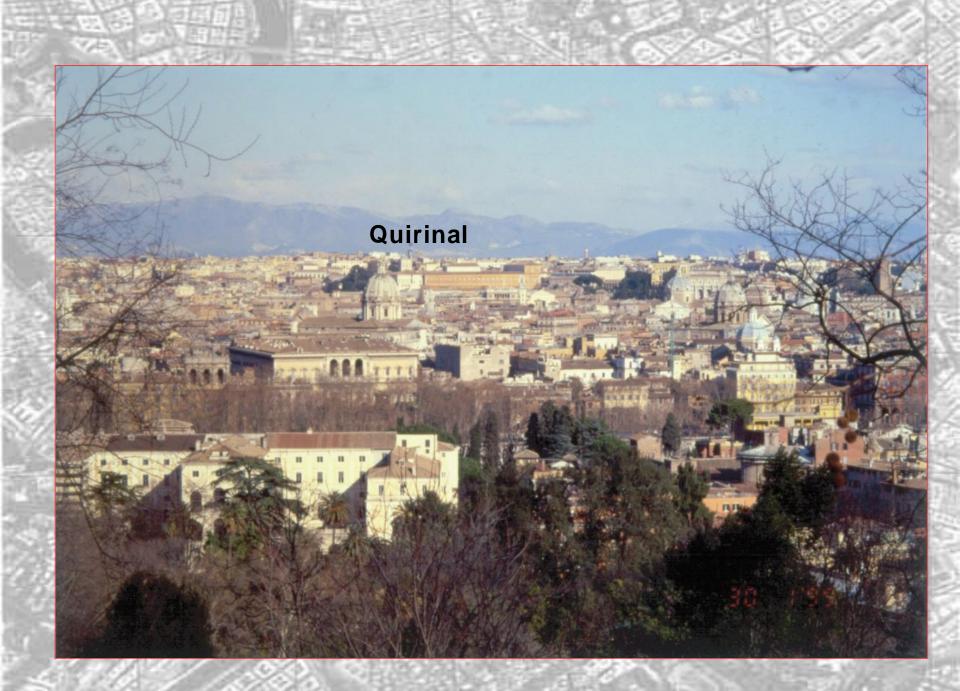
The Link Between Rome's Geologic Setting to its Past, Present, and Future

> Grant Heiken Freeland, Washington, USA

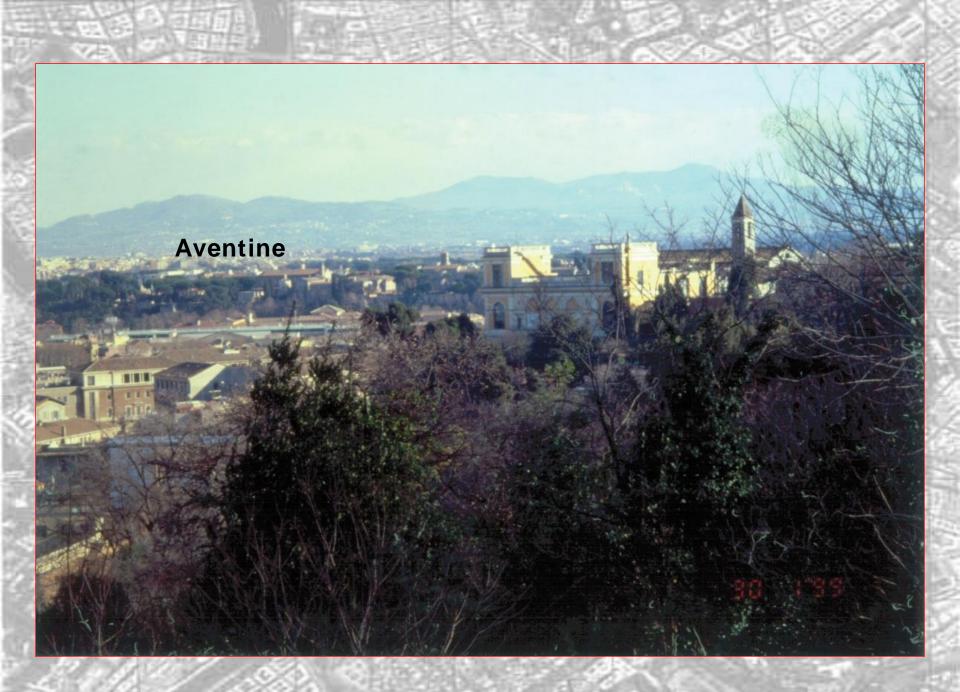


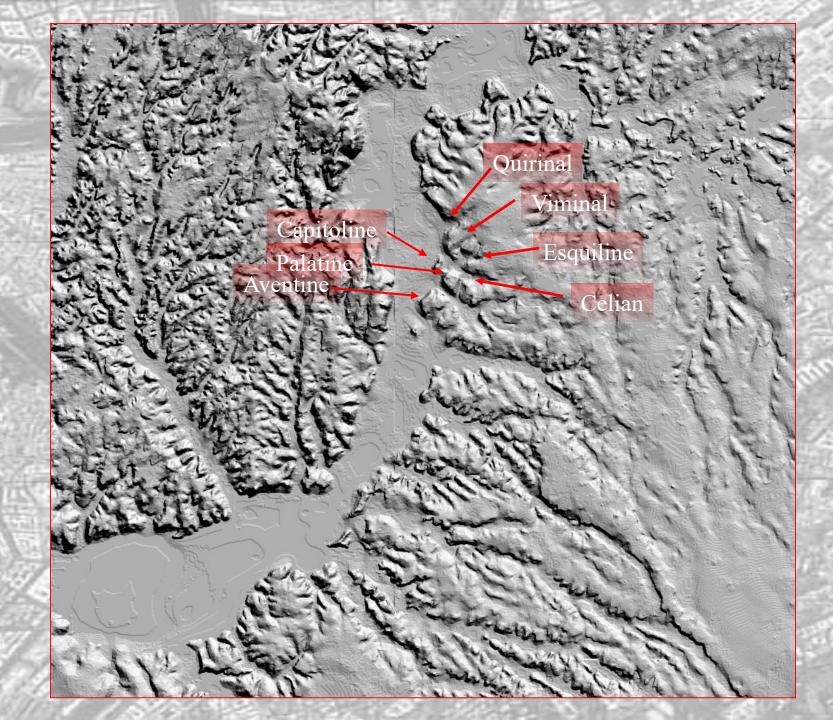
Trevi Fountain-Nicola Salvi, 1732-1762





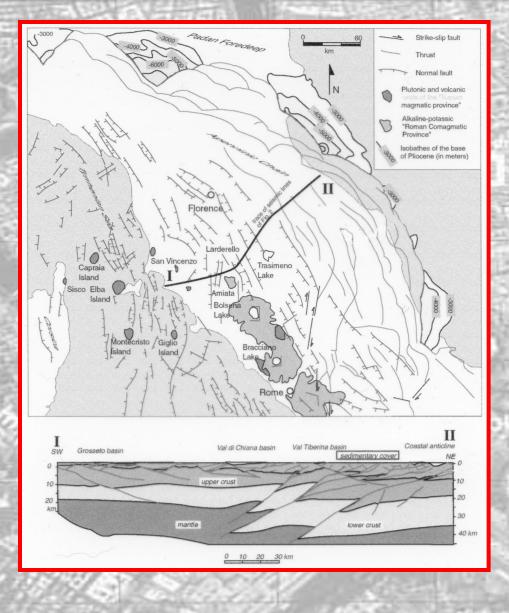




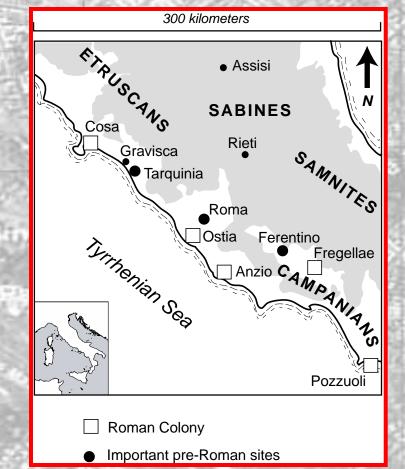




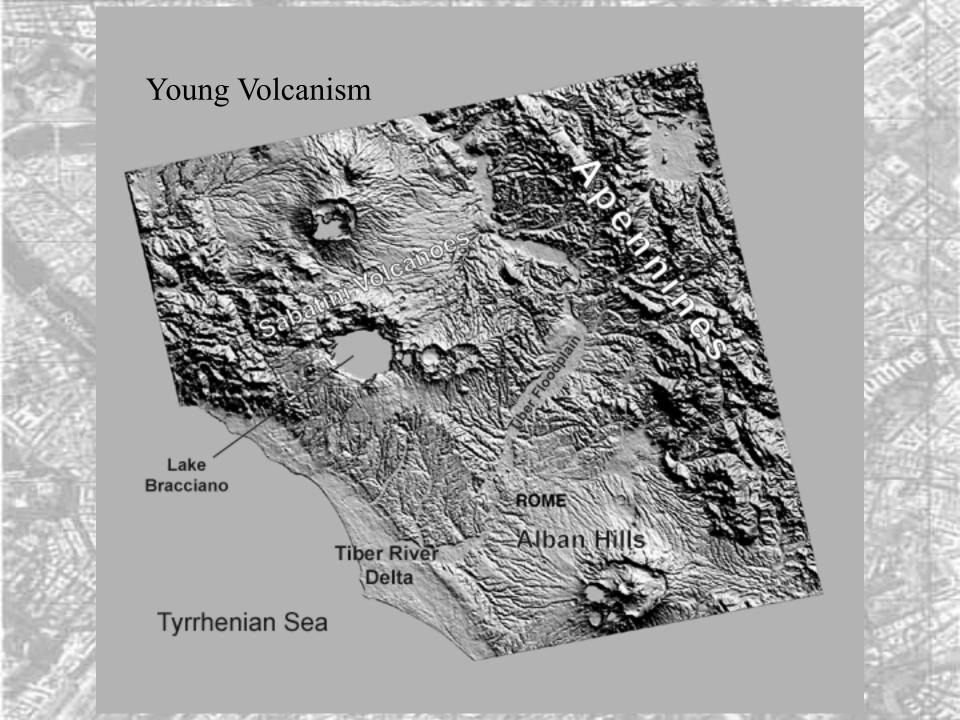


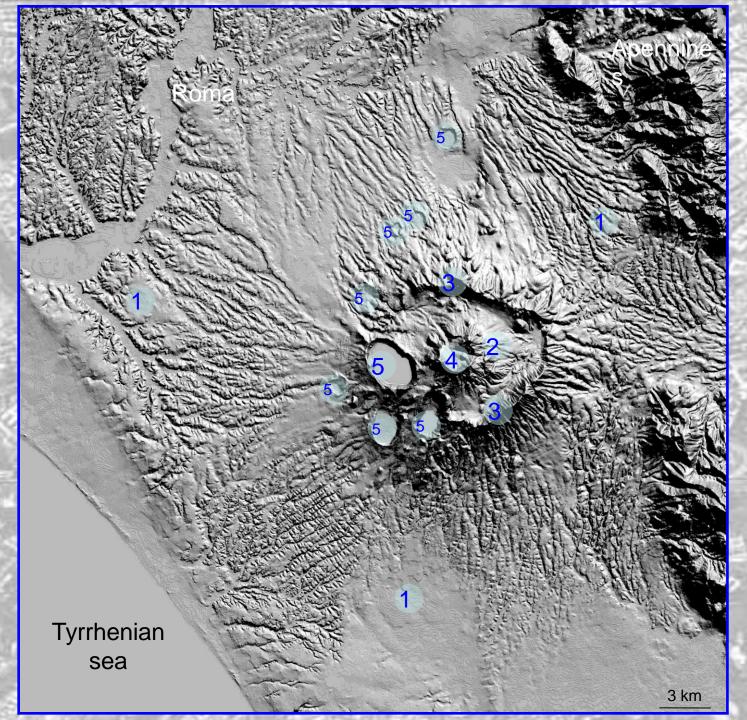


## Tectonics and Roman History



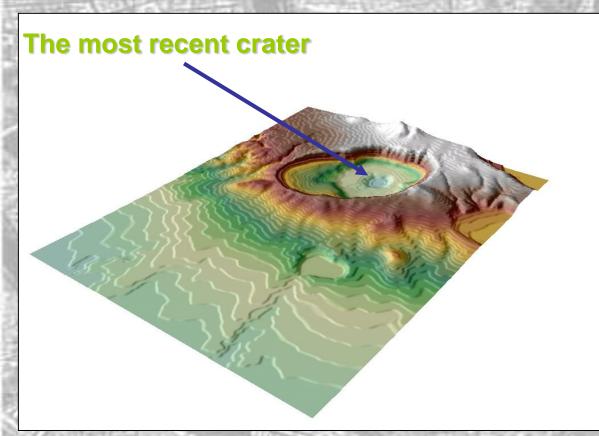
G	eology and Rome—	Timenne in years be	erore present							
Tectonic History	Volcanic activity in the Alban Hills volcanic field (formed the plateau of the "Seven Hills of Rome"Low stand of the Sea level rise began.									
	End of volcanic activity in the F									nuingtothe present
	100,000	90,000	80,000	70,000	60,000	50,000	40,000	30,000	20,000	10,000
ositional ory	Deposition of travertine from springs in the Acque Abula basin (Tivoli); 165,000 years to the present									
	Timeline 5									Timeline
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Ge	ology and Rome—	Timeline in years be	fore present	The second second	9-19-90 AV	and the second s	1911 C 2637		リン・マンド	1000
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								an urban center ∳ Republ	Imperial ic  Rome	
	10,000	9,000	8,000	7,000	6,000	5,000	4,000	3,000	2,000	1,000
