Cenozoic magmatism in the Alps with special reference to the Ligurian knot

Alfons Berger

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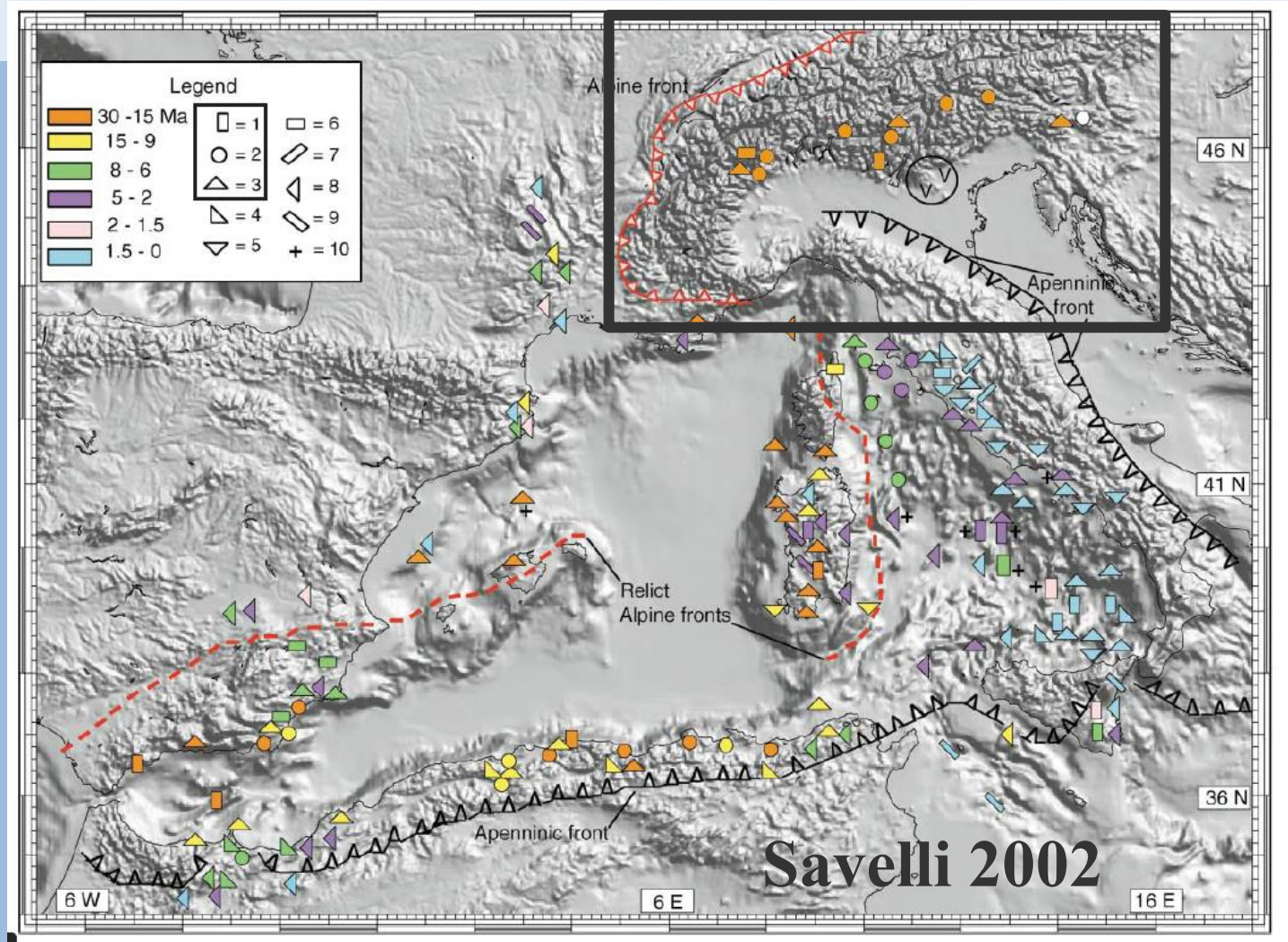
The Alps inside the Western Mediterranean

