Vintage crustal-scale seismic profiling data made available for future applications: DEKORP 1984 - 1999

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What is DEKORP?

DEKORP = German Continental Seismic Reflection Program (1984 - 1999)[1,2,3,4]

Investigation costs were ~60 Mio. €, today's costs estimate much higher, rerecording nowadays probably impossible

Aims[2,5]: Generation of a large-scale net of seismic lines to investigate the deep crustal structure and its evolution

- Investigation of the thrust and fault zones between the Variscan zones of Central Europe
- Structural architecture of the deeper crust and depth of the crust-mantle boundary (Moho)
- Site studies of possible drilling locations of the German Continental Deep Drilling Programme KTB and detailed 3D investigation of the determined drilling location
- Eastern Alps: Orogenic processes caused by the collision of continental lithosphere
- Northeast German Basin: Geodynamic evolution model, imaging of the suture zone between Caledonian and Variscan basement

Techniques

- Steep-angle reflection & wide-angle seismic measurements
- Other additional geophysical measurements

Data sets & results[1,3,4]

- More than 40 crustal-scale 2D-seismic reflection lines (~4700 km) (Fig. 1)
- One 3D-seismic survey (~400 km²) as part of the KTB programme
- More than 8000 data sets & 100 publications

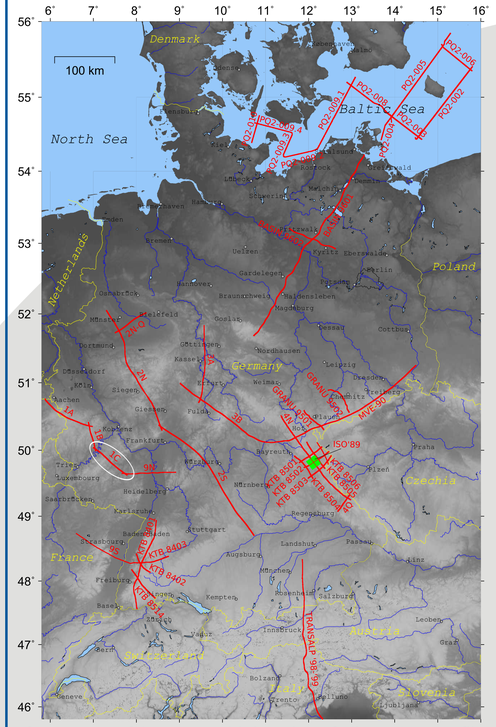

Fig. 1. *Map of Germany with location of all DEKORP profiles*

Data publication

- Data publication with **D**igital **O**bject **I**dentifier (DOI) → scientifically quotable
- Creation of a website for enquiry and download (Fig. 2)
- Automatic provision of meta data, raw data, final data, high-resolution graphics, literature etc.
- Simplified license distribution for data usage (free for academic use; license fee for commercial use)
- → **https://dataservices.gfz-potsdam.de**
  → Search for: "DEKORP"

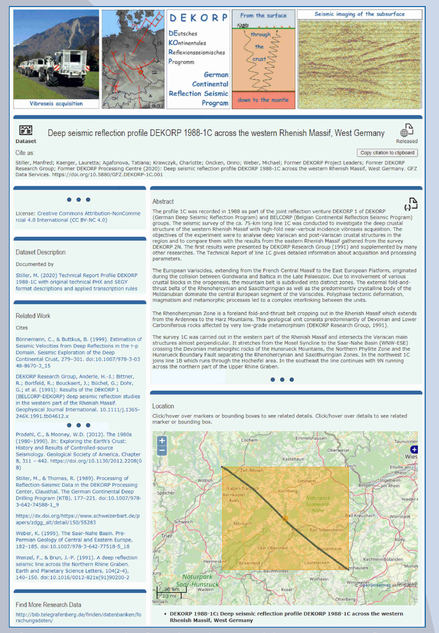

Fig. 2. *Example for the data publication interface: DEKORP '88-1C*

Conclusion

- Protection and safeguarding of valuable data sets imaging the entire crust and the crust-mantle boundary
- Result: A resource-efficient & future-proofed data pool
- Improved availability for the geoscientific community & future applications
- Potential template for the publication of further seismic data sets

Reprocessing: Example DEKORP '88-1C

Location: From the Mosel Syncline to the Saar-Nahe Basin (WNW-ESE) (Fig. 1, white circle)

Profile length: ~74 km (part of survey DEKORP 1)

Aim: • Analysis of deep Variscan and Postvariscan crustal structures under the western Rhenish Massif[5]

• Comparison with results from the eastern Rhenish Massif (DEKORP '86-2N[6])

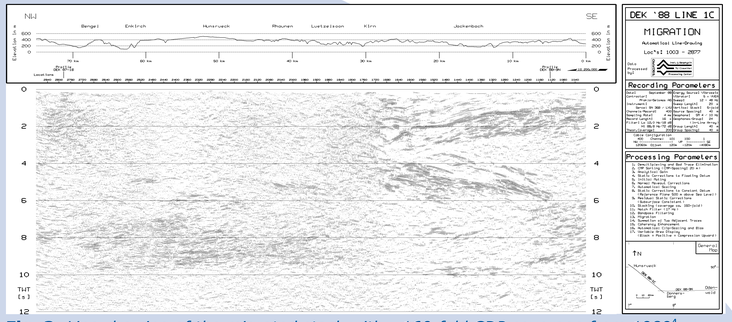

Fig. 3. *Line-drawing of the migrated stack with ~160-fold CDP coverage from 1989[4]. Base for the past interpretations of subsurface structures in the profile section.*

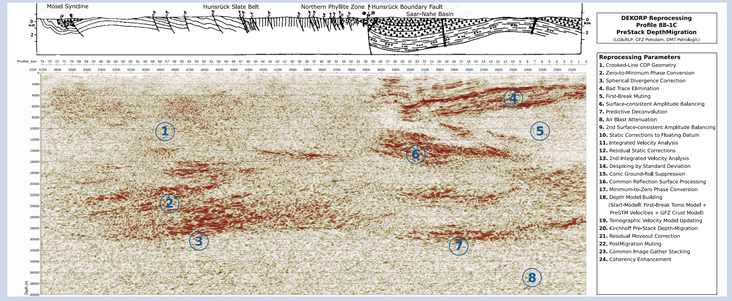

Fig. 4. *Final PreStack DepthMigration based on the reprocessed CRS gathers. North of the Hunsrück Boundary Fault (HBF): **1.** Poly-phase deformed low-grade Paleozoic rocks **2.** Flat and gently dipping reflectors of the top of a crystalline stratified lower crust **3.** Moho. South of the HBF: **4.** NW-dipping sedimentary fill of the Saar-Nahe Basin **5.** Crystalline basement of the Saar-Nahe Basin as part of the Mid-German Crystalline Rise **6.** Possibly the south-dipping Variscan suture zone between the Rhenohercynian and the Saxothuringian Zones **7.** Moho **8.** Deeper crust and upper mantle reflections (based on[4,5], geological profile based on[5]).*

Transcription process of the DEKORP data

- Data originally stored on magnetic tapes; not readable with modern hard- and software and at the end of their durability
- Data transcription by specialised British company to modern formats → protection of valuable data
- ~95% of the main + 60% of special & additional data sets already rescued
- Transcribed data: raw records, final results, high-resolution graphics
- Preparation, supervision and compilation of transcribed data by three-person GFZ-team

Application potential

- Increasing interest for DEKORP data by external institutions (universities, research centres, geological surveys, engineering offices, exