

# Characterisation of recent microseismic activity in southwestern Germany

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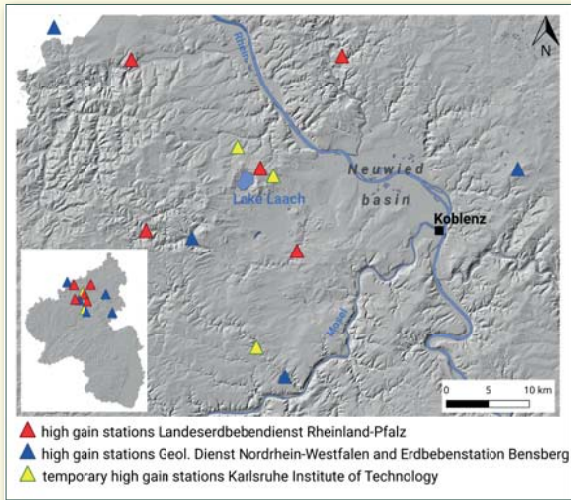


Fig. 1a: Current local seismometer networks of the eastern Eifel.

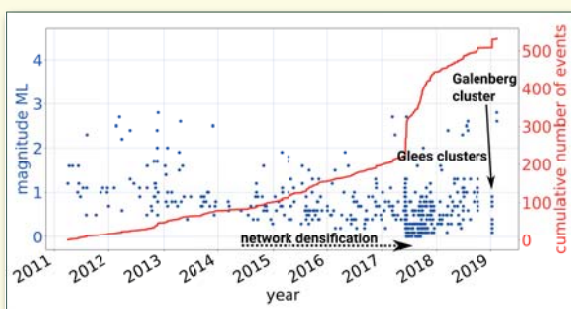


Fig. 2a: Event-time distribution of the eastern Eifel since 2011.

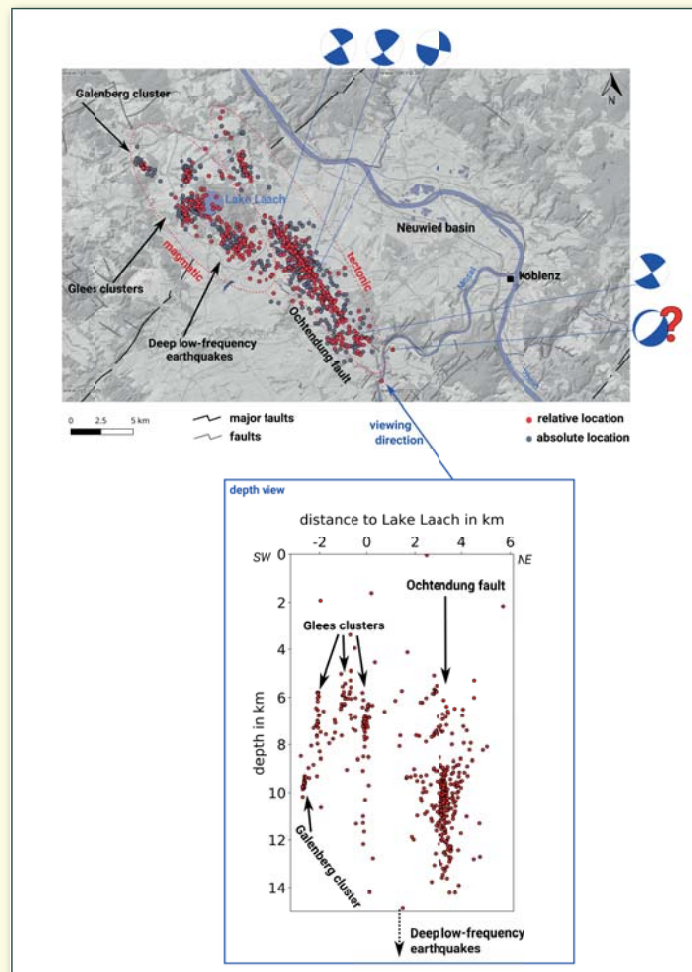


Fig. 3a: Fault plane solutions and absolute event locations (grey dots) from the Erdbebendienst Südwest catalogue. Relative locations (red dots) are obtained using the hypoDD routines (WALDHAUSER, 2001) and a local 1-D velocity model from BÜHLER (2018).

