The French seismic CATalogue for France (FCAT-17)

(submitted to BEE)

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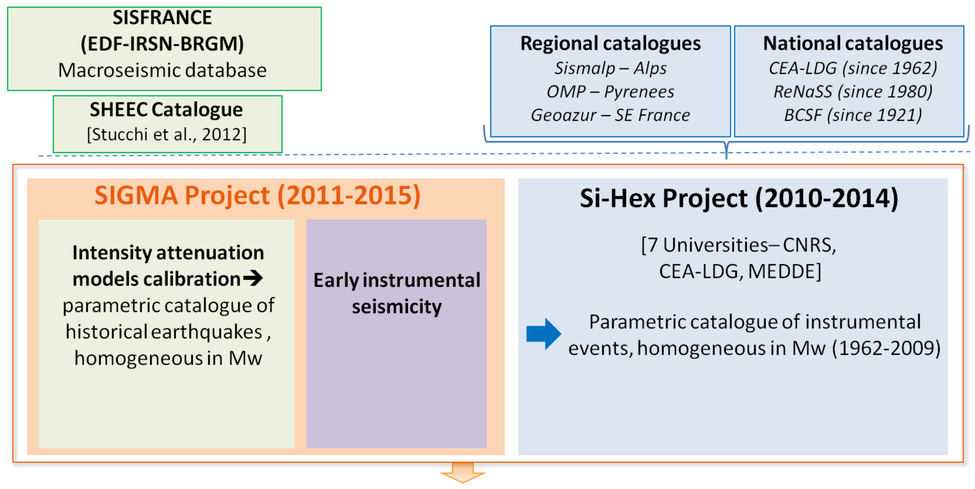
Projet SIHEX

ABSTRACT

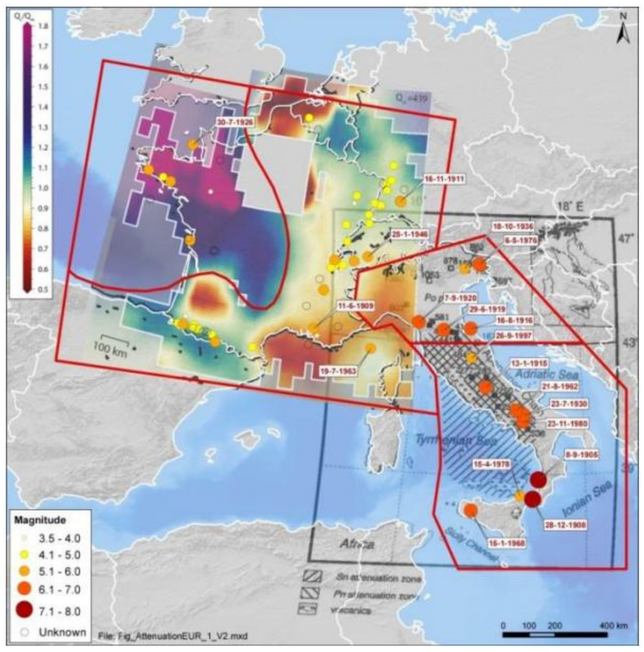
One of the main goals of the SIGMA research program (EDF-CEA-AREVA-ENEL; 2011-2015) was to produce a seismicity catalogue for metropolitan France, homogeneous in Mw and covering both, the instrumental and the historical periods. The instrumental part is represented by the SiHex catalogue [Cara et al., 2015a and 2015b; Denieul et al., 2014], while the work performed within SIGMA led to the determination of the seismological parameters for the historical earthquakes of the SISFRANCE database [Traversa et al., 2017, Baumont et al., submitted, Manchuel et al., submitted]. The two pieces of the catalogue are merged at a unique date, set to the year 1965. The aim of this poster is to describe the method used to assess magnitude and depth of historical earthquakes using Intensity Data Points (IDPs).