ogical	Tiber delta growing outward into the sea over the last 12,000 years.									
nts	(end of the last major glacial before this time									
	Deposition of travertine near Tivoli, over the last Tip5, UUU years and continuing									
	Timeline 6							Timeline 7		
223	1200	120C	and the	The State		0.640.00	A STATE		COLUMN TO LO	-
	Geology an	d Rome—Timeli	ine in years bef	ore present	🛡 Major re	corded floods on	the Tiber	<ul> <li>Major recorde</li> </ul>	d earthquakes	
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		the Cloaca M	/ '	4 n n ia 🛛 👘 👘		(fewree	orded observations)	founded	d   "Littleid	· · ~
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s	First settleme	Etruscan Etru citystates exp	elled	Caesar Pant murdered	heon \1st St. Pet Baths of Caracalla		ed by Van dals Medieval Rom	Peter's bi	uilt <del>enaissance</del> Rome Baro	capitol of It
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s orical nts	First settleme Romulus	Etruscan Etru citystates exp	elled	Caesar Pant murdered	heon \1st St. Pet Baths of Caracalla	ĨŘomie sack ed		Peter's b ne	uilt <del>enaissance</del> Rome Baro	capitol of It





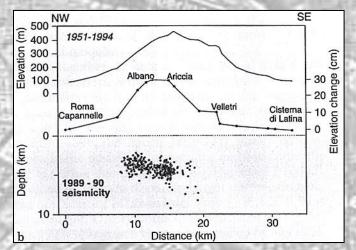
The main feature of the Colli Alban volcano are:

- 1. The 1600 km<sup>2</sup> ignimbrite plateau
- 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