Area of next slide



1: tholeiite 2: calc-alkaline plutons
3: calc-alkaline volcanics

see also Lustrino 2011, Savelli 2015

Tectonic map of the Alps
including some ages (in Ma) of the magmatic centers

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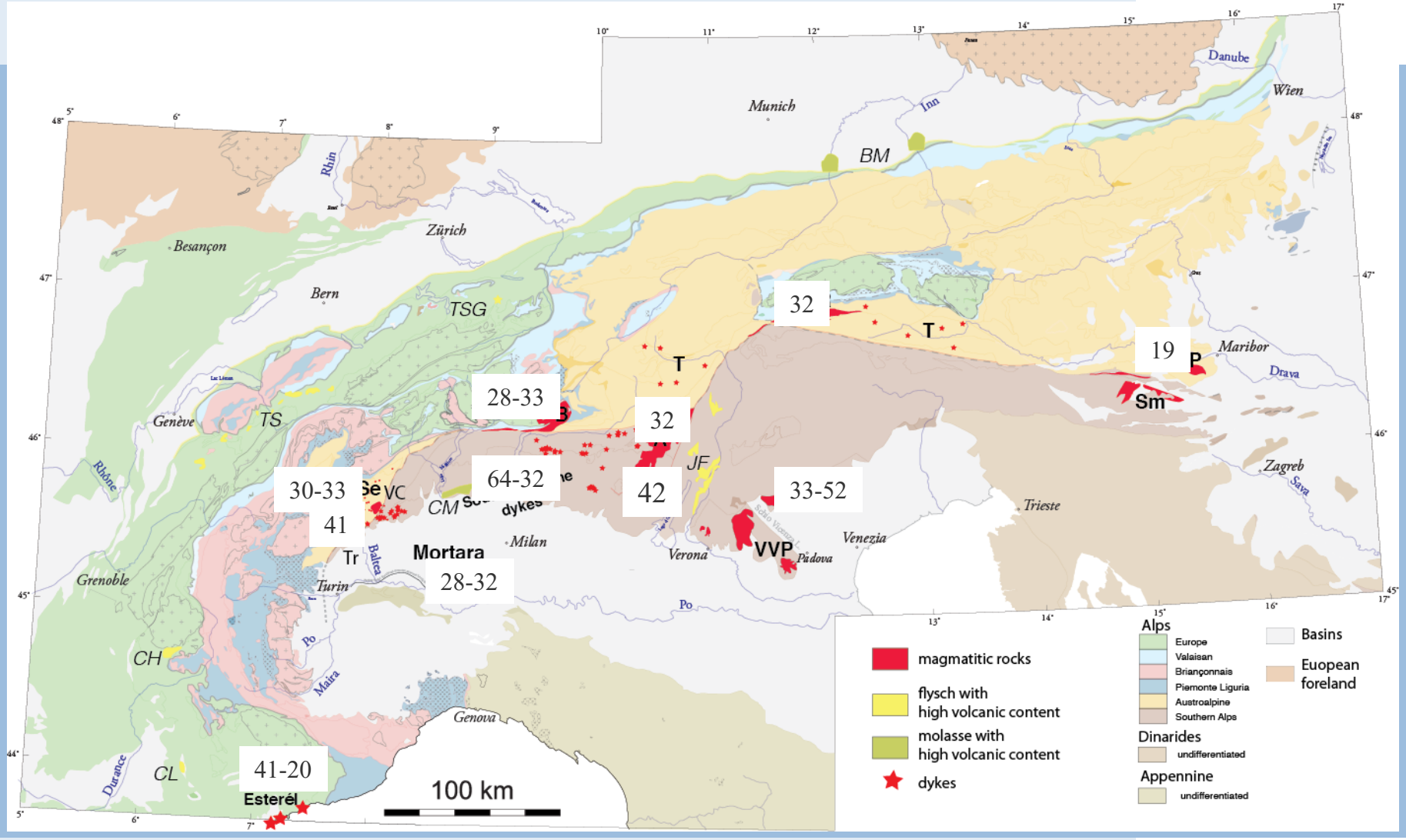