## Introduction

The Zollernalb and the eastern Eifel are well-known as seismically active regions in southwestern Germany. Since 2000 more than 500 microearthquakes are located on the Zollernalb along the nearly N-S striking Albstadt shear-zone, and along a SW-NE trending area ranging from Balingen up to Dusslingen. In the eastern Eifel, also at least 300 microearthquakes are observed along the NW-SE striking Ochtendung fault since 2011. In the last years, a densification of the seismometer networks enabled the observation of the seismic activity with increasing detail, and for the first time the detection of microearthquakes attributed to magmatic processes beneath Lake Laach Volcano (HENSCH et al., 2019).

## Zollernalb region

- Albstadt shear-zone:
  - ~ 300 events with ML < 4.4 since 2000.
  - Mostly N-S striking epicenter distribution and strike-slip faulting.
  - Tailfingen: at least 100 events with ML < 1.6. NNW-SSE striking and steeply NE descending earthquake distribution and fault plane solution. Yet unique swarm-like behaviour within the Albstadt shear-zone
- Hechingen-Dusslingen zone:
  - ~ 200 events with ML < 3 since 2000.
  - General SW-NE striking epicenter distribution.
  - Hechingen: NW-SE striking epicenter distribution (analogue Hohenzollern-graben) and corresponding normal faulting.
  - Dusslingen: towards NE dipping of hypocenters.

## Eastern Eifel region

- General NW-SE striking earthquake distribution splitted up at Lake Laach.
- Ochtendung fault:
  - ~ 300 events with ML < 3 since 2011.
  - NW-SE striking epicenter distribution and strike-slip faulting, confined to a vertically oriented, plane in the upper crust.
  - b-value of about 1 indicates tectonic origin.
  - Gap of tectonic earthquakes near Lake Laach.
- Lake Laach Volcano:
  - ~ 200 events with ML < 2 since 2011.
  - Several clusters of deep low-frequency earthquakes, according to HENSCH et al. (2019) related to magmatic processes ranging from the upper crust down to the upper mantle.
  - Swarm-like sequences at Galenberg (for the first time observed in January 2019) and Glees supposedly induced by magmatic processes.

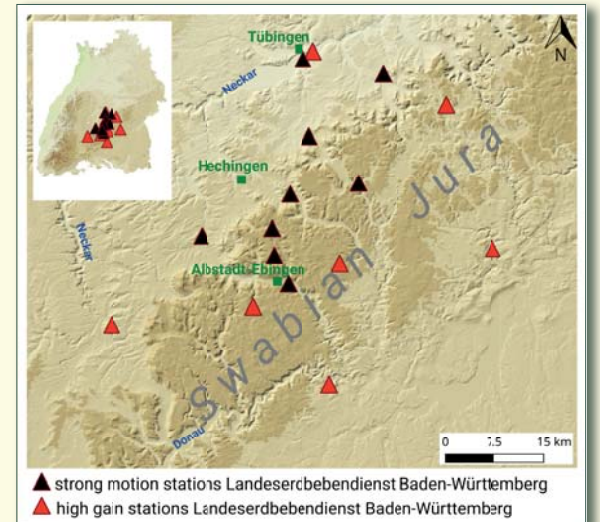


Fig. 1b: Current local network of the Zollernalb region.

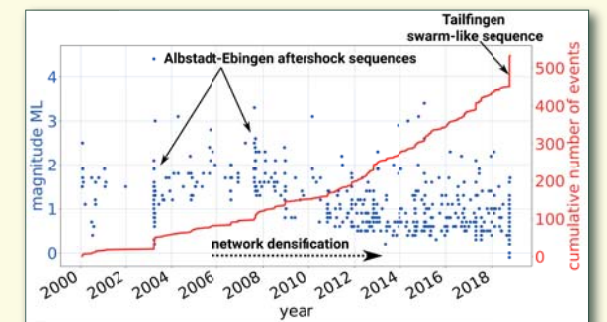


Fig. 2b: Event-time distribution of the Zollernalb region since 2000.

