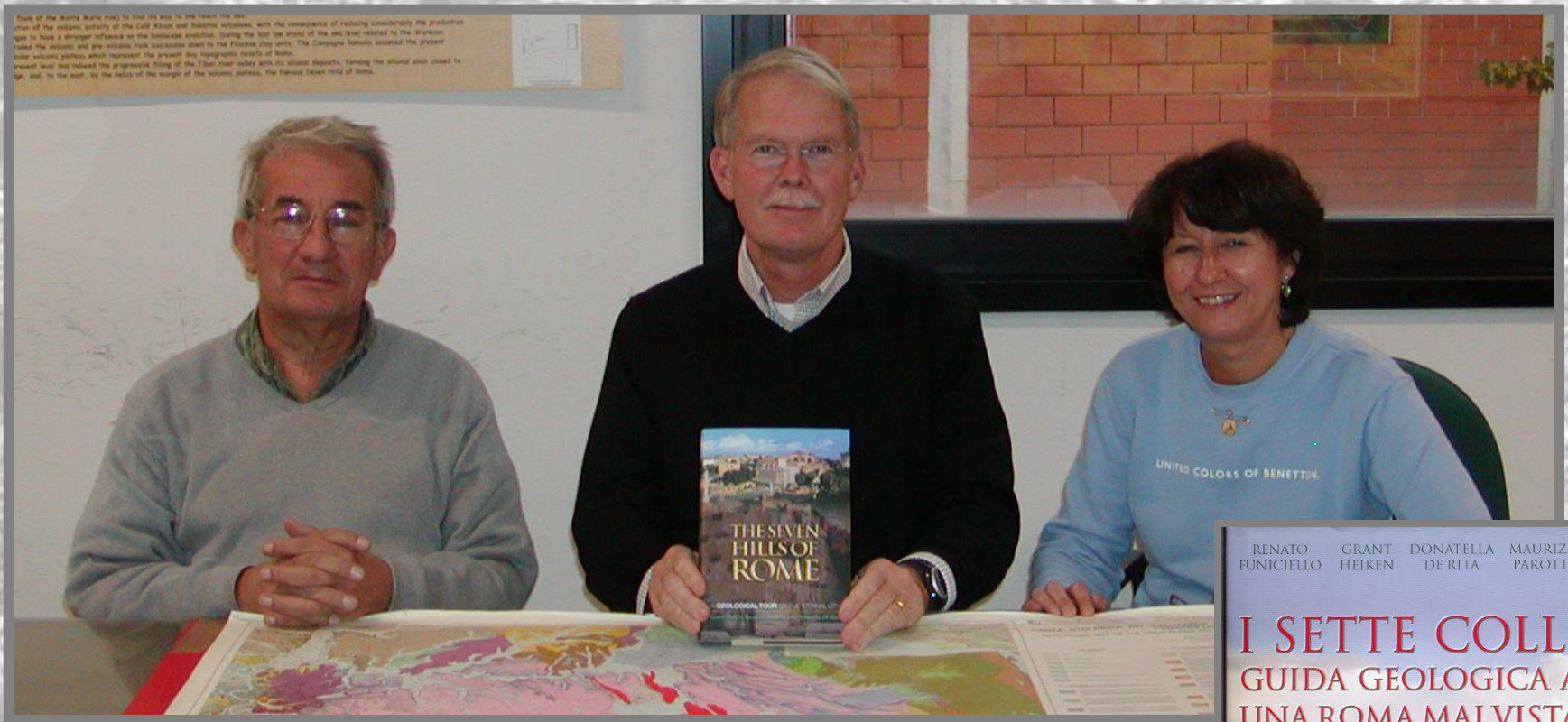








It is appropriate that the term  
“urban geology” has its origin in  
*Urbs*, which was the ancient name  
for the City of Rome.



Renato Funciello, Grant Heiken, and Donatella De Rita

