Characteristics and possible origins of the seismicity in northwestern France

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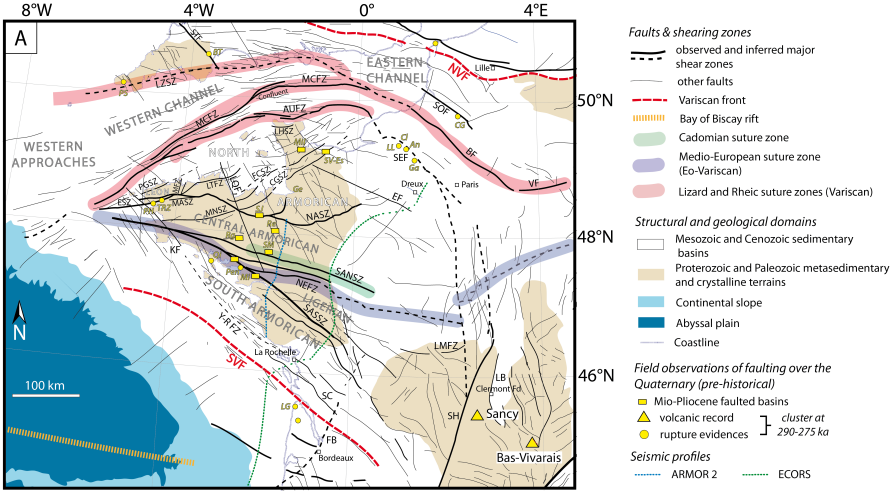
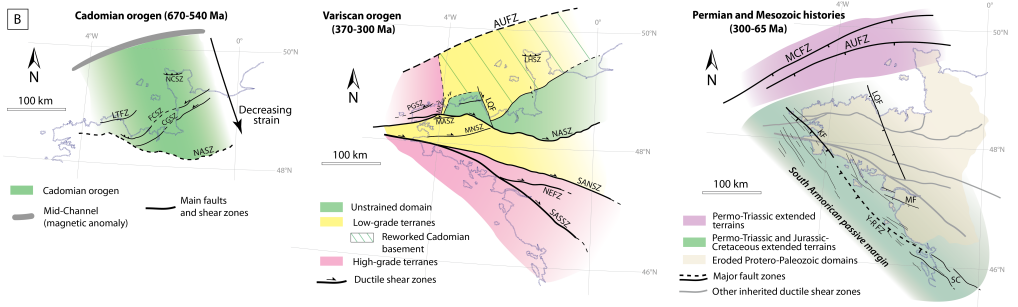
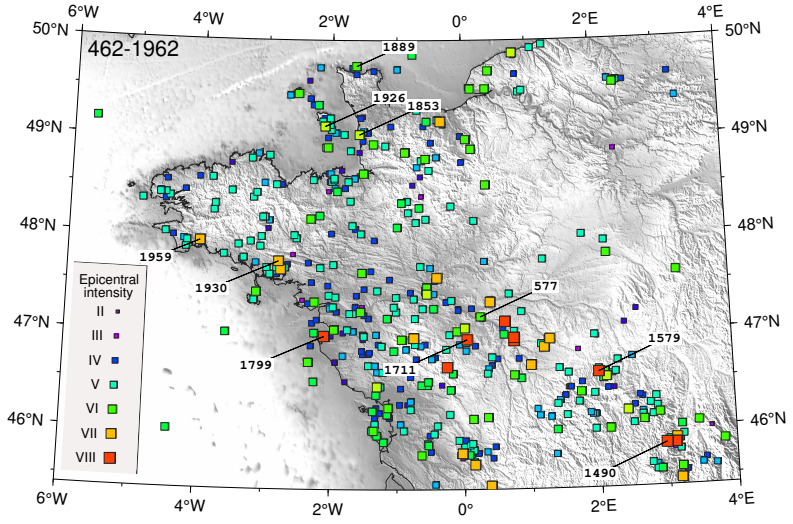
A polyphased geological setting