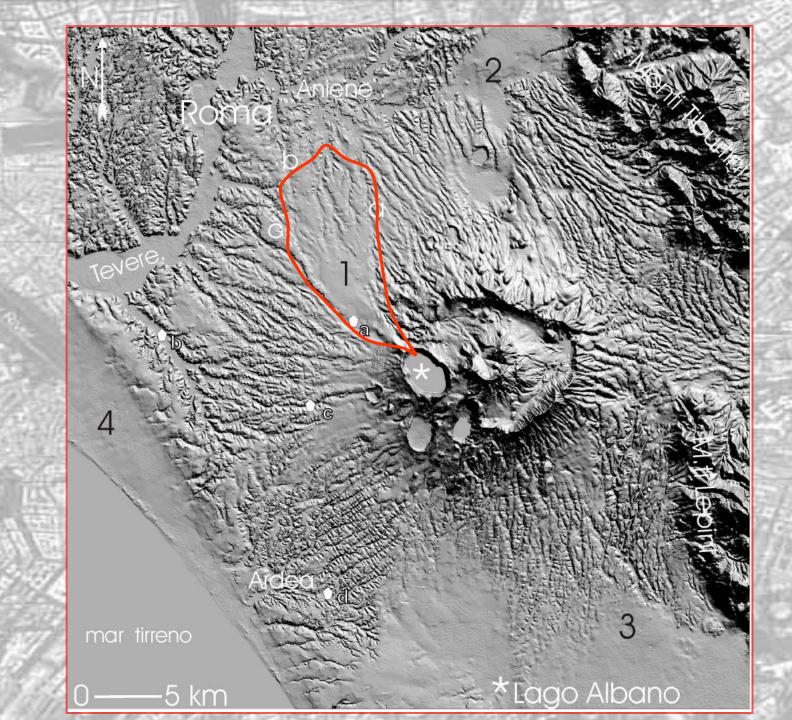


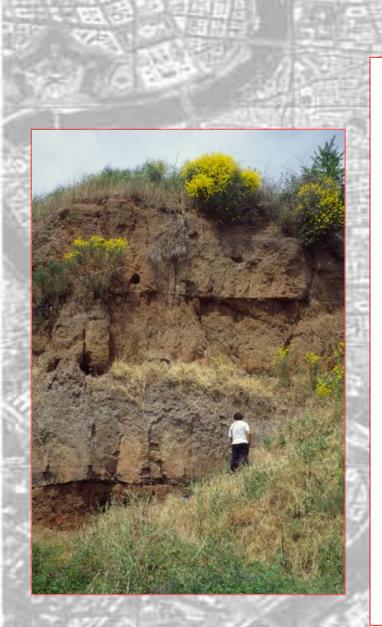
The most recent activity of the volcano formed the polygenetic Albano maar, hosting the deepest volcanic lake in Italy (-173 m).

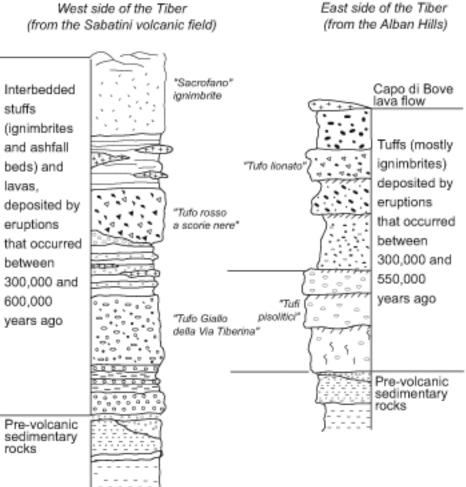
The Holocene activity of this maar has been described only recently (Funiciello et al., 2002, 2003, Giordano et al., 2005)



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)







