## A.S.C.I.L. Corso formativo sul tartufo Potenza, 10 giugno 2015

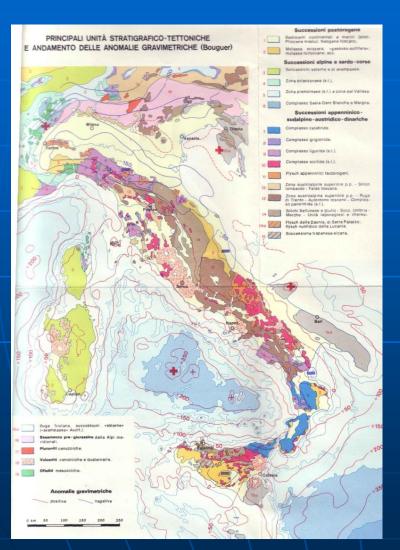


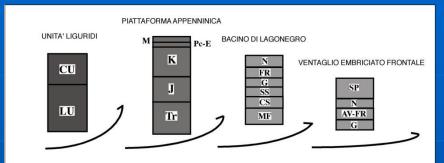
## GEOLOGIA E GEOMORFOLOGIA DELLA BASILICATA

#### MARCELLO SCHIATTARELLA

Dipartimento di Scienze, Università degli Studi della Basilicata, Potenza

#### Gli archi orogenici italiani e l'Appennino meridionale



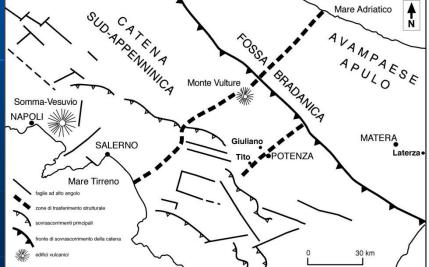


UNITA' LIGURIDI: CU = Unità del Cilento (Miocene inferiore); LU = Unità Liguridi (unità ofiolitifere del Giurassico - Oligocene)

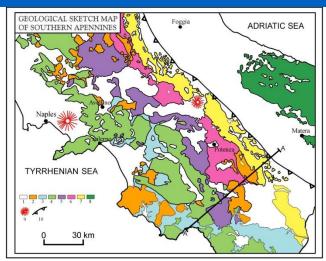
PIATTAFORMA APPENNINICA: **M** = Formazioni del Bifurto e Cerchiara (Miocene inferiore-medio); **Pe-E** = Formazione di Trentinara (Paleocene - Eocene); **K** = Calcare di piattaforma cretacico; **J** = Calcare di piattaforma giurassico; **Tr** = dolomia triassica.

BACINO DI LAGONEGRO: **N** = Flysch Numidico (Miocene inferiore-medio); **FR** = Flysch Rosso (Cretacico medio - Oligocene); **G** = Formazione dei Galestri (Cretacico inferiore); **SS** = Scisti Silicei (Giurassico); **CS** = Calcari con Selce (Triassico superiore); **MF** = Formazione di Monte Facto (Triassico inferiore-medio).

VENTAGLIO EMBRICIATO FRONTALE: SP = Formazione di Serra Palazzo (Miocene superiore); N = Flysch Numidico (Miocene inferiore-medio); AV-FR = Argille Varicolori - Flysch Rosso (Cretacico medio - Oligocene); G = Galestri (Cretacico inferiore).



# La struttura profonda dell'Appennino meridionale



Geological map of southern Italy. Legend: 1. Plio-Quaternary clastics and Quaternary volcanics; 2. Miocene syntectonic deposits; 3. Cretaceous to Oligocene ophiolite-bearing internal units (Ligurian units); 4. Meso-Cenozoic shallow-water carbonates of the Apenninic platform; 5. Lower-middle Triassic to Miocene shallow-water and deep-sea successions of the Lagonegro-type Monte Arioso Unit; 6. Lower-middle Triassic to Miocene shallow-water and deep-sea successions of the Lagonegro-type Groppa d'Anzi Unit; 7. Cretaceous to Miocene deep-sea successions of the Lagonegro-type Campomaggiore Unit; 8. Meso-Cenozoic shallow-water carbonates of the Apulian platform; 9. Volcanoes; 10. Thrust front of the chain. A-A': trace of the regional cross-section shown in Fig. 7.

Schiattarella et al., 2006, Geological Society of America Special Paper

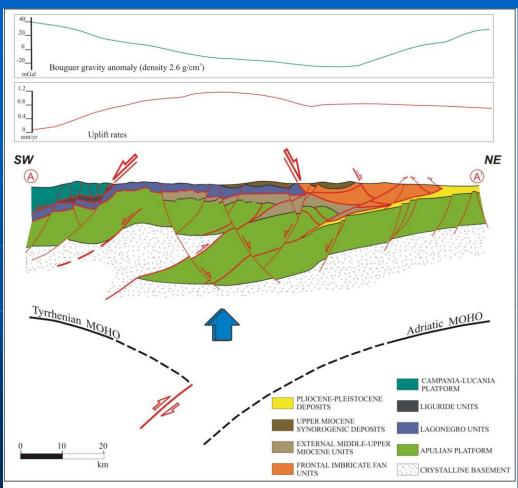
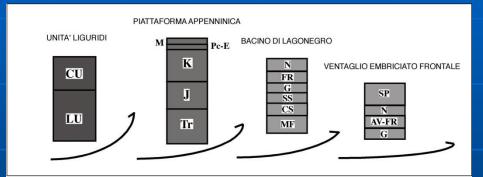


Fig. 7 Regional cross section of the southern Apennines with deep structural interpretation and its relationships with uplift rate (see Fig. 6) and gravimetric (after Menardi Noguera and Rea, 2000) profiles. The trace of the cross-section is shown in Fig. 2.