FCAT-17: Seismicity catalogue for metropolitan France, homogeneous in Mw, covering both, the historical and the instrumental periods

1. Intensity Prediction Equations (IPEs) *[Baumont et al., submitted]*

1. 1. Calibration



Zonation based on attenuation properties

Calibration earthquakes

- 30 events located in France and nearby
  - ➔ 3.6 ≤ Mw ≤ 5.8
  - ➔ Distance completeness of macroseismic data≥ 30 km
  - ➔ Number of MSK intensity classes ≥ 3
- 11 events from Italy
  - ➔ Mw ≥ 6.0
  - ➔ Only MCS intensities ≤ VII are considered [Traversa et al., 2014]

➡ 6 different sub-datasets according to macroseismic data completeness (nb intensity class and distance)

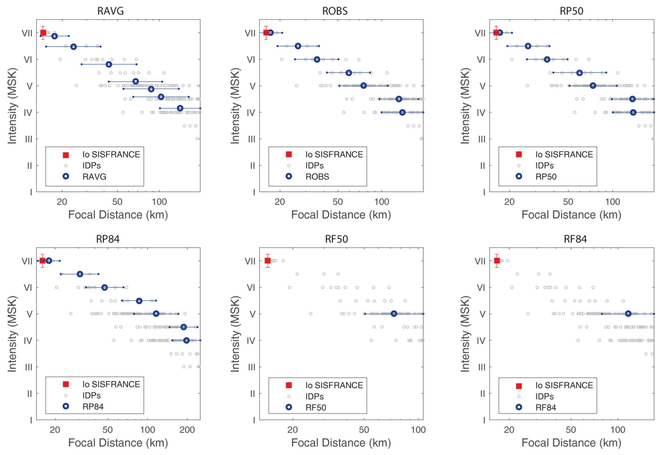
Attenuation properties (for France : Mayor et al. 2017 attenuation map at 1Hz; for Italy : Gasperini et al. [2001] attenuation map)

Mathematical formulation

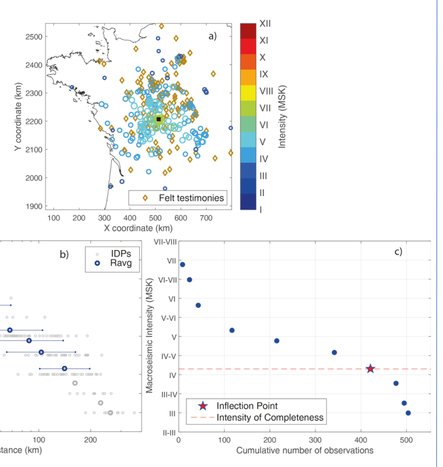
$$I_j = c_1 + c_2 \cdot M_W + \beta \cdot \log_{10}(R_j) + \gamma_{region} \cdot R_j$$

6 different metrics used to define the isoseismals (intensity class binning), following the approach proposed by Baumont et Scotti [2006, 2008]: R_{AVG},R_{OBS}, R_{P50}, R_{P84}, R_{F50} et R_{F84}.

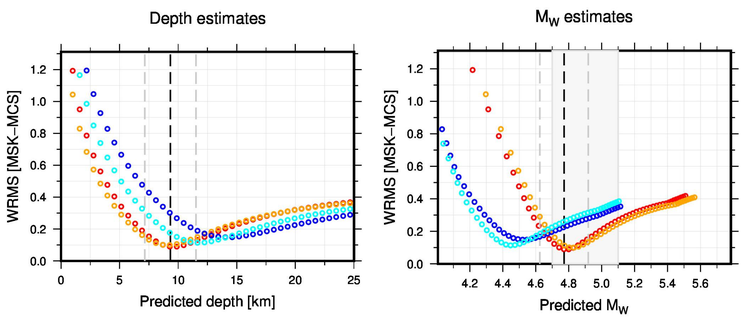
Completeness: only isoseismals above completeness are considered



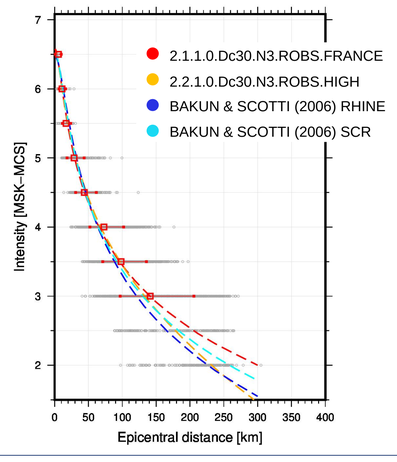
BRENNE
14-SEPT-1866
EARTHQUAKE
I_0 = VII MSK