East side of the Tiber



## Tuffs from underground quarries

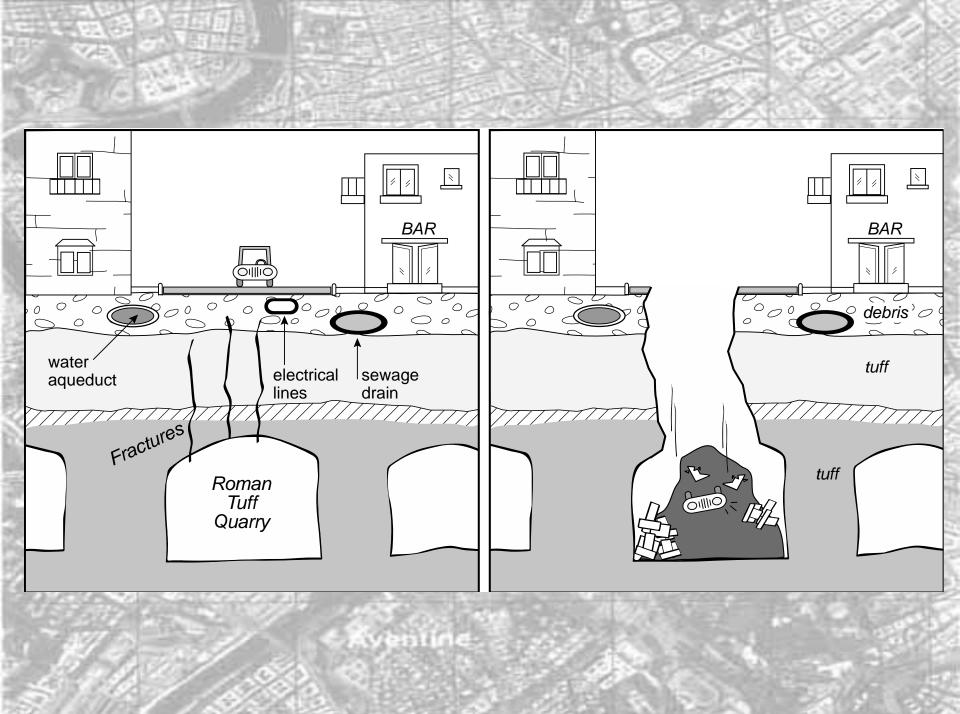




# Quarries and catacombs





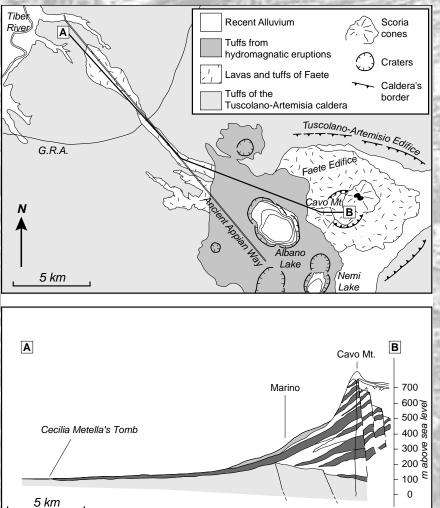




## Pozzolana concrete



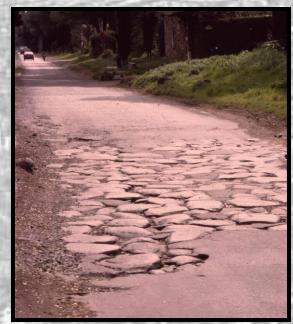
## **Road Building**



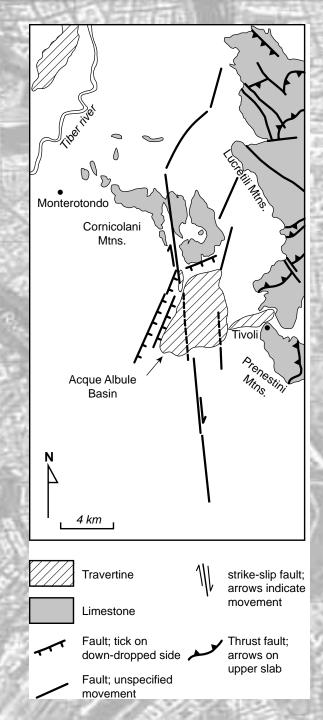
#### Capo di Bove lava flow



## Porta Maggiore



Via Appia





0-1-1+

## TRAVERTINE

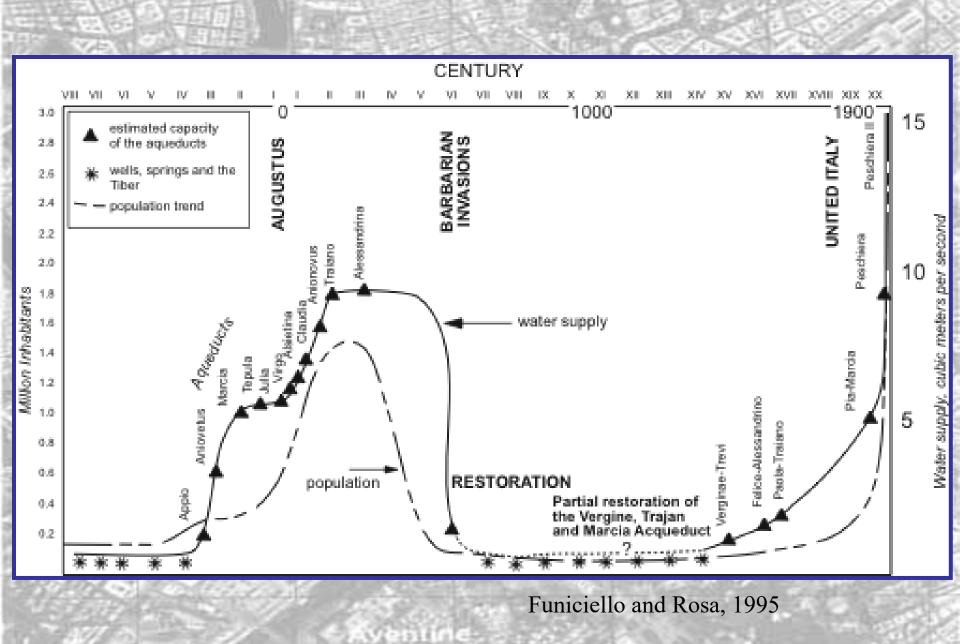
#### Travertine Quarry Bagni di Tivoli

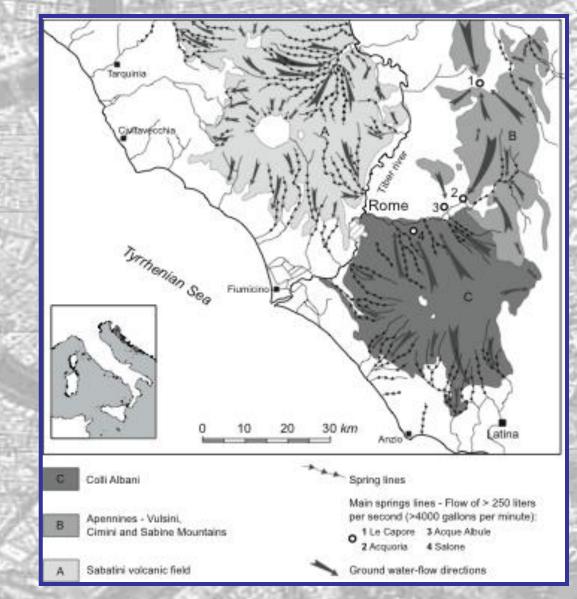


Ponte Cestio-46 BCE

A key to Rome's success— Clean water







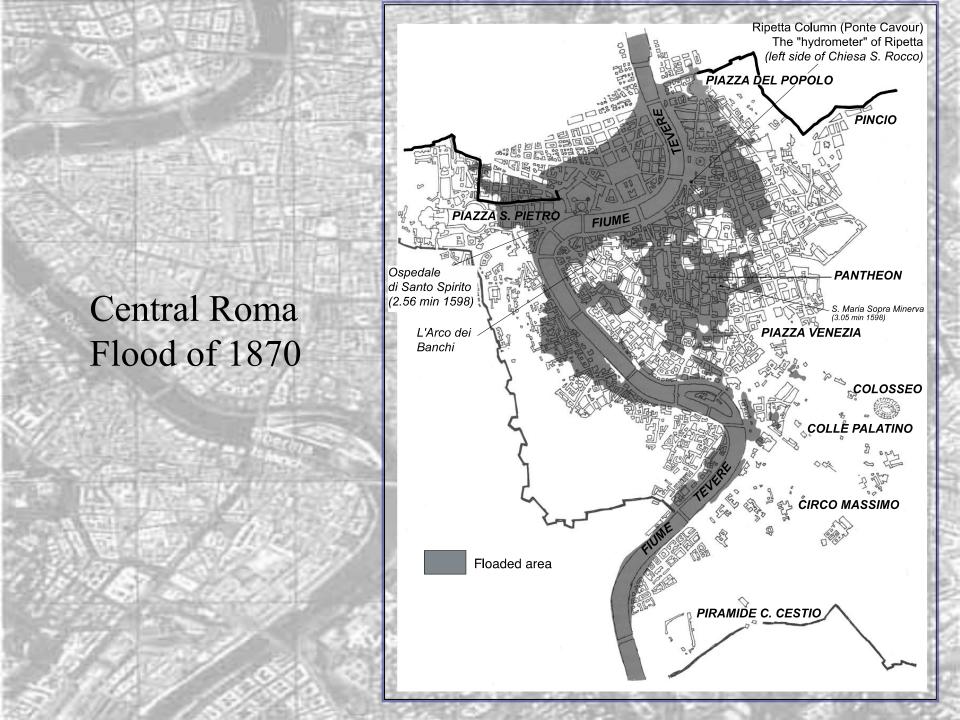
Corazza and Lombardi, 1995

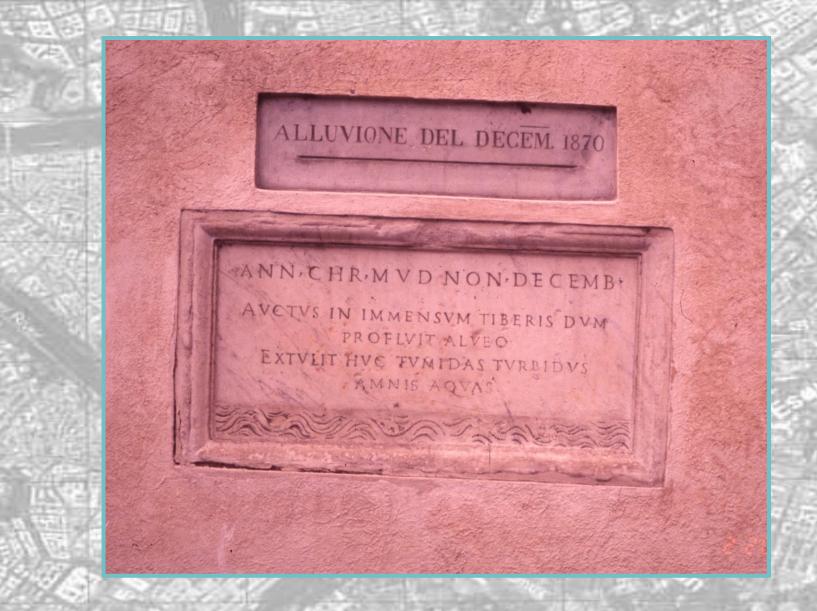
## Aqueducts and thermal baths



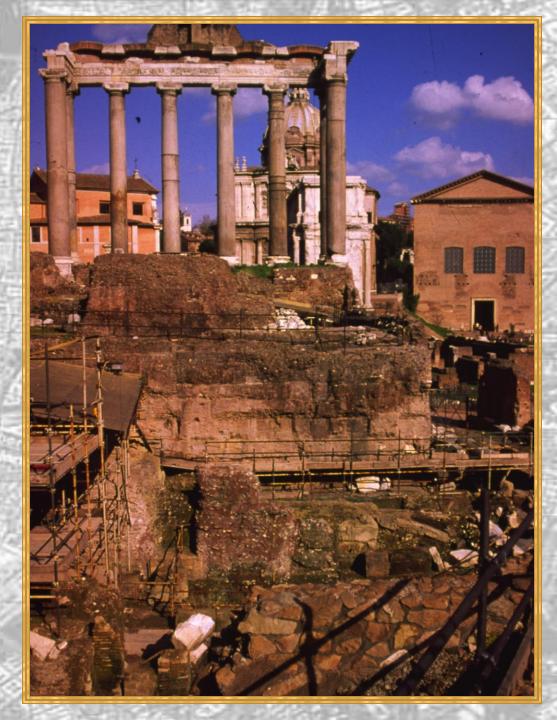
## Piazza Navona Flood of 1870



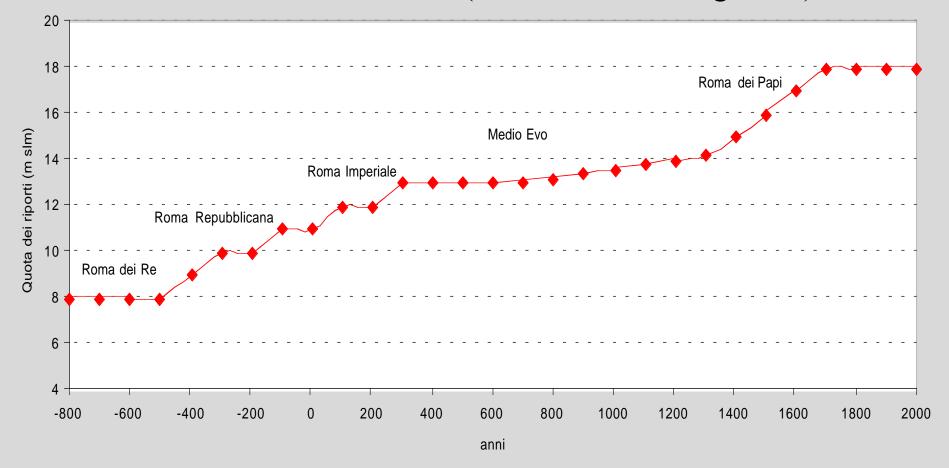


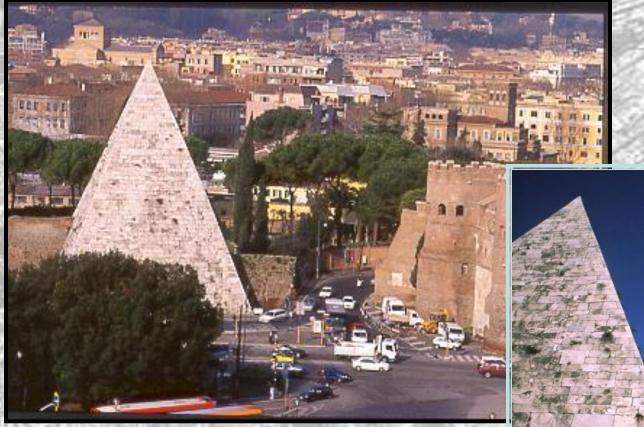


Plaque, façade of Church of Santa Maria Sopra Minerva Flood of 1870. Water depth of 3.95 meters Millenia of debris and trash