### I terreni affioranti in Basilicata



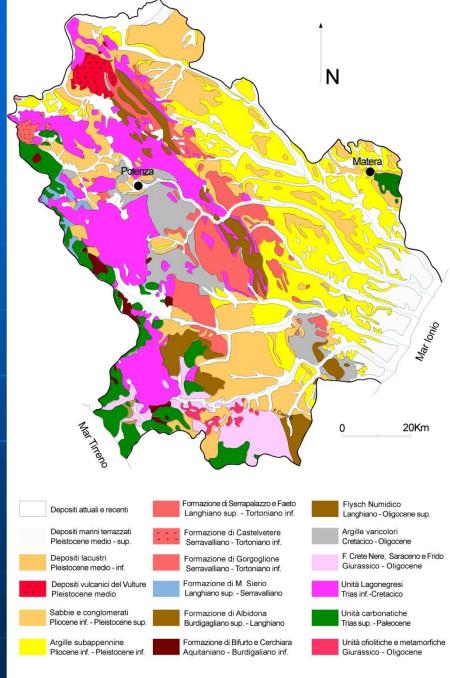
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VENTAGLIO EMBRICIATO FRONTALE: **SP** = Formazione di Serra Palazzo (Miocene superiore); **N** = Flysch Numidico (Miocene inferiore-medio); **AV-FR** = Argille Varicolori - Flysch Rosso (Cretacico medio - Oligocene); **G** = Galestri (Cretacico inferiore).

Modificato da: Schiattarella, 1998, Geological Society of London Special Publ.



#### L'età dei terreni che costituiscono l'Italia

#### INTERNATIONAL CHRONOSTRATIGRAPHIC CHART

v **2014**/02



www.stratigraphy.org

International Commission on Stratigraphy

10 E 10 P

	m/A	E S	do do			
Eono.	Erath,	iary System Eng	Series / Epoch	Stage / Age	GSSP	numerical age (Ma)
		2	Holocene		1	present
		a		Upper	,	0.0117
		1		Middle		0.126
		ate	Pleistocene	Calabrian	1	0.781
		Ä			1	1.80
		O		Gelasian	3	2.58
			Pliocene	Piacenzian	1	3.600
			***********	Zanclean	444	5.333
		Φ		Messinian	3	7.246
		odene		Tortonian	3	11.62
		Ö,		Serravallian	3	13.82
	O	è	Miocene	Langhian		
	Cenozoic	_		Burdigalian		15.97
	9			Aquitanian	_	20.44
	ē				3	23.03
	O		Oligocene	Chattian		28.1
			Oligocerie	Rupelian	4	33.9
		-		Priabonian		
		Paleogene	Eocene	Bartonian		38.0
<u>0</u>						41.3
20				Lutetian	3	47.8
Phanerozoic				Ypresian	5	56.0
				Thanetian	VV	59.2
÷			Paleocene	Selandian	3	
т.				Danian		61.6
				Danian	3	66.0
				Maastrichtian	1	72.1 ±0.2
				Campanian		
			2.2	Santonian	1	83.6 ±0.2
			Upper		1	86.3 ±0.5
				Coniacian		89.8 ±0.3
	0	S		Turonian	3	93.9
	zoje	90		Cenomanian	3	100.5
	<b>Aesozoic</b>	tacı		Albian	772	100.5
	ž	Se				~ 113.0
		O		Aptian		
				Barremian		~ 125.0
			Lower	Hauterivian		~ 129.4
						~ 132.9
				Valanginian		~ 139.8
				Berriasian		~ 145.0

IUGS

\$ P	Series / Epoch			ries / Epoch	Stage / Age	GSSP	numerical age (Ma)
					Tithonian		~ 145.0
				Upper	Kimmeridgian		152.1 ±0.9
					Oxfordian		157.3 ±1.0
					Callovian	_	163.5 ±1.0 166.1 ±1.2
				Middle	Bathonian Bajocian	3	168.3 ±1.3 170.3 ±1.4
		ura			Aalenian	3	174.1 ±1.0
					Toarcian		1007.07
	<u>.0</u>					_	182.7 ±0.7
	Aesozoic					1	190.8 ±1.0
	esc				Sinemurian	3	199.3 ±0.3
	Σ				Hettangian Rhaetian		201.3 ±0.2
					Kildellali		~ 208.5
					Norian		
		sic					~ 227
		ias			Carnian	4	~ 237
O		F				3	~ 242
ZO							247.2
Phanerozoic				Lower	Olenekian Induan	3	251.2
ane		Permian		opingian	Changhsingian		252.17 ±0.06 254.14 ±0.07
Phi				opingian	Wuchiapingian	1	259.8 ±0.4
					Capitanian	3	265.1 ±0.4
			Gu	adalupian	Wordian	3	268.8 ±0.5
					Roadian	3	272.3 ±0.5
		Per			Kungurian		283.5 ±0.6
		_	C	isuralian	Artinskian		
	<u>.0</u>		J	iourunum	Sakmarian		290.1 ±0.26
	020				Asselian	3	295.0 ±0.18 298.9 ±0.15
	Paleozoic		ian	Upper	Gzhelian		303.7 ±0.1
	Pa		van		Kasimovian		307.0 ±0.1
		sn	Pennsyl	Middle	Moscovian		315.2 ±0.2
		010	Pen	Lower	Bashkirian	3	
				Upper	Serpukhovian	-	323.2 ±0.4
		9	ississippian	орро.	- Corporation		330.9 ±0.2
		Ca		Middle	Visean	1	12/12/2017
						1	346.7 ±0.4
				Lower	Tournaisian	3	

tono.	Eratt Pon / E	System / Era	Series / Epoch	Stage / Age	GSSP	numerical age (Ma)							
	Ì		Upper	Famennian	0	358.9 ± 0.4							
		_	орро.	Frasnian	4	372.2 ±1.6 382.7 ±1.6							
		nia		Givetian	3								
		Devonian	Middle	Eifelian	3	387.7 ±0.8							
		۵		Emsian		393.3 ±1.2							
			Lower	Pragian	VV	407.6 ±2.6 410.8 ±2.8							
				Lochkovian	3								
			Pridoli			419.2 ±3.2							
			Ludlow	Ludfordian	VV	423.0 ±2.3 425.6 ±0.9							
		an	Ludiow	Gorstian	1	427.4 ±0.5							
		Ë	Wenlock	Homerian	3	430.5 ±0.7							
		Silurian	Llandovery	Sheinwoodian Telychian	~	433.4 ±0.8							
				Aeronian	3	438.5 ±1.1							
S.	()			Rhuddanian	3	440.8 ±1.2 443.4 ±1.5							
Z	Ö		Upper	Hirnantian	1	443.4 ±1.5 445.2 ±1.4							
Phanerozoic	Paleozoic	ovician		Katian	3	453.0 ±0.7							
har	ian		Ordovician	ian	ian		Sandbian	3	458.4 ±0.9				
а				Middle		3							
				Ordo	Ordo		Dapingian	3	467.3 ±1.1				
		Ō				Ō	ō	Ō	ō		Floian	4	470.0 ±1.4
												Lower Tremado	
				Stage 10		485.4 ±1.9							
			Furongian	Jiangshanian	4	~ 489.5							
				Paibian	3	~ 494							
						Guzhangian	3	~ 497 ~ 500.5					
			Series 3	Drumian	1	~ 504.5							
		Orig		Stage 5									
		Ħ		Stage 4		~ 509							
		Cambrian	Series 2	Stage 3		~ 514							
				Stage 2		~ 521							
			Terreneuvian			~ 529							
				Fortunian									

	them Eon	Erathem / Era	System / Period	ÖÖ	numerical age (Ma)
			Ediacaran	3	541.0 ±1.0 ~ 635
		Neo- proterozoic	Cryogenian		
		p.10.10.10.10.10.10.10.10.10.10.10.10.10.	Tonian	<b>A</b>	850 1000
			Stenian		1200
	ပ	Meso- proterozoic	Ectasian		
	ozo		Calymmian	0	1400
	Proterozoic		Statherian	Ĩ	1600
an	Pro	Paleo- proterozoic	Orosirian	9	1800
Precambrian			Rhyacian	0	2050
car			Siderian	0	2300
Pre			Siderian	0	2500
	an	Neo- archean			2800
		Meso-			2800
	he	archean		0	3200
	Arc	Paleo- archean			
		Eo-		0	3600
		archean		0	4000
	Hadean				
nfin	~ 4600				

Units of all ranks are in the process of being defined by Global Boundary Stratotype Section and Points (GSSP) for their lower boundaries, including those of the Archean and Proterozoic, long defined by Global Standard Stratigraphic Ages (GSSA). Charts and detailed information on rafified GSSPs are available at the website <a href="https://www.stratigraphy.org">https://www.stratigraphy.org</a>. The URL to this chart is found below.

Numerical ages are subject to revision and do not define units in the Phanerozoic and the Ediacaran; only GSSPs do. For boundaries in the Phanerozoic without ratified GSSPs or without constrained numerical ages, an approximate numerical age (~) is provided.

Numerical ages for all systems except Lower Pleistocene, Permian, Triassic, Cretaceous and Precambrian are taken from 'A Geologic Time Scale 2012' by Gradstein et al. (2012), those for the Lower Pleistocene, Permian, Triassic and Cretaceous were provided by the relevant ICS subcommissions.

Coloring follows the Commission for the Geological Map of the World (http://www.ccgm.org)

Chart drafted by K.M. Cohen, S.C. Finney, P.L. Gibbard

To cite: Cohen, K.M., Finney, S.C., Gibbard, P.L. & Fan, J.-X. (2013; updated) The ICS International Chronostratigraphic Chart. Episodes 36: 199-204.

CCGM

URL: http://www.stratigraphy.org/ICSchart/ChronostratChart2014-02.pdf

Ere geologiche e
principali tartufi
associati ad esse
(sic)

[si riporta la parte più recente]

Ce	no	οz	oi	С

Era

Periodo

Ma

0,01

**Epoca** 

Olocene Flandriano o Recente

	Quaternari		
Cenozoico	Terziario		
∕lesozoico	Cretaceo		

1,8
5
24
38
54
65
144

	1,8
	5
	24
	38
	54
	65
	144

Pleistocene
Pliocene
Miocene
Oligocene
Eocene
Paleocene

Tartufo bianco pregiato Tuber Magnatum
Tartufo nero estivo Tuber aestivum
Tartufo nero pregiato Tuber melanosporum
Tartufo nero estivo Tuber aestivum

**Tartufi** 

**Associati** 

Tartufo bianco pregiato Tuber Magnatum

Tartufo nero

**Tuber aestivum** 

estivo

Età

Monastoriano o Wurm

Tirreniano o Riss

Siciliano o Günz

Milazziano o Mindel

Astiano o Superiore Piacenziano o Medio

Messiniano o Saheliano

Langhiano o Elveziano

Tortoniano Serravalliano

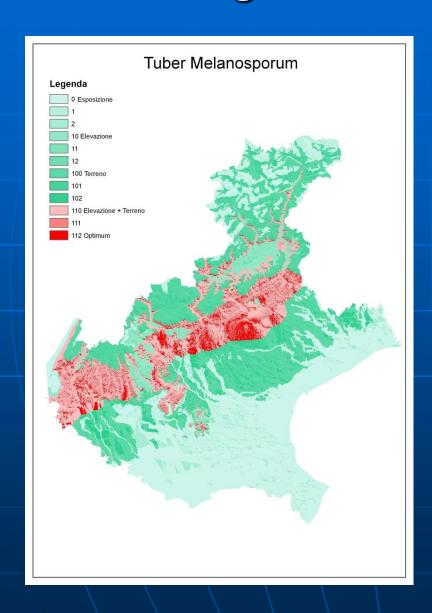
Burdigaliano Aquitaniano Chattiano Rupelliano Priaboniano Bartoniano Luteniano Ypresiano Thanetiano Senoniano o Superiore Daniano

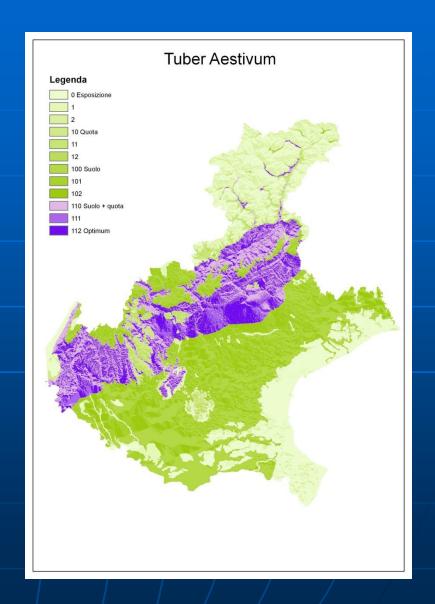
Maastrichtiano Campaniano Santoniano Coniaciano Gallic o Medio Turoniano

Cenomaniano Albiano Aptiano Barremiano Neocomiano o Inferiore Hauteriviano Valanginiano Berriasiano

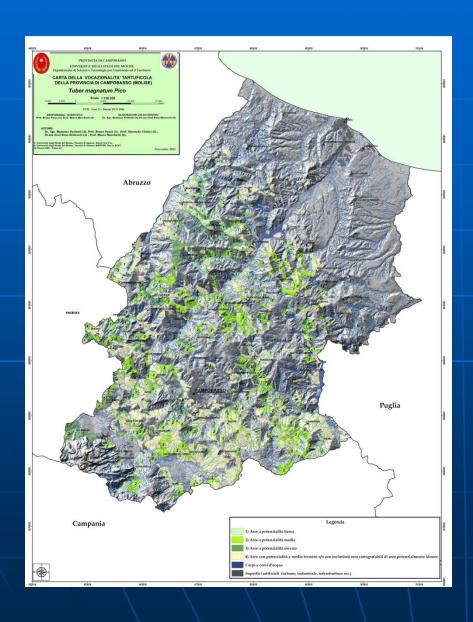
Zancliano o Inferiore o Tabianiano

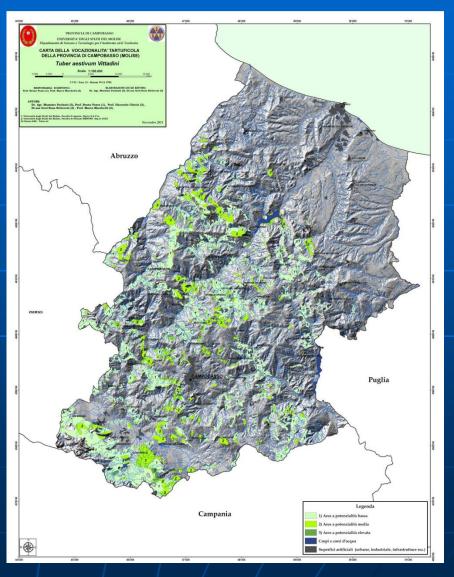
### Cartografia derivata dedicata



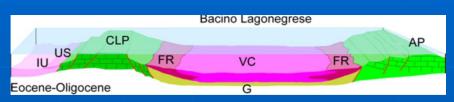


#### Carte della vocazionalità tartuficola

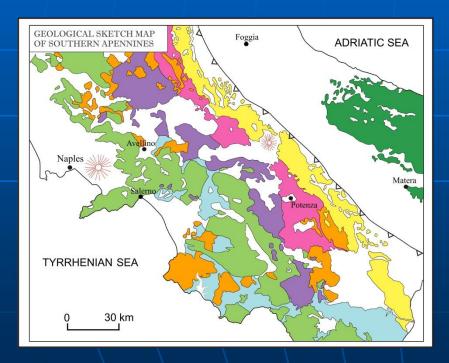




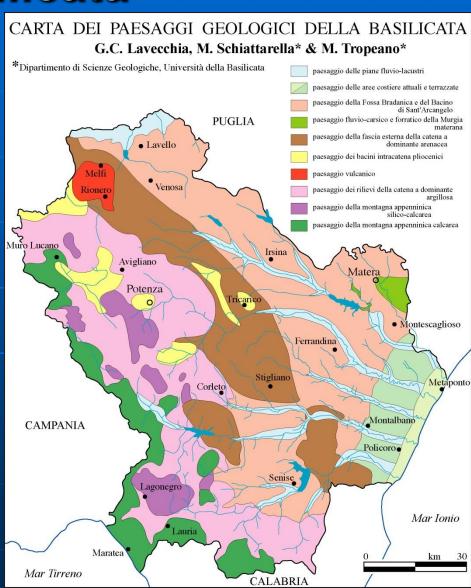
### Geologia e paesaggio fisico della Basilicata



#### Paleogeografia



Schema tettonico



### Indice di geodiversità

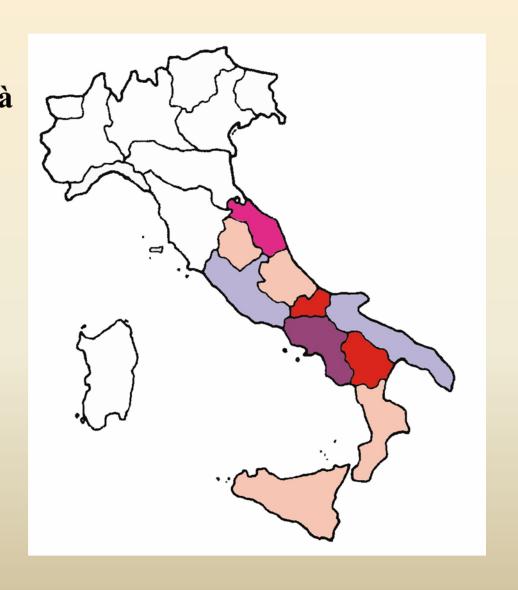
$$\frac{\sum \mathbf{P_g}}{\mathbf{A_t}} * 100$$

dove  $P_g$  rappresenta il singolo paesaggio geologico

mentre  $A_t$  è l'area del territorio preso in esame

# Comparazione dell'indice di geodiversità per le regioni dell'Italia centro-meridionale

	Regione	Indice di geodiversit
•	Umbria	3,5
•	Marche	5,1
•	Lazio	2,9
•	Abruzzo	3,7
•	Molise	9,0
•	Campania	4,4
•	Basilicata	9,0
•	Calabria	3,3
•	Puglia	2,0
•	Sicilia	3,5

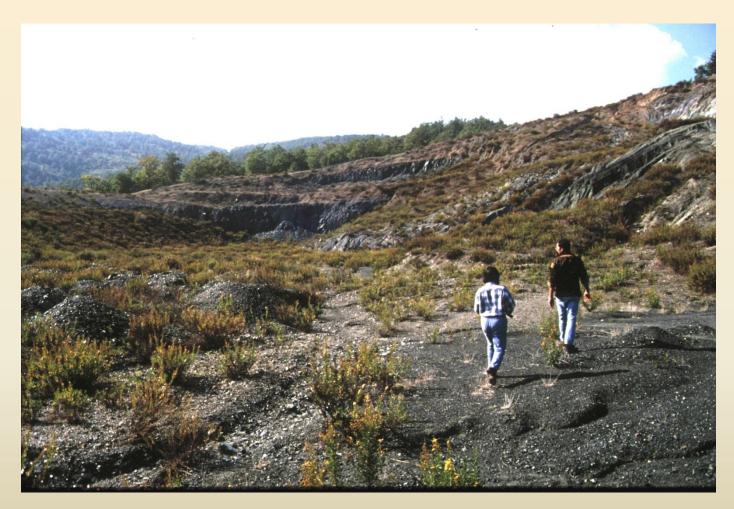


### Indice di attrazione geoturistica

\( \sum\_{\text{Attrattori territoriali}}\) (artistici, culturali, infrastrutturali, ecc.)

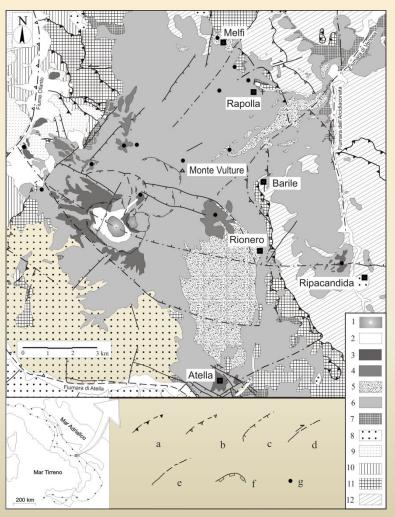
Indice di geodiversità

#### Le rocce di derivazione oceanica



Cava in serpentiniti nell'area del Parco del Pollino

#### Il distretto vulcanico

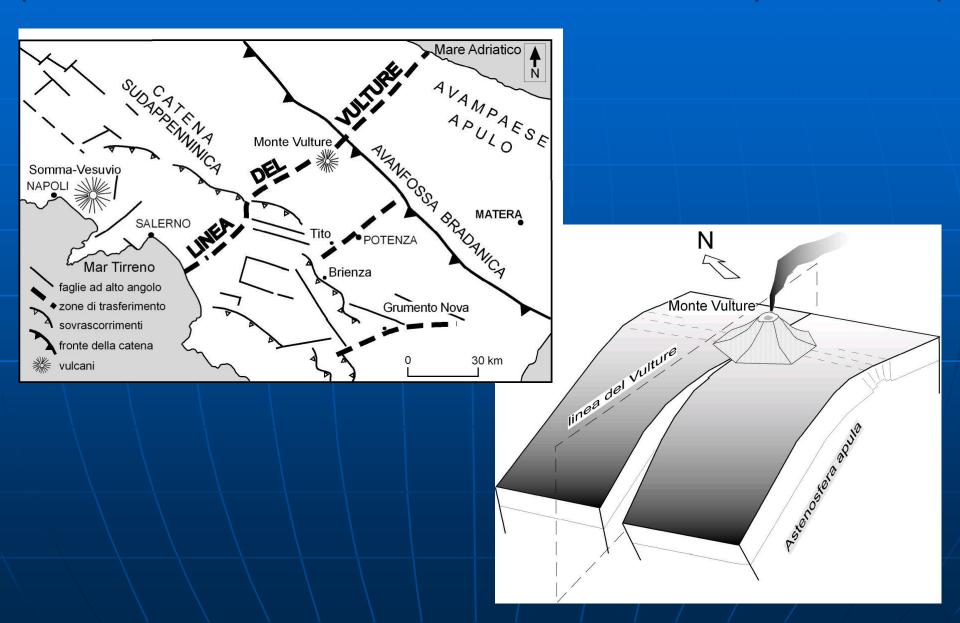




Monte Vulture e bacino di Atella (da Schiattarella *et alii*, 2005)