Groups

Periadriatic magmatic rocks
(calc-alkaline series between
~42 and 30 Ma)

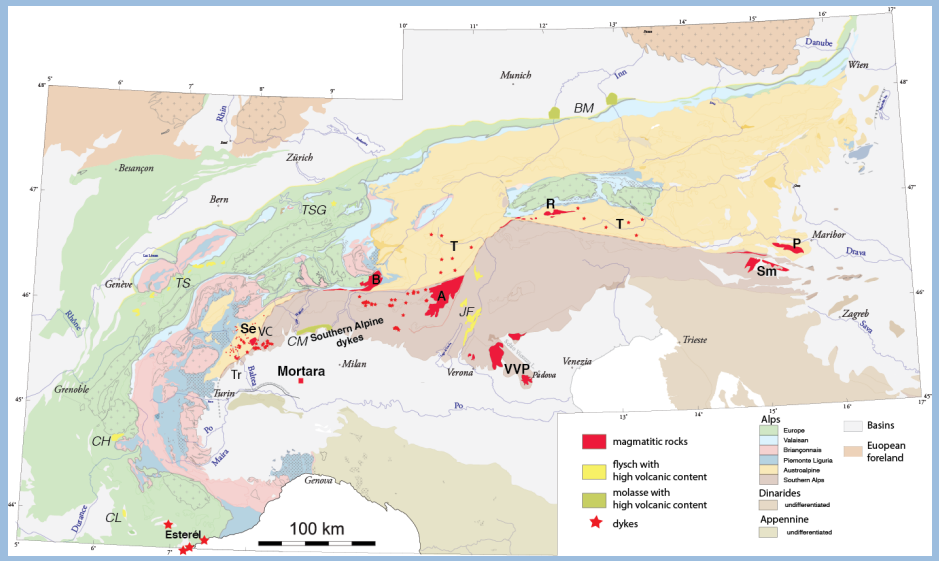
Dykes in the Southern- and Eastern Alps
(basalts, andesites between 64 and 33 Ma)

Sesia Zone area
(ultrapotassic, shoshonitic rocks between 33 and 30 Ma

Veneto volcanic province
(nephelinites, basanites and alkali basalts between 52 and 30 Ma

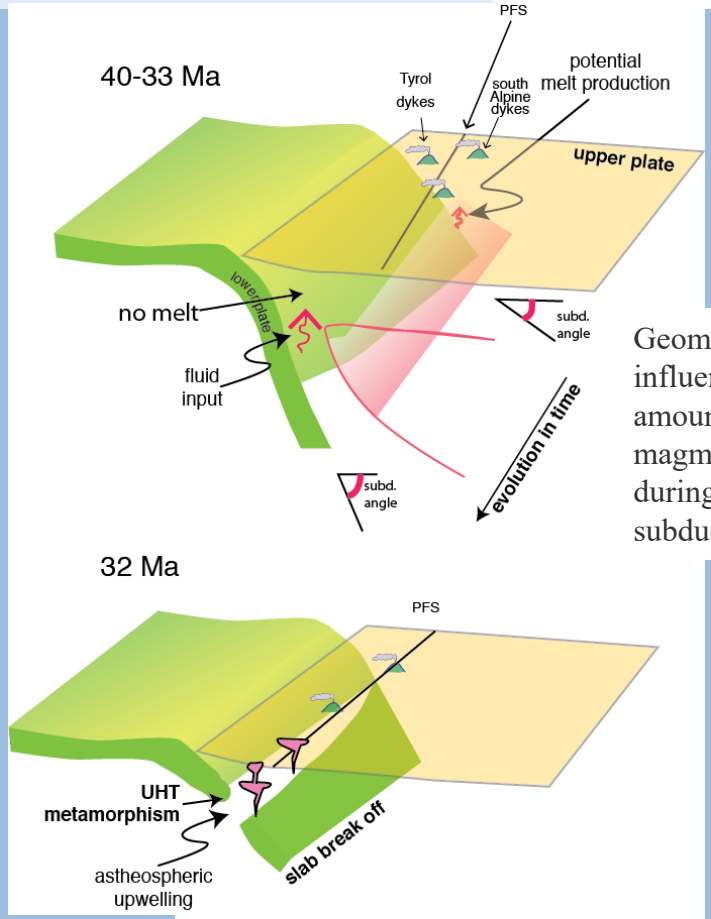
Esterél
(basalts, andesites and dacites 40 and 20 Ma)