#### VARIAZIONE DELLA QUOTA DEI RIPORTI (area campo Marzio) Variation in debris thickness (Area of Mars drill ground)



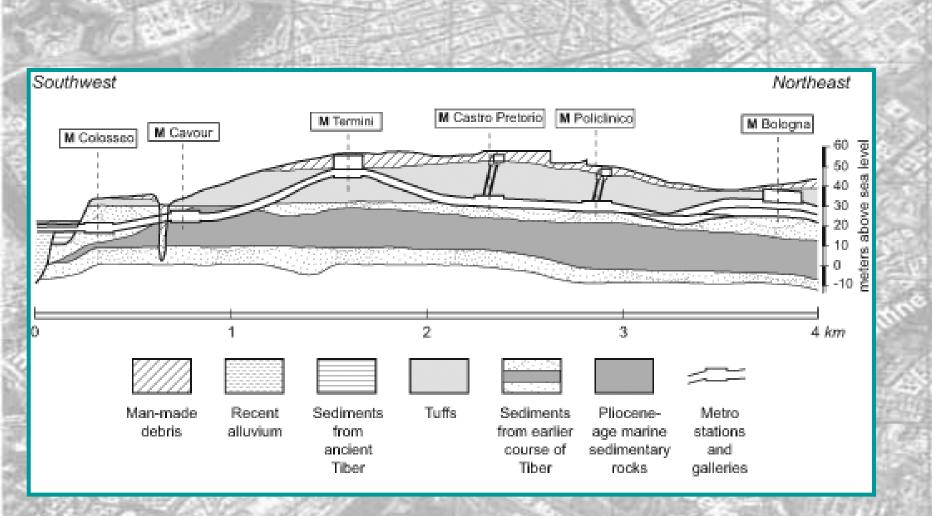


Piramide— Memorial pyramid of Caius Cestius, 12 BCE

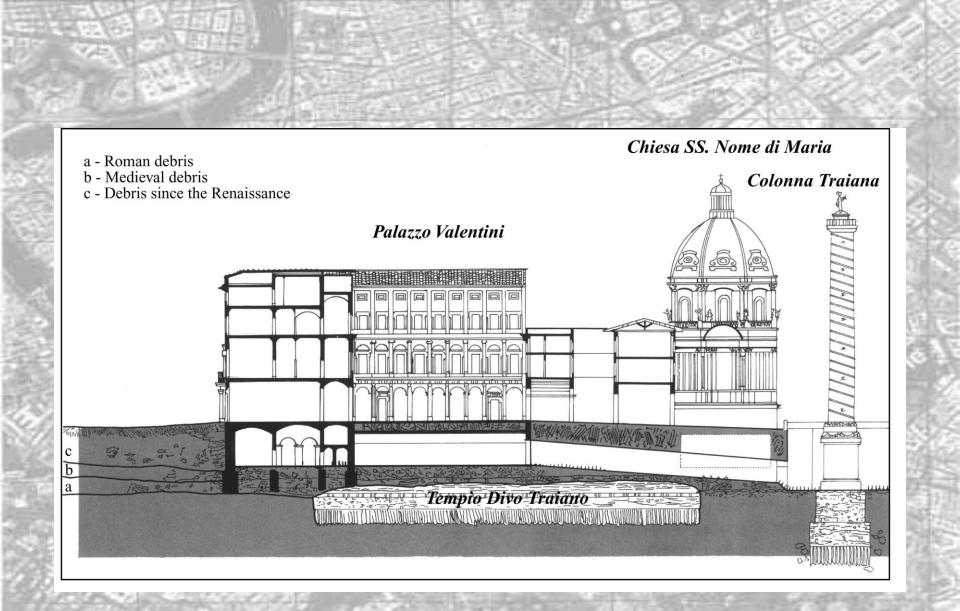




12<sup>th</sup> C. Church of San Clemente (overlies the 1<sup>st</sup> C. BCE Temple of Mithras)



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



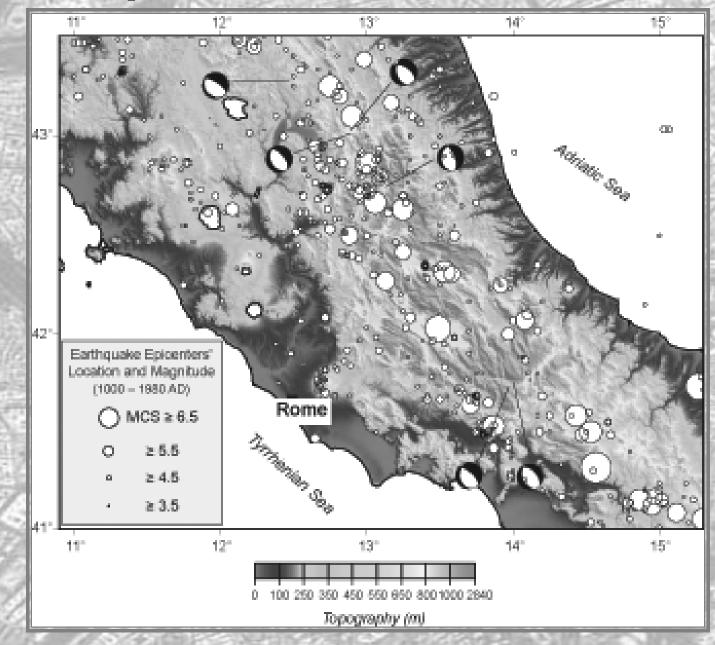
#### Palazzo Valentini (offices of the Provincia de Roma)