#### Strutture di trasferimento: la Linea del Vulture

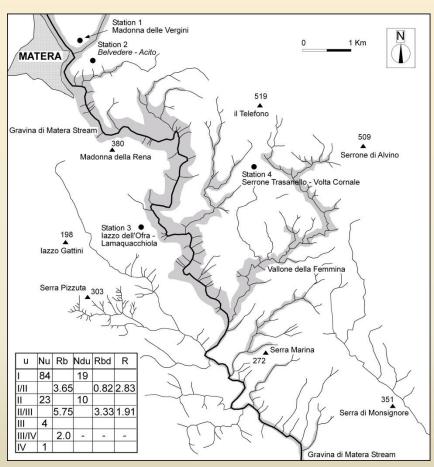
(Schiattarella, Beneduce, Di Leo, Giano, Giannandrea & Principe, 2005, BSGI)



#### Aree di avampaese



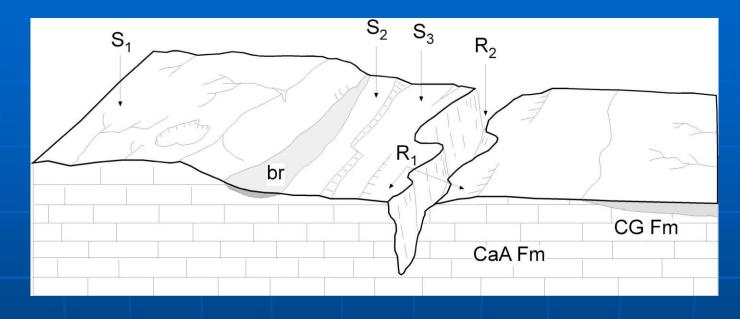
Calanchi e superfici strutturali nel bacino di Sant'Arcangelo

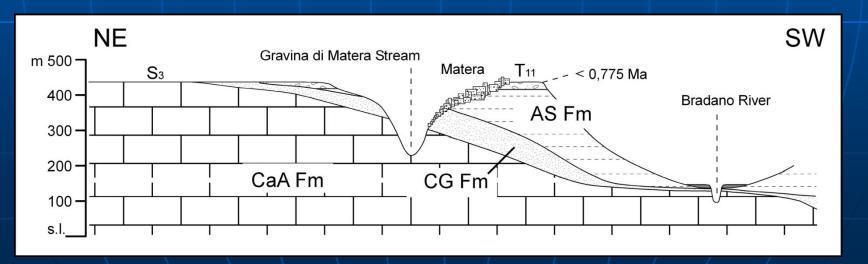


Il reticolo idrografico "anomalo" della Murgia materana

#### L'alto morfostrutturale di Matera

(Beneduce, Festa, Francioso, Schiattarella & Tropeano, 2004, PCE)





### Le forme strutturali









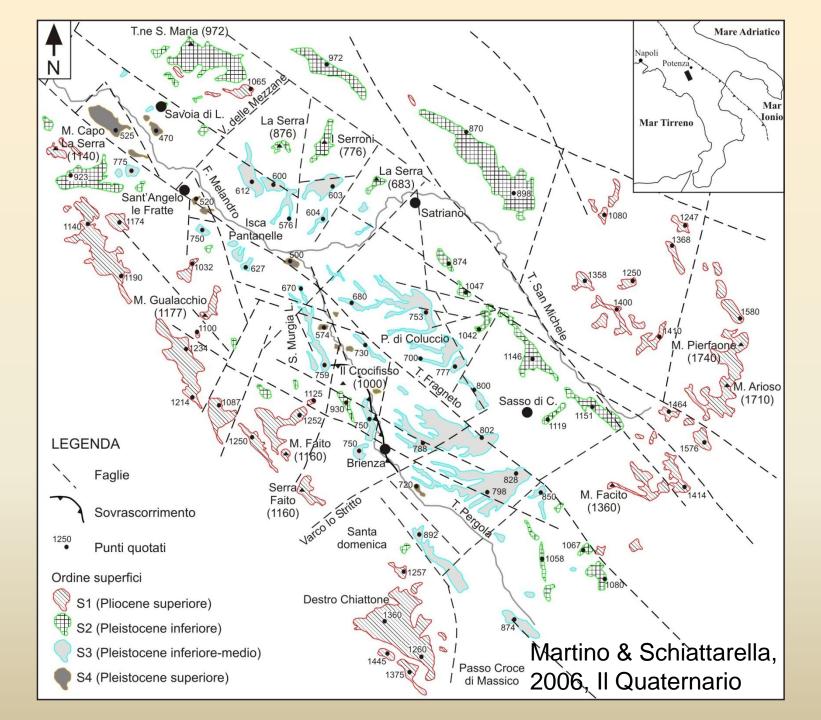
### Le superfici spianate o terrazzate



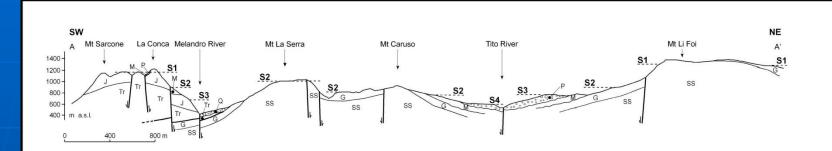


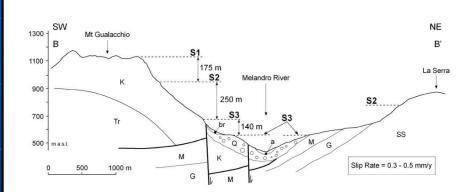


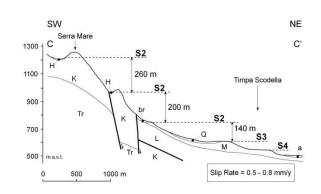




#### Sezioni morfostratigrafiche dell'Appennino lucano (Schiattarella et alii, 2003, Quaternary International)







#### Legend

#### **CLASTICS DEPOSITS**

- a: Holocene alluvial deposits
- br: Pleistocene slope deposits
- Q: Pleistocene alluvial deposits
- P: Pliocene conglomerate
- M: Miocene siliciclastic units

#### CARBONATE PLATFORM

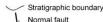
- K: Cretaceous shallow-water limestone
- J: Jurassic shallow-water limestone
- Tr: Triassic dolomite

#### LAGONEGRO BASIN

- G: Galestri Fm (Cretaceous)
- SS: Scisti Silicei Fm (Jurassic)
- CS: Calcari con selce Fm (upper Triassic)
- MF: Monte Facito Fm (lower-middle Triassic)

#### LIGURIAN BASINS

L: Ophiolitic units (Cretaceous - Oligocene)



Trascurrent fault

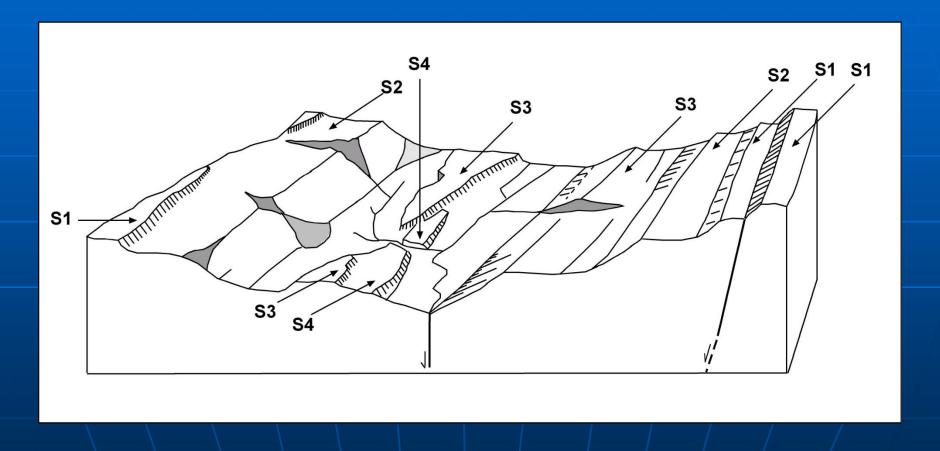
Thrust

#### LANDSURFACES

- S1: late Pliocene early Pleistocene
- S2: early Pleistocene
- S3: middle Pleistocene
- S4: middle-late Pleistocene

# Interpretazione geomorfologica ed attribuzione cronologica delle superfici spianate

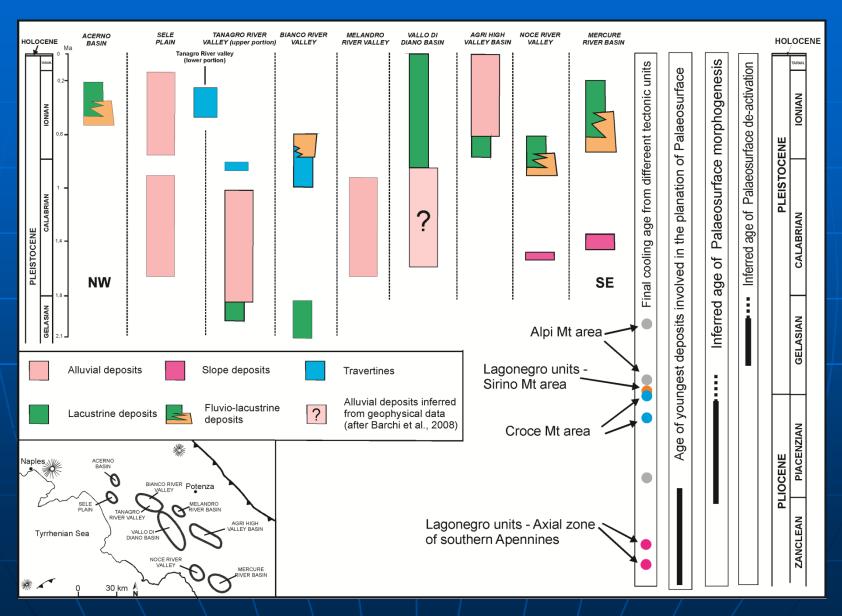
(Schiattarella et alii, 2003, 2004, 2006, 2013)



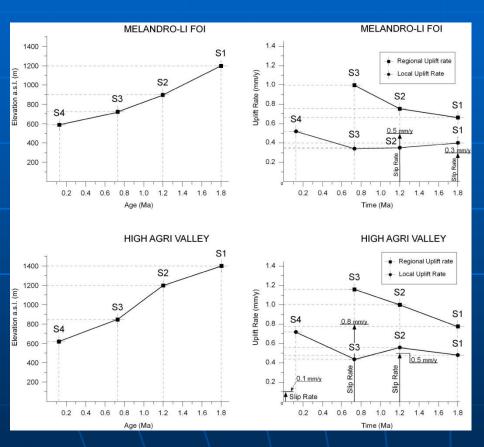
S1 land surface = paleosuperficie sommitale

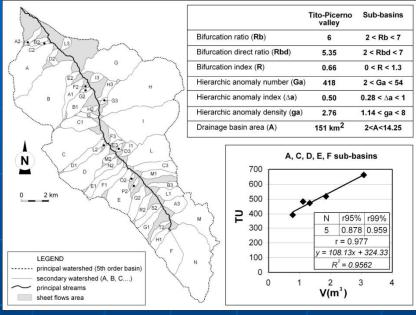
#### Età del riempimento dei bacini intermontani