Subduction and slab break off



subduction related magmatism occur over ~20 Ma (preservation is weak: Southern Alpine dykes 60-33 Ma, Southern Adamello) see also Flysch and Molasse deposits

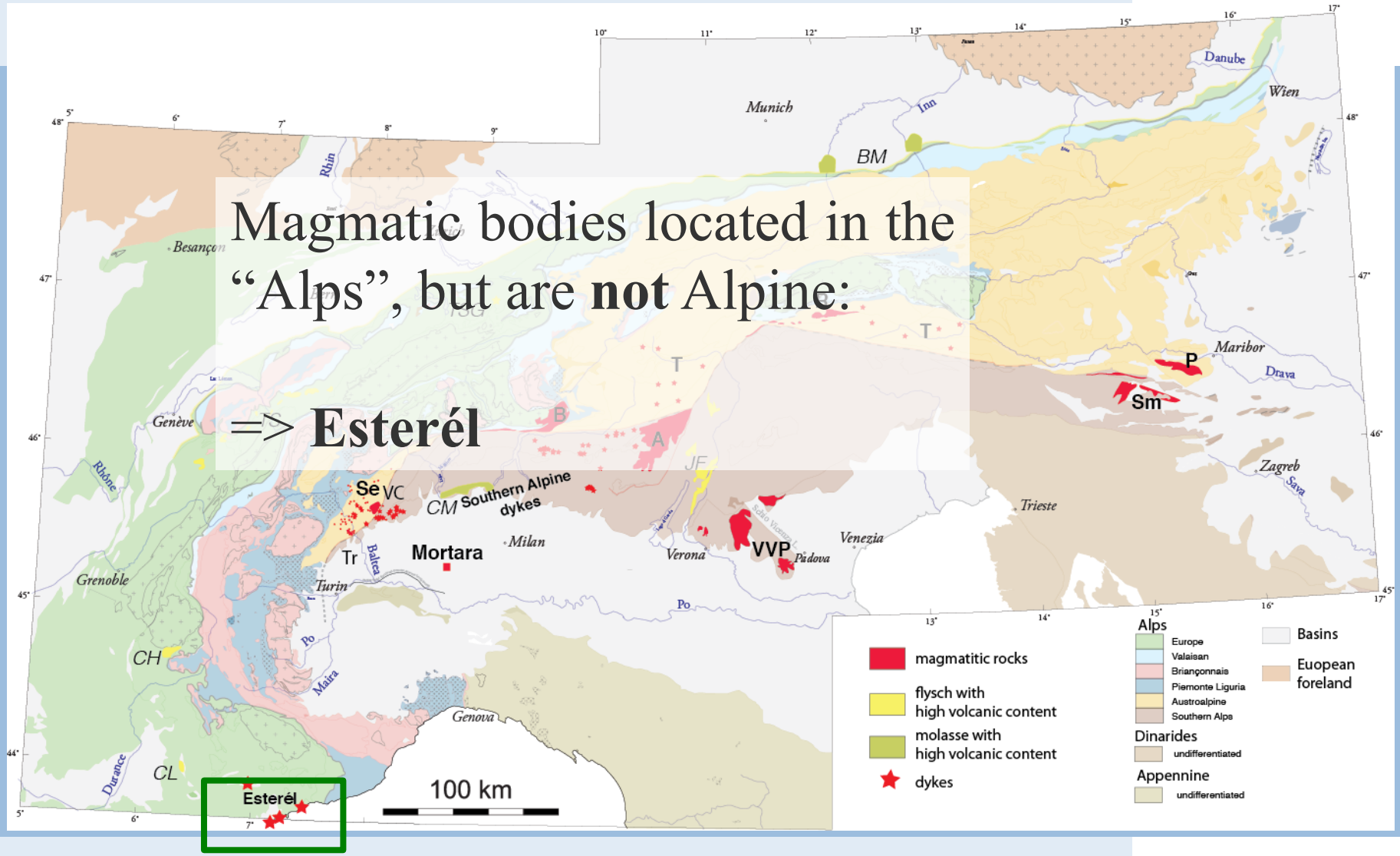
slab break off magmatism:
high preservation in plutonic rocks
tight temporal window (32-28 Ma)