1. 2. Comparison with existing IPEs

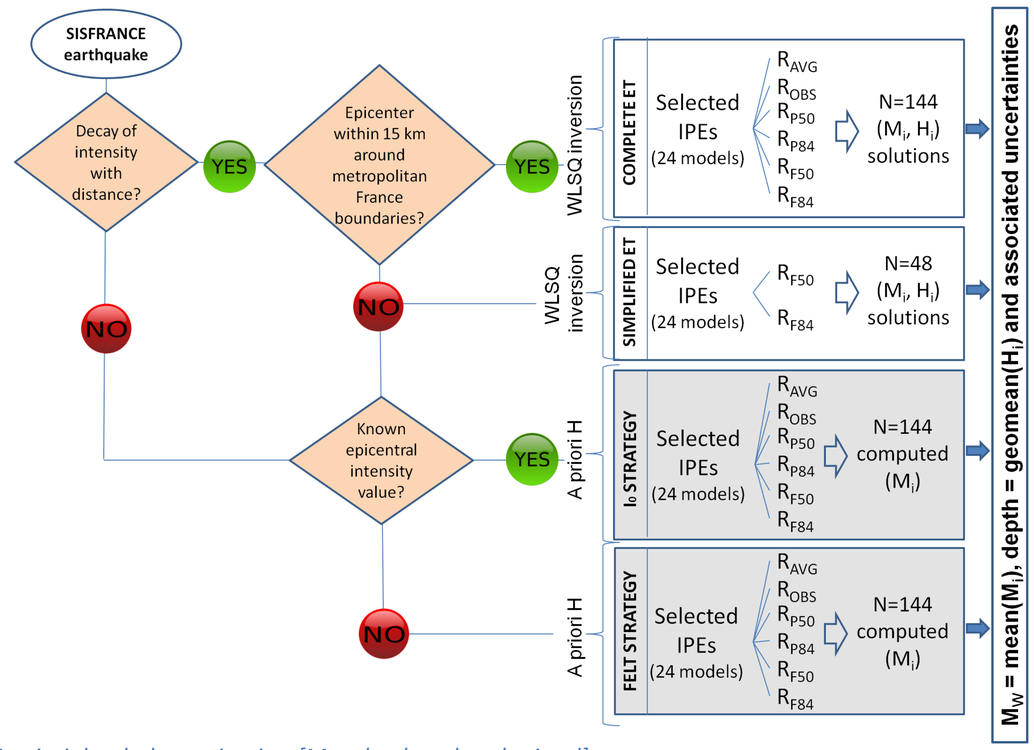


Magnitude-depth estimates for the 2003, Rambervillers (22/02/2003) earthquake using the Bakun and Scotti (2006) models and newly developed IPEs. Left and center: misfit curves as a function of the depth and Mw. Right: DP misfit with respect to the predicted intensities according to the various tested models. The shaded area in the Mw estimates inset represents the instrumental estimates.