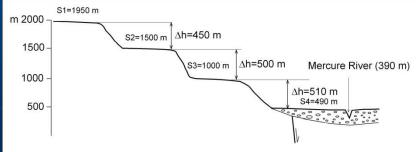
(Di Leo et alii, 2009; Gioia et alii, 2011a, 2011b; Giano et alii, 2014a, 2014b)



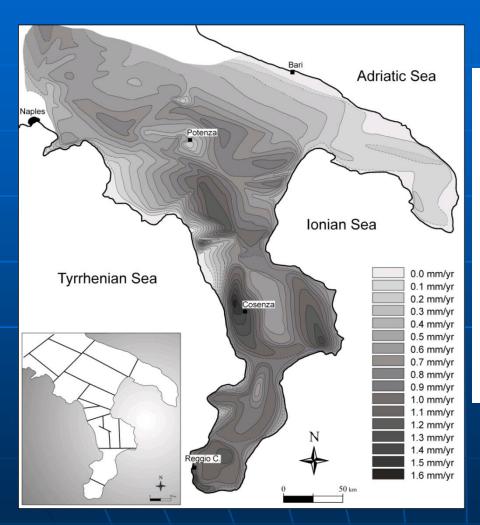
## Comparazione tra tassi di sollevamento ed erosione (Schiattarella *et alii*, 2003, 2004, 2006, 2008)

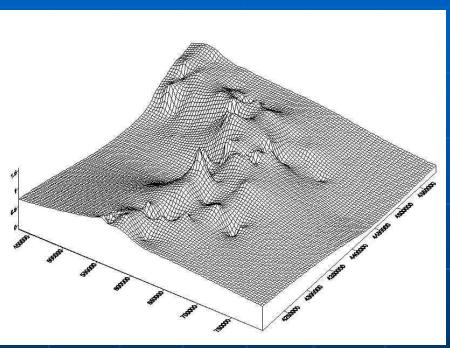






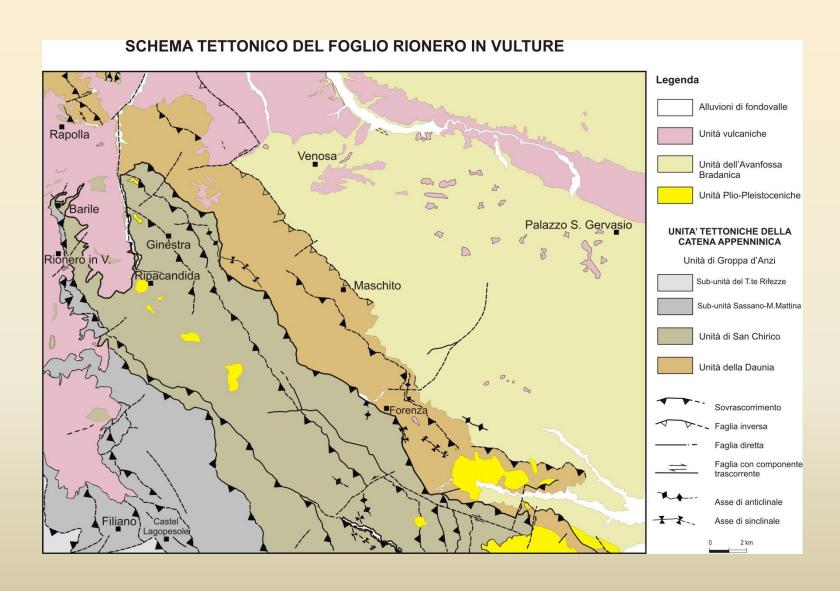
## La ripartizione del tasso di *uplift* in Italia meridionale (Schiattarella *et alii*, 2006, GSA Special Paper, 2008 BGTA)



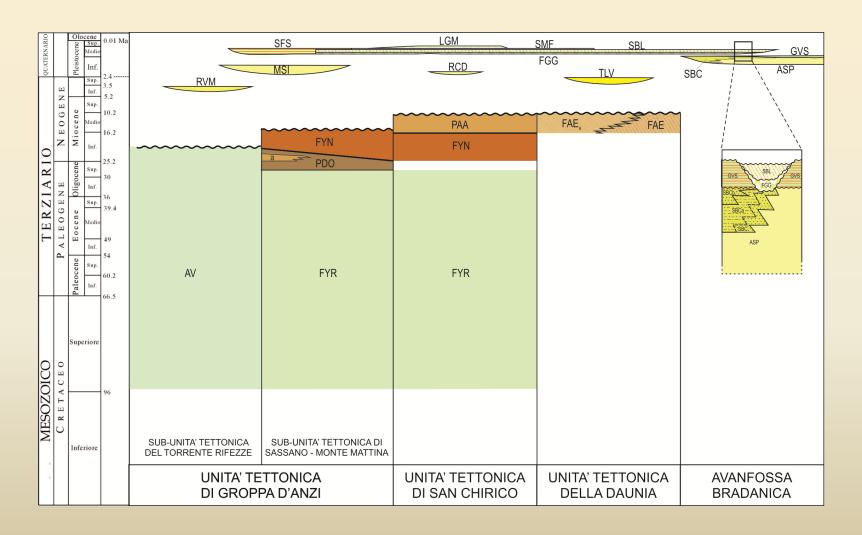


La catena orogenica sud-appenninica è caratterizzata da un paesaggio fisico «transiente»

### La parte frontale della catena



# Schema cronostratigrafico del fronte della catena



#### Distribuzione areale dei conglomerati: un esempio dal Senisese



### Le sette chiavi geologiche e geografico-fisiche

Complessità geologica

Caratteri chimico-fisici dei suoli

Spessore della copertura pedologica

Classi di acclività dei versanti

Esposizione dei versanti

Parametri climatici

Idrografia