Geometry influence the amount of magmatism during subduction

Slab break off is more localized

Magmatism at Alpine bourders:



Esterél magmatism and the relation to the Apennine

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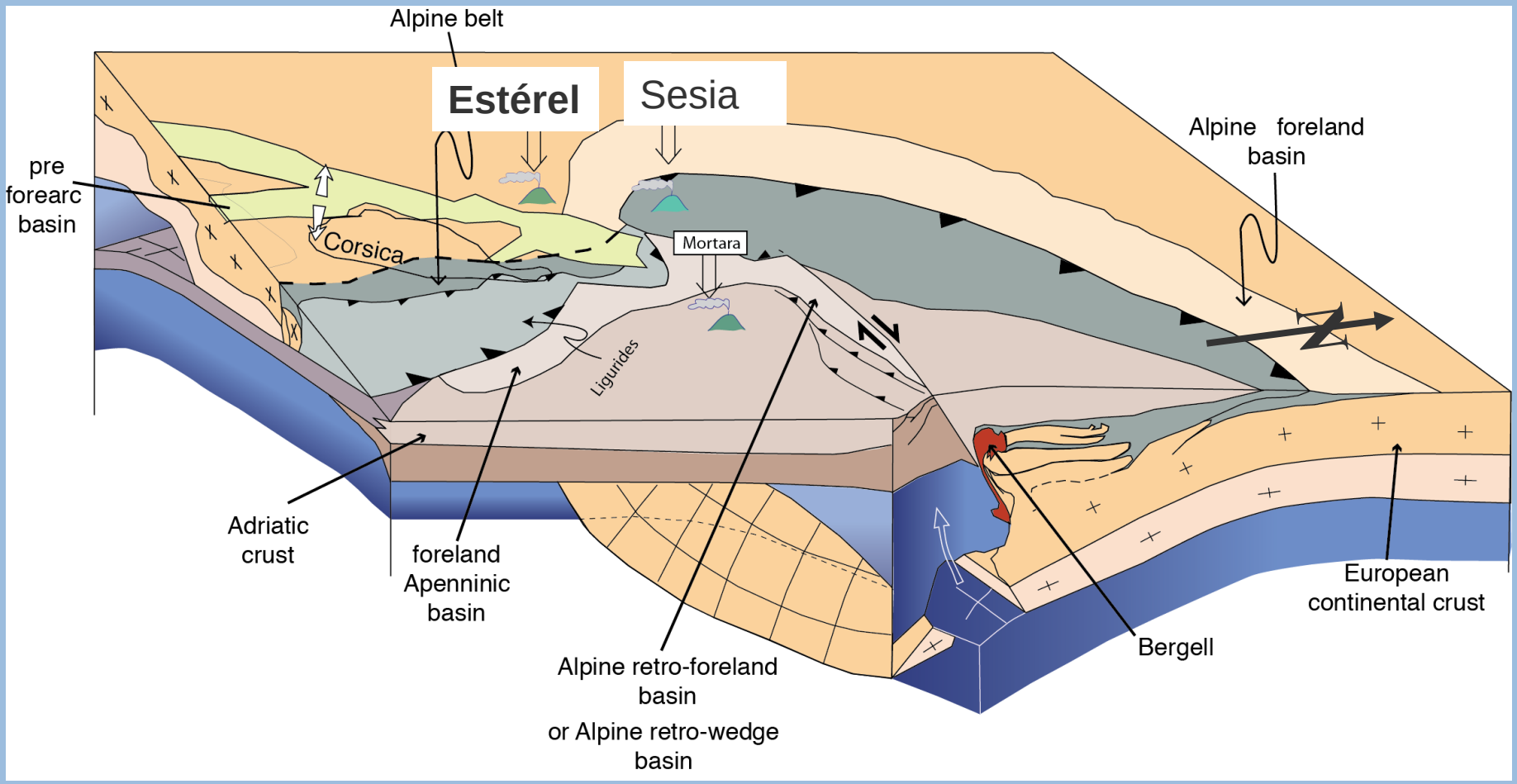
~ 33-32 Ma

