Note on the instrumental seismicity dataset in mainland France and its associated map

Instrumental seismicity dataset

1. For the period 1962-2009

The catalog used is the one from the SI-Hex project (https://www.franceseisme.fr/sismicite.html).

Reference: Cara, et al. 2015. SI-Hex: a new catalog of instrumental seismicity for metropolitan France. *Bull. Soc. Géol. France*, 186 (1), 3-19. doi:10.2113/gssgfbull.186.1.3

2. From 2010 onwards

The SI-Hex catalog is completed by the seismicity recorded and located by the BCSF-Rénass (https://renass.unistra.fr), whose MLv magnitudes hereafter referred to as ML_{Ren} have been converted to Mw. This conversion, in two steps, is based on the work done in the SI-Hex project: a first conversion from ML_{Ren} to ML_{LDG}, then a second one from ML_{LDG} to Mw.

2.1. Conversion of ML_{Ren} to ML_{LDG}

For this conversion two periods are to be distinguished:

- 2010-2011:

This period is in the continuity of what had been done in the SI-Hex project, so we can use the published conversion laws:

$$ML_{LDG} = 0.9819\ ML_{Ren} + 0.048$$

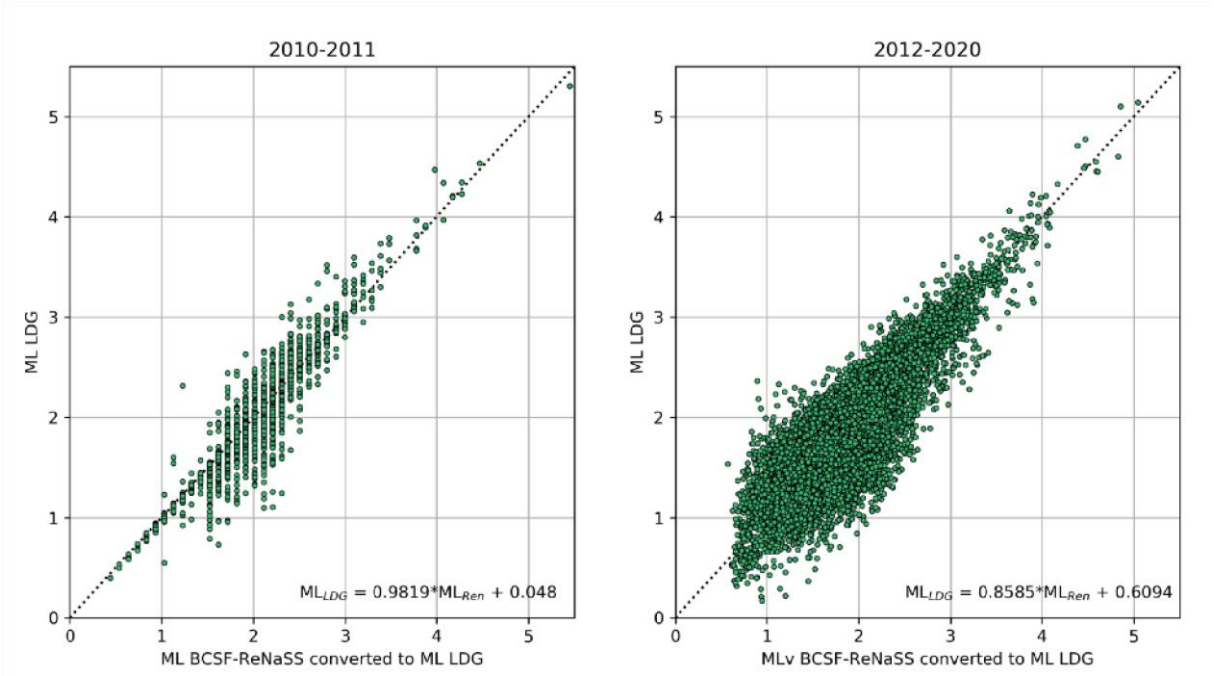
- from 2012 onwards:

This period coincides with the implementation of a new seismicity processing chain at BCSF-Rénass (use of SeisComP). For this period, the previous conversion is not appropriate, a new conversion law has been established from the set of events over the period 2012-2020 for which there is both an LDG and BCSF-Rénass magnitude (apart from a few special cases). The resulting orthogonal linear regression law is:

$$ML_{LDG} = 0.8585\ ML_{Ren} + 0.6094$$

This law is subsequently used throughout the period starting in 2012.

The figure below shows this conversion from ML_{Ren} to ML_{LDG} over the period 2010-2011 (left), and the period 2012-2020 (right).



2.2. Conversion of ML_{LDG} to Mw

For this conversion, we use the laws established in SI-Hex:

- for $ML_{LDG} < 3.117$: $Mw = 0.6642\ ML_{LDG} + 0.4467$
- for $3.117 \leq ML_{LDG} < 4$: $Mw = ML_{LDG} - 0.6$
- for $ML_{LDG} \geq 4$: $Mw = 0.8208\ ML_{LDG} + 0.080$

For events with Mw calculated from waveforms (Geoazur - only those with a manual revision, https://sismoazur.oca.eu/#/focal_mechanism/oca/), if the difference between the conversions and these Mw is too large (> 0.4), the choice was made to use the latter Mw. This is notably the case for the Barcelonnette earthquake (2014-04-07 19:26, Mw = 4.8), and the Teil earthquake (2019-11-11 10:52, Mw = 4.8).

Instrumental seismicity map

The map associated with the dataset represents the location of earthquake epicentres.

In color: epicentres of natural earthquakes within the SI-Hex area (hexagonal France and the marine exclusive economic zone (EEZ) with an enlargement of 20km), as well as earthquakes outside the SI-Hex area felt in France with an EMS-98 intensity ≥ IV.

In grey: for information only, epicentres of natural earthquakes outside the SI-Hex area (from 1998). The seismicity catalog used is from EMSC (www.emsc-csem.org) for which the magnitudes have been converted into Mw magnitudes.

1. Mapping information

Scale: 1:1 500 000 (A0 print); 1:6 500 000 (A4 print)

Projection: Lambert-93 (EPSG:2154)

Map extent (in Lambert 93 coordinates):

West:	50600 m
East:	1297100 m
South:	5993050 m
North:	7178050 m

2. External resources used

Topography: NASA Shuttle Radar Topography Mission (SRTM); Jarvis A., H.I. Reuter, A. Nelson, E. Guevara, 2008, Hole-filled seamless SRTM data V4, International Centre for Tropical Agriculture (CIAT), available from https://srtm.csi.cgiar.org

Bathymetry: NGDC ETOPO1; Amante, C. and B.W. Eakins, 2009. ETOPO1 1 Arc-Minute Global Relief Model: Procedures, Data Sources and Analysis. NOAA Technical Memorandum NESDIS NGDC-24. National Geophysical Data Center, NOAA. doi:10.7289/V5C8276M [2013-05-19].

Borders/rivers and lakes: ESRI Data & Maps 9.3 [CD-ROM] - AND Data Solutions, B. V.

Exclusive Economic Zone boundary (EEZ): VLIZ (2012). Maritime Boundaries Geodatabase, version 7, available online at https://www.marineregions.org/.

How to cite:

BCSF-Rénass (2022). Instrumental seismicity in mainland France. EOST UAR830, Université de Strasbourg, CNRS. (Collection). doi:10.25577/fv3f-sq09