A polyphased geological setting

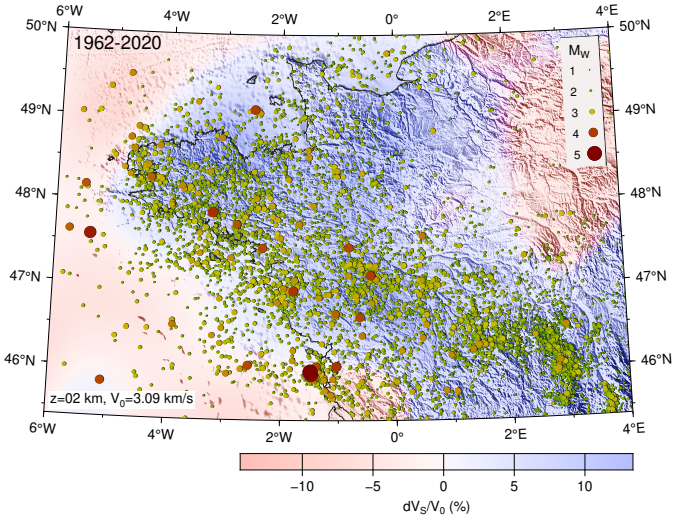


Historical data



565 events in SISFRANCE database (Jomard *et al.*, 2021)

Instrumental data



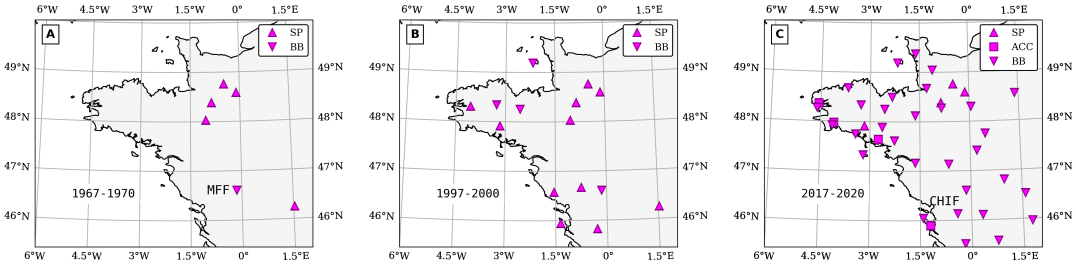
1962-2020 dataset

- 1962-2009: SI-Hex (Cara *et al.*, 2015)
  6631 NW events *vs* 38028
  ($M_W \geq 2.5, 597/2591 \simeq 23\%$)
- 2010-2020: unified catalogue BCSF-RéNaSS+CEA
  2689 NW events *vs* 38048
  ($M_W \geq 2.5, 847/3326 \simeq 25\%$)

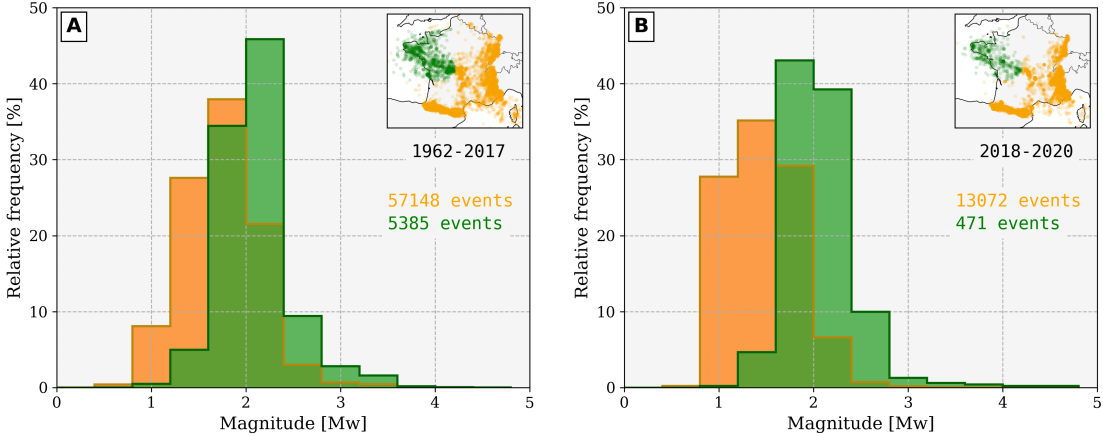
Total: **9320** events in the northwestern part of France (including NW of Auvergne)

V_S model from (Gaudot *et al.*, 2021)