At the same time Sesia, subduction and Esterel magmatism occur



The Liguran knot @ 33 Ma

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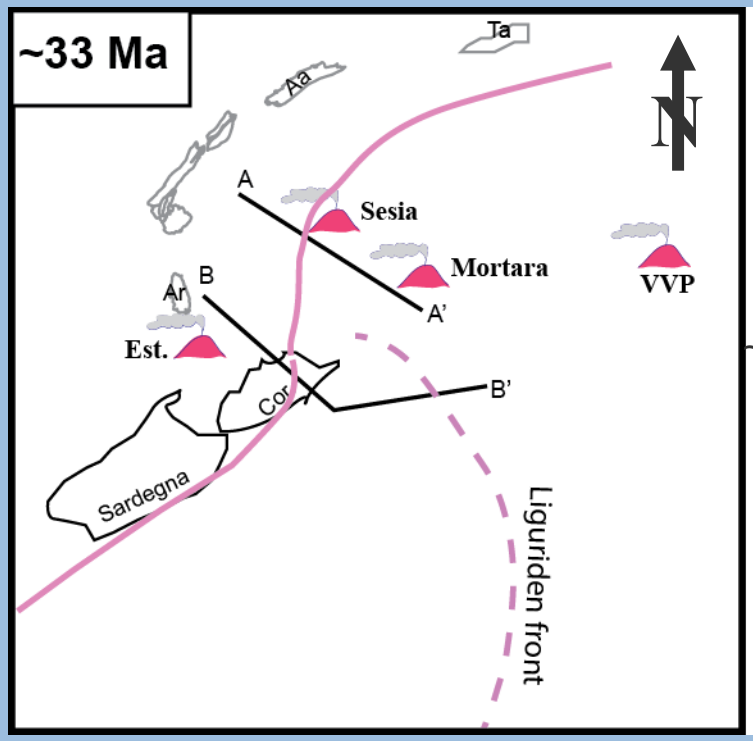
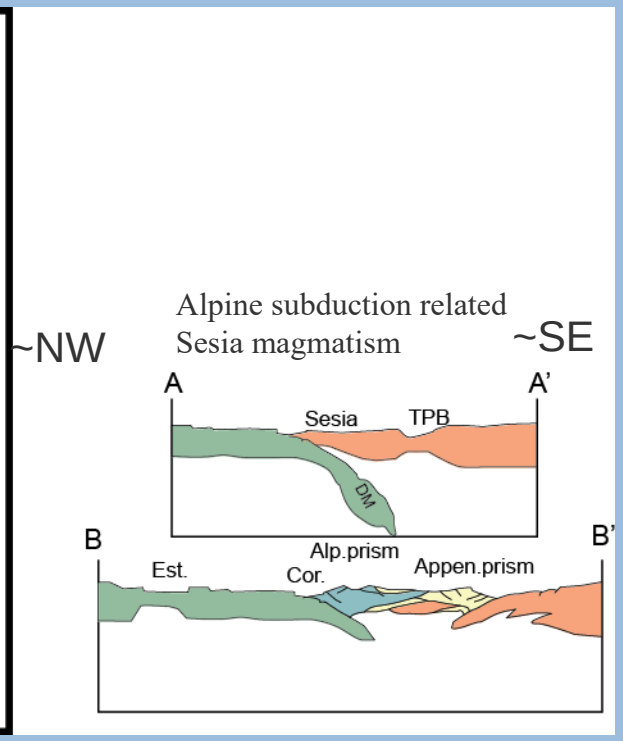
map