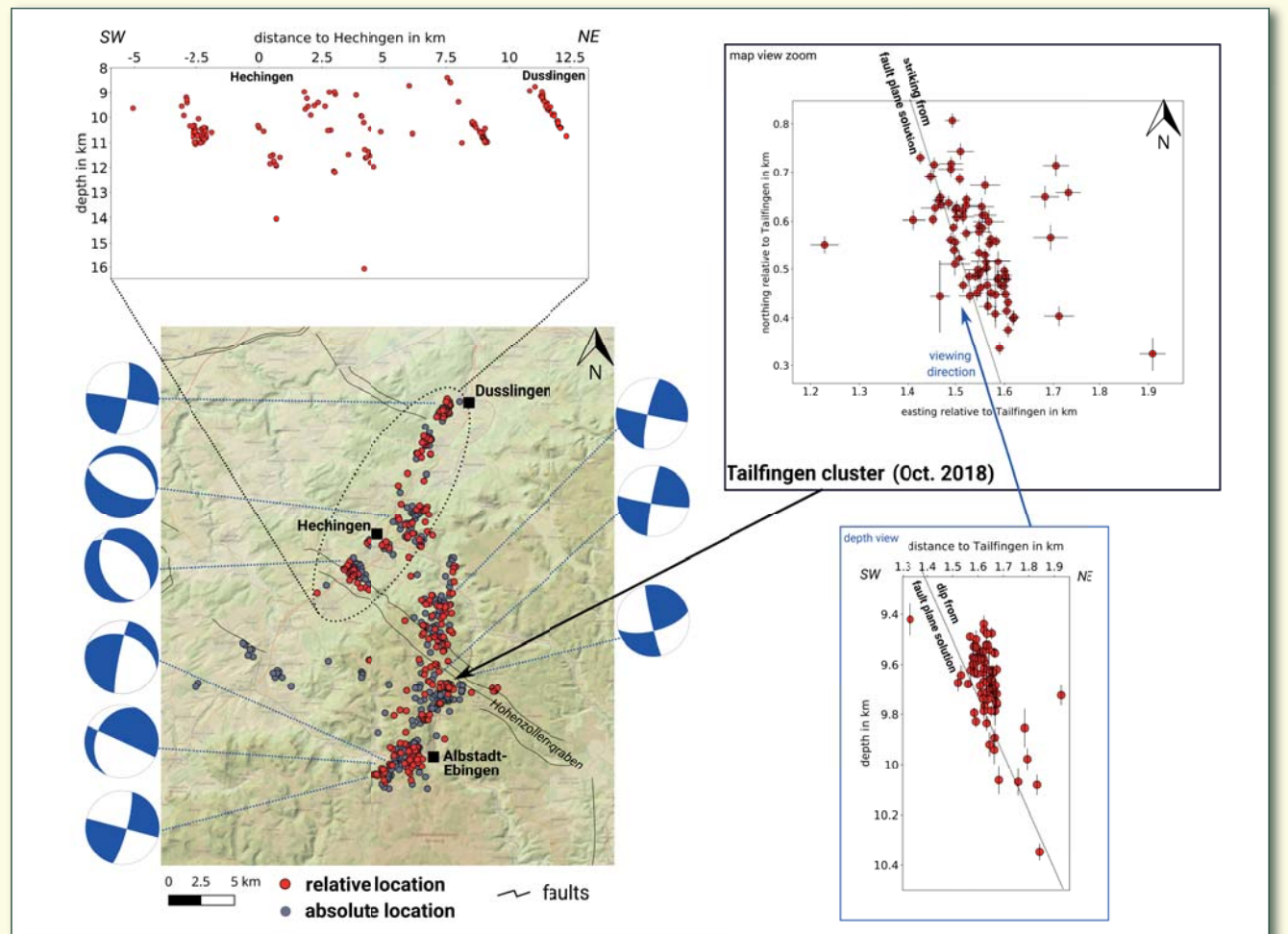


Fig. 3b: Fault plane solutions and absolute event locations (grey dots) from the Erdbebendienst Südwest catalogue. Relative locations (red dots) are obtained using the hypoDD routines (WALDHAUSER, 2001) and a local 1-D velocity model. Relative location errors (95 % confidence level) of the Tailfingen cluster is indicated by black lines.

## References

BÜHLER, J. (2018): Relokalisierung von Seismizität in der Eifel mit einem Minimum-1-D-Modell. Dipl.-Arbeit. Karlsruhe Inst. of Technology. HENSCH, M. et al. (2019): Deep low-frequency earthquakes reveal ongoing magmatic recharge beneath Laacher See Volcano (Eifel, Germany). Geophys. J. Int. 216, 2025-2036. WALDHAUSER, F. (2001): HypoDD: A computer program to compute double-difference earthquake locations, USGS Open File Rep., 01-113.

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