Permanent seismic coverage evolution



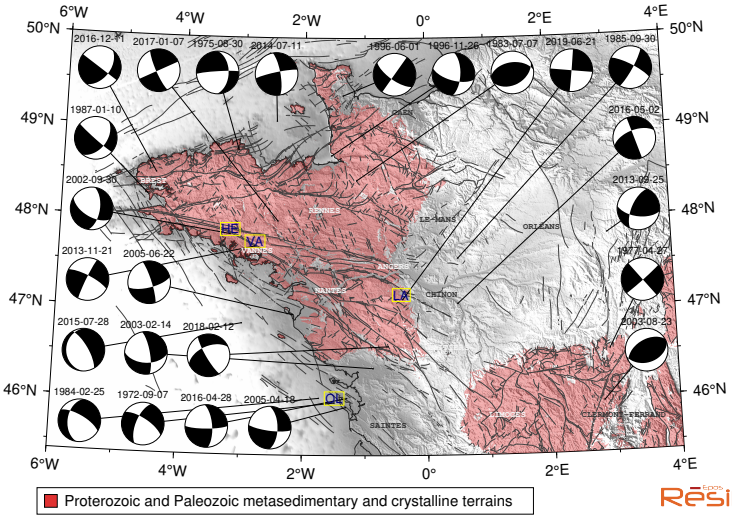
Magnitudes



Respective distributions of moment magnitudes for the western part (green) and for the rest of metropolitan France (orange) during two different time ranges. The green histograms are computed for a region comprised between 2° E and 6° W and 45.4° N and 50° N, using bins of 0.4

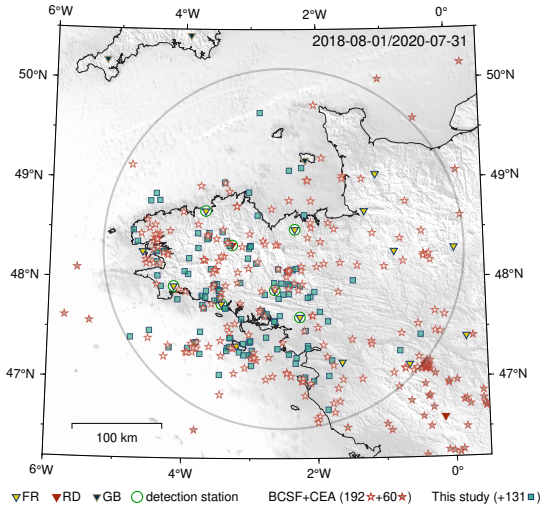
Focal mechanisms

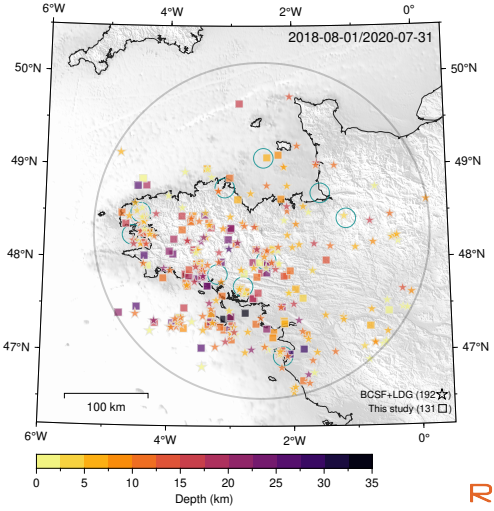
fmhex database (Mazzotti *et al.*, 2021)



Toward a comprehensive catalog? 2-year of continuous seismic signal

Template matching + discrimination (see C. Hourcade poster for ML implementation and details)

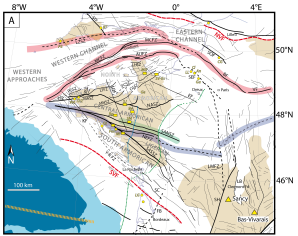




Discussion

Possible geodynamic factors controlling the seismicity

1. **Plate-scale stress field**
   Overall NW-SE orientation of the maximum horizontal stress and a general extensive to transtensive tectonic style with a NE-SW deviatoric tension
2. **Local and temporal stress modulations**
   Spatial variations of gravitational potential energy / isostatic adjustment to erosion and sedimentation / mechanical response to hydrological or meteorological transients / post-glacial adjustmets / tides
3. **Tectonic and fault inheritance**
   Are earthquake locations compatible with known (active) faults?
   $\rightarrow$ back to the question about a comprehensive catalogue



Frequency: 0.4 $\rightarrow$ 1 event/day

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