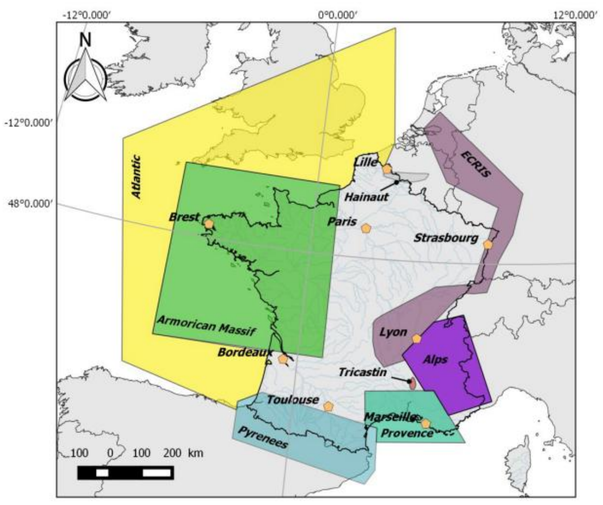


2. SISFRANCE macroseismic data inversion

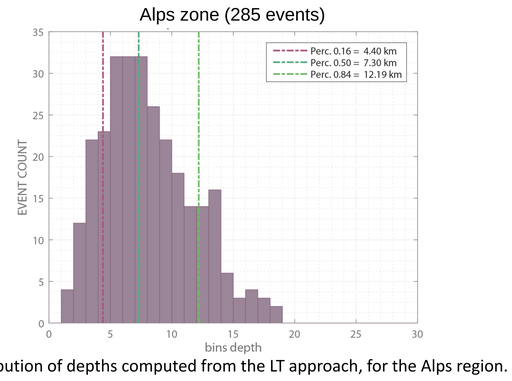
2. 1. Inversion scheme *[Traversa et al., 2017]*



2. 2. A priori depth determination *[Manchuel et al., submitted]*



Geological and seismological zonation for a priori seismogenic depth characterization



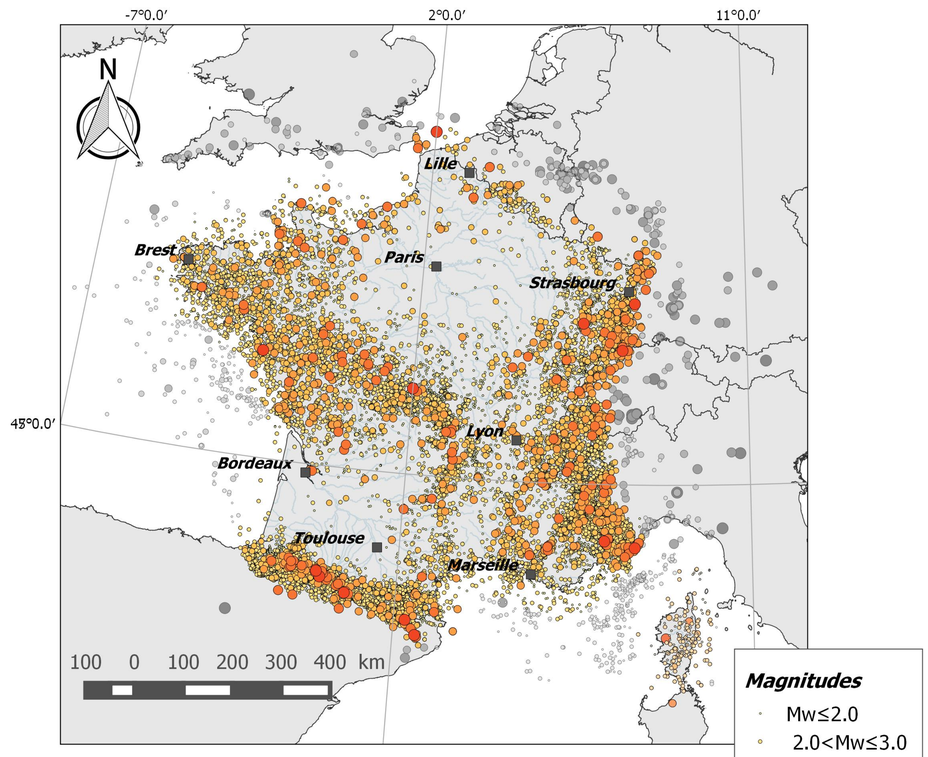
Distibution of depths computed from the LT approach, for the Alps region.

Regional depths

Zone	A priori depth (km)	Min Depth (km)	Max depth (km)
Alps	7	4	12
Pyrenees	9	6	13
Armorican Massif	14	9	16
ECRIS	12	6	15
Provence	6	4	10
Tricastin	3	2	6
Hainaut	5*	2*	8*
Atlantique	15	10	17
Zoneless	11	7	14

** Arbitrarily fixed values*

3. French seismic CATalogue (FCAT-17)



- 463 – 2009
- SiHex [Cara et al., 2015] + SIGMA (concatenation date: 1965)
- About 42 000 events (metropolitan France plus a buffer of 15 km)
- Mw and h estimates, with uncertainties (excepted uncertainties related to instrumental depth estimates)
- Homogeneous Mw magnitude ➔ no need for magnitude conversions ➔ decrease of uncertainties in seismic hazard assessment
- Update of historical part of the SHEEC catalogue for France [Stucchi et al., 2012; Baumont et Scotti, 2011]

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