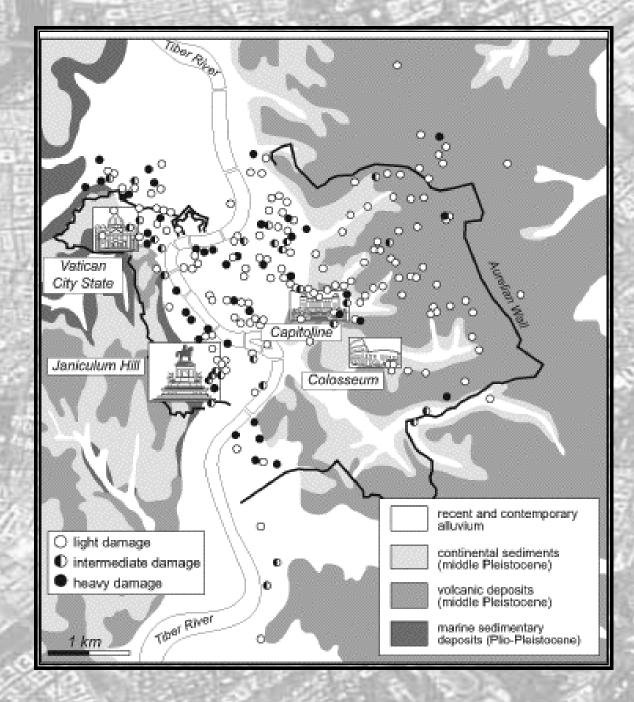
Monte Testaccio—mound of broken Amphorae accumulated between CE 145 And CE 255—53 million amphorae!



#### Earthquakes

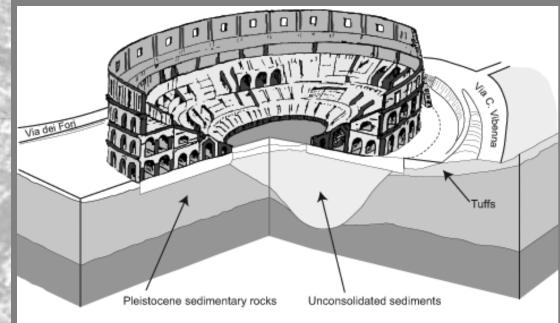


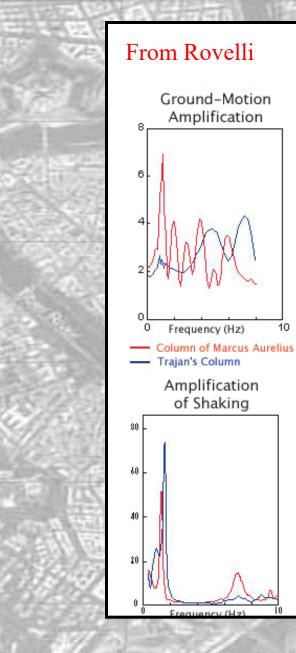
Damage to historical structures caused by earthquakes



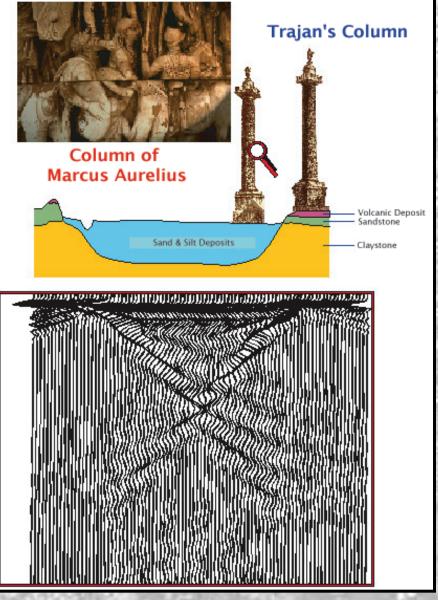


Colosseum (Flavian Amphitheater) Influence of underlying geology on degree of damage caused by earthquakes over the last 1900 years

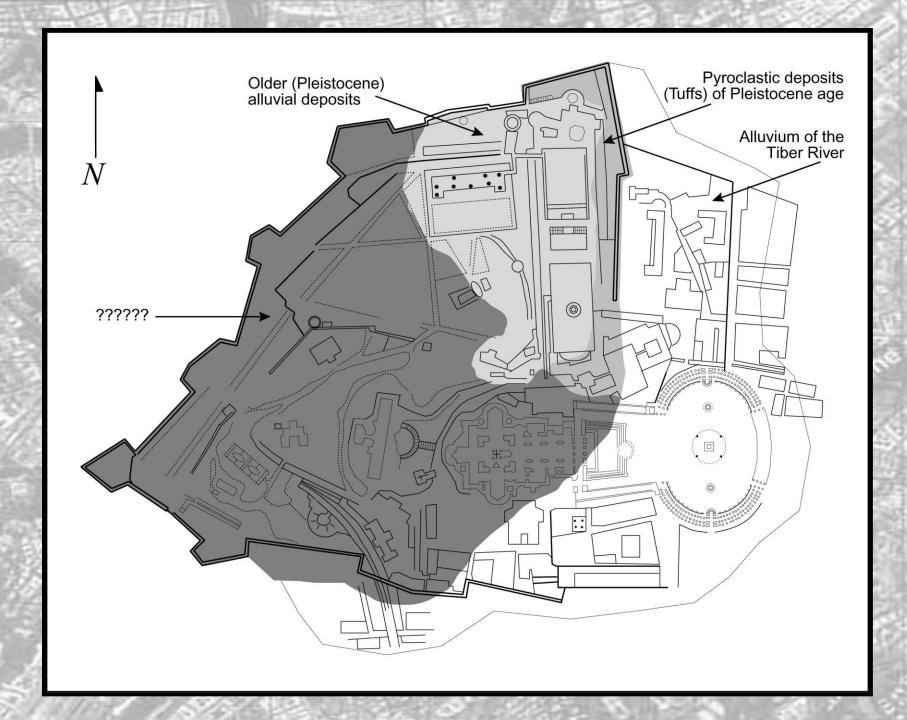




10



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



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

Earth scientists working <u>for</u> the cities, <u>in</u> 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

scala 1:10.000 a cura di Renato Funiciello 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 Funiciello, Grant Heiken, and Donatella De Rita

