ac lengines

The Mediterranean is a very dynamic area, where two major and various smaller lithospheric plates meet. The geodynamic scheme is mainly governed by the northwards movement of the African plate, as well as its collision with and its sinking (subduction) underneath the Eurasian plate in the areas of Sicily and Aegean. Collision started million of years ago in the western part propagating to the east leading to the creation of large mountain chains in South Europe. Additionally, several small plates, such as the Arabian and Anatolia, move independently and affect the rocks of the broader area. These movements result in the high seismicity and volcanism of the whole Medi-terranean area, with a large number of earthquakes occurring along the margins of the plates.

Seismotectonics diagram of Mediterranean **Eurasian plate** Area strain at plate
boundaries Europe - Africa active volcano instrumental seismicity (period from 1973 to August 2006) Normal faults (distension) Reverse faults (compression) M at least equal to 7 6<=M<7 5<=M<6 Strike slip faults Adriatic **Black Sea Anatolia** Arabic plate African plate

Today, modern technology and satellites offer the opportunity to measure plate movements down to millimetre.

The African plate is approaching at a rate of 7mms/year. The Arabian plate is also moving away from Africa forcing Anatolia to move westwards. The Anatolia plate pushes the southern Aegean southwards towards Africa at a rate of 2,5 mms/year, whereas the Hellenic arc (Peloponnesus, Crete, Dodecanese) moves southwards at a rate of 3mms/year. A simple addition of the speed that the African and southern Aegean plate move indicates that they are approaching each other by 37 mm per year, a rate similar to the growth of our nails.

It appears thus that Mediterranean is the area that receives the main consequences from plate convergence by deforming its shape and extend, whereas the southern Europe (France, northern Italy, Bulgaria etc) is acting as the depreciation zone for the stresses that are released. This convergence for more than 100 million years has shaped the landscape of southern and central Europe and the peri-Mediterranean area.

Italy is one of the countries in the Mediterranean area with high seismicity, < 0,025g 0,050-0,075 due to its particular geographic position 0,050-0,075 0,075-0,100 0,100-0,125 0,125-0,150 at the boundary of the African and Eurasian plates. The highest seismicity is 0,150-0,175 concentrated in the central-southern 0,175-0,200 0,200-0,225 part of the peninsula, along the Apennine 0,225-0,250 0,250-0,275 0,275-0,300 > 0,300g ridge, in Calabria and Sicily. Over the past 2,500 years, over 30,000 medium to strong earthquakes occurred. In the 20th century alone, seven earthquakes had a magnitude of 6.5 or more degrees in the Richter scale. L'aquila earthquake Seismic risk in Italy

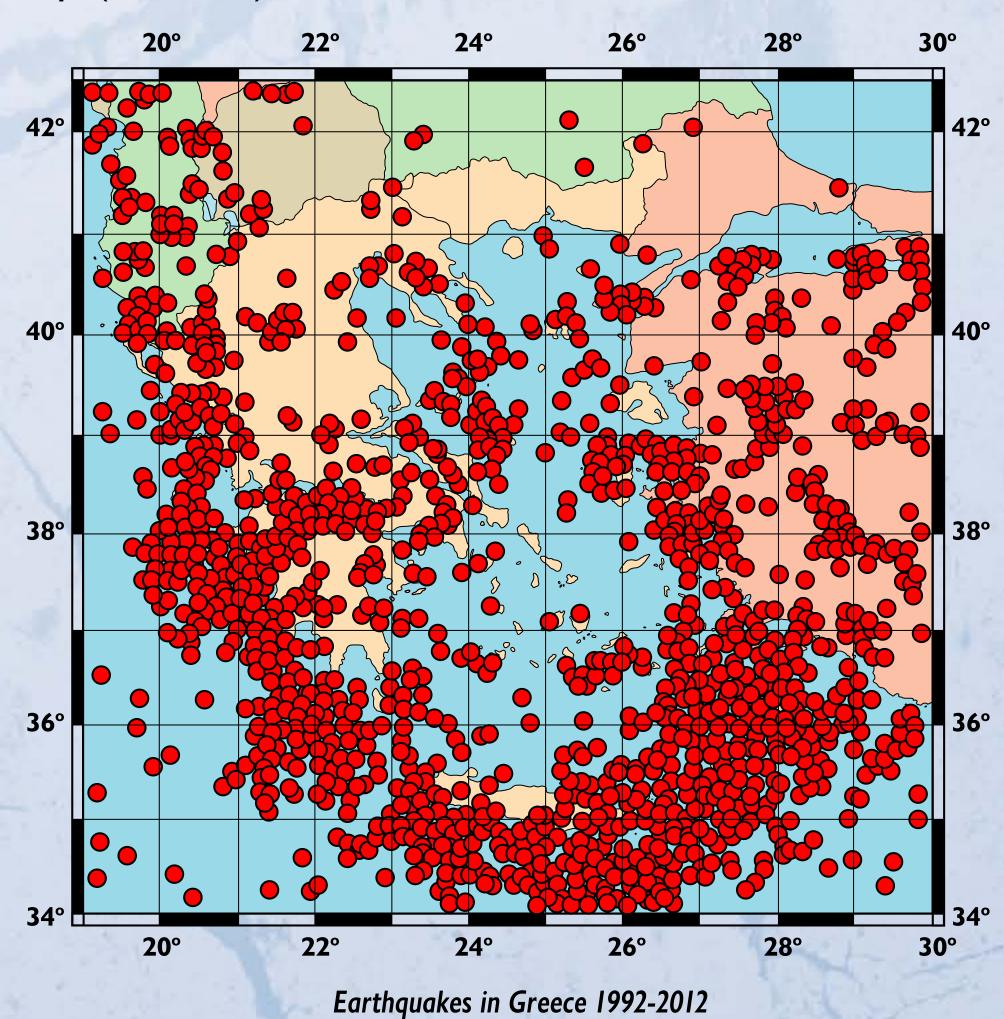
picentres des séismes Ion leur magnitude (ML), BCSF