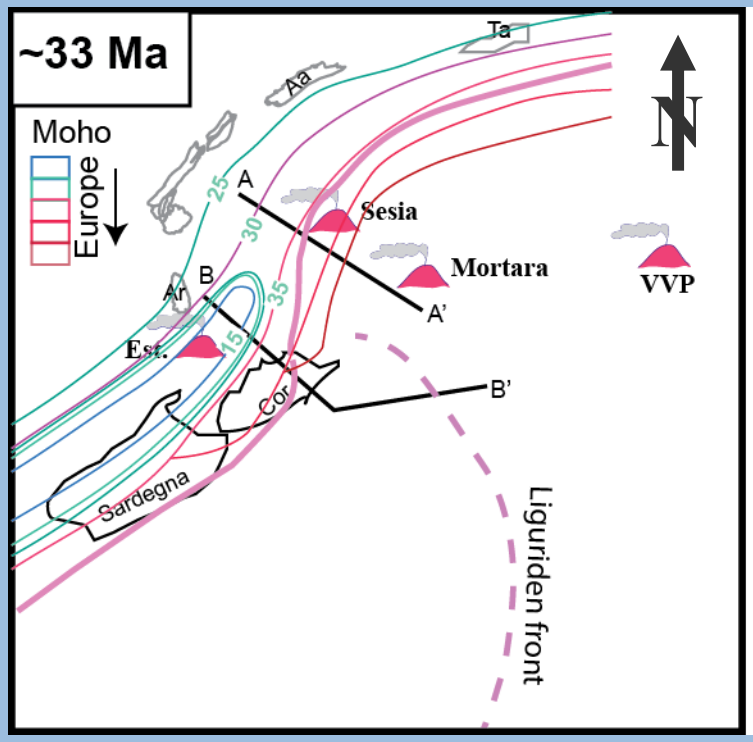
sections

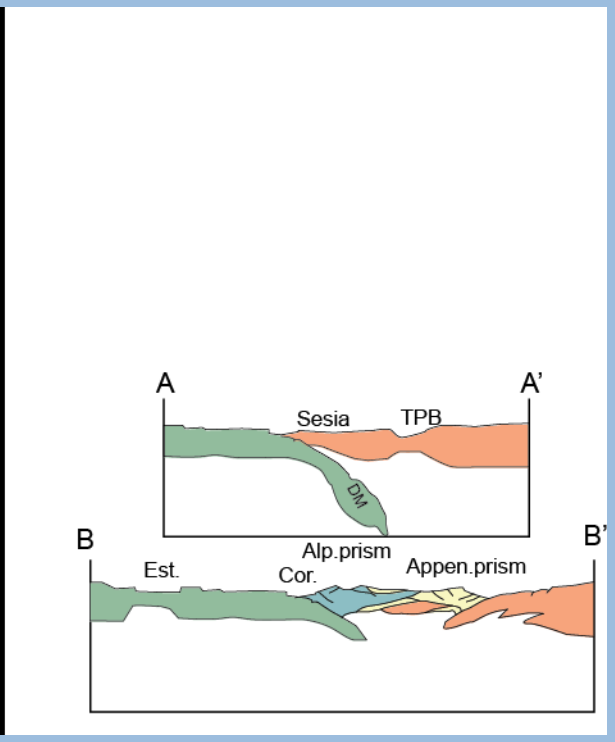


Sketched Moho depth of Europe

(based on magmatism)

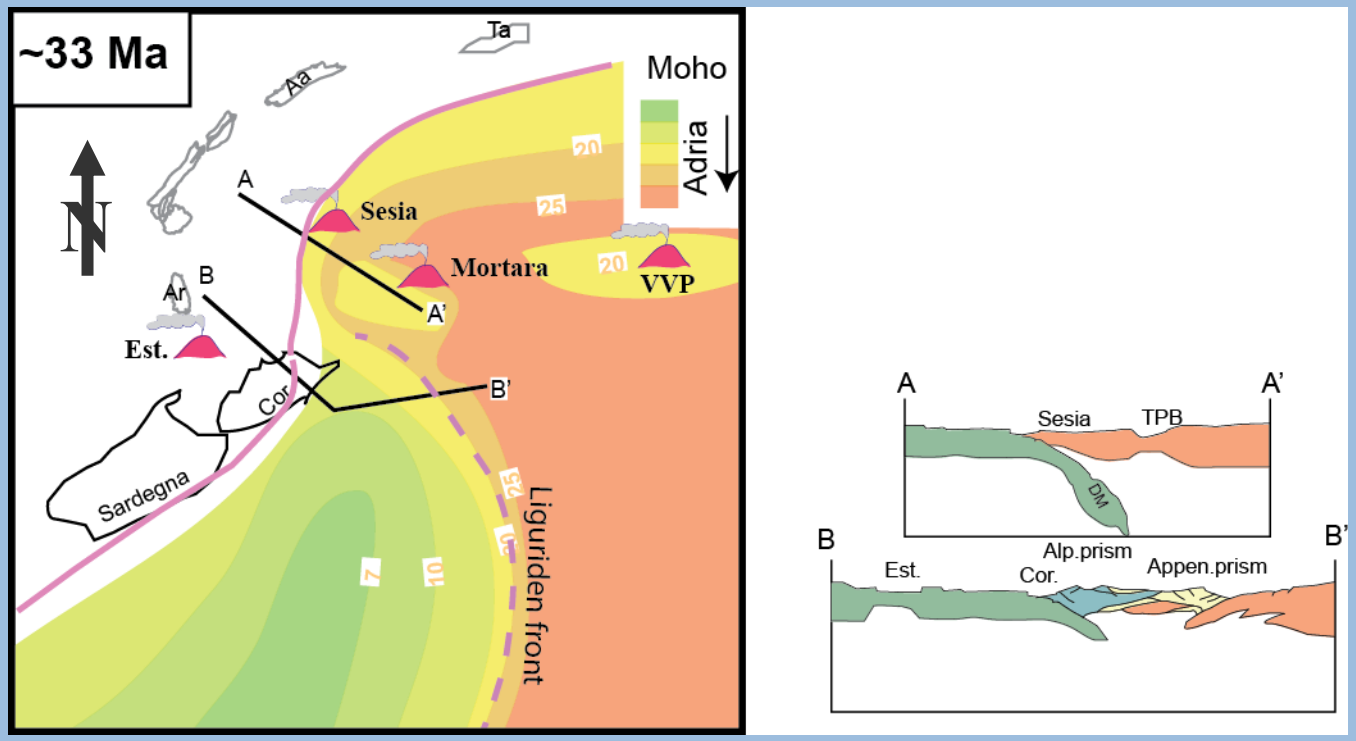
Note the decreasing slab depth and the income of the "proto-forerac basin"





Sketched Moho depth of Adria

(based on magmatism and structure)



inferred mantle structure assuming crustal thinning for development of the basins (VVP, TPB) and the geometry from the sections

Summary and Conclusion

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Magmatism in and direct surroundings of the Alps in small time interval are related to different processes

=> this also include the lithospheric mantle of different microcontinents and require small scale dynamics (see for example model of Papua New-Guinea)

Inferred mantle dynamics from the mantle-component in melts give another view in contrast to upper and middle crustal structural data