Earthquakes in France 1980-2010

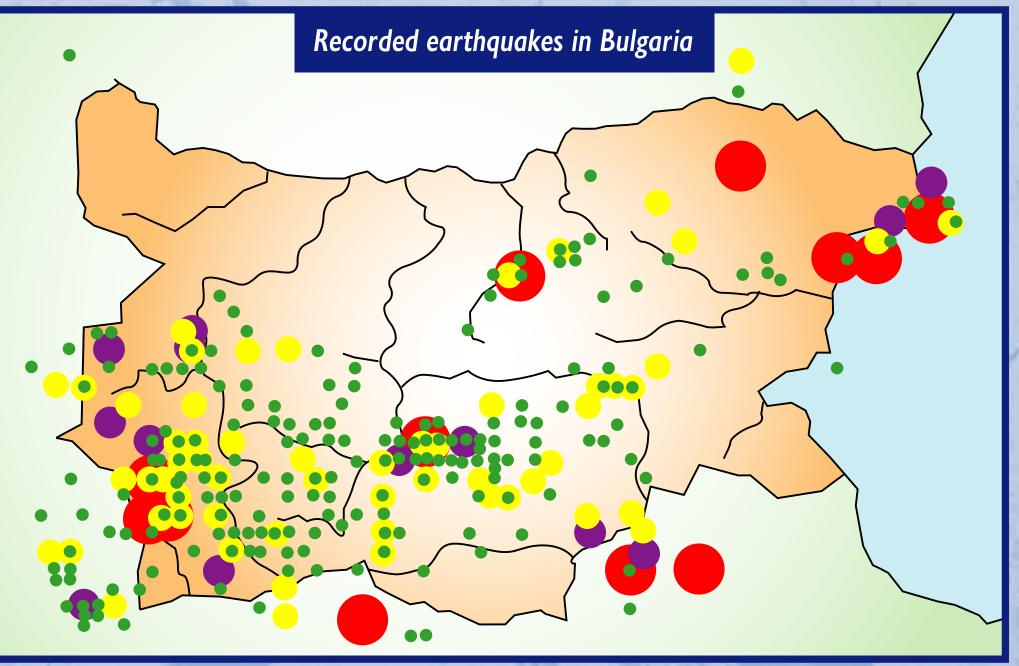
Mainland France is a moderately seismic country but destructive earthquakes are however possible with magnitude that may exceed 6. This seismicity is mainly superficial. During the last 20 years (1980-2010) nine earthquakes with magnitude 4.9 to 5.6 have been recorded. They result from the slow convergence of African and Eurasian plates. Seismicity in mainland France focuses on: Rhine Graben, Armorican massif, Pyrenees and Alps mountains. The last really destructive earthquake occured in 1909 (estimated magnitude: 6), in an area very close to the Reserve Geologique de Haute-

Greece presents the highest seismicity in Europe and the sixth globally. Its high earth-quake activity is mainly attri-buted to its tectonic posi-tion just at the boundary of Eurasia and African plates. All kind of earthquakes can be observed in Greece, from the very deep (300kms) to shallow.

Geodynamic conditions in Mediterranean and plate motions (arrows)



The seismic activity in Bulgaria is also high, as 97% of its territory is under earthquake threat. Most of the earthquakes in the area are shallow, with a focus of around 60 km deep in the lithosphere, a fact that intensifies the effects of the seismic events on the surface. Seismically active areas are: Krupnik, Blagoevgrad, Sofia, Mariska area, Shabla Area, the region of Veliko Tarnovo and Gorna Oryahovitsa. Recurrence of large earthquakes is estimated to around 100-150 years.



larger than 7 between 6 and 7 between 5 and 6 between 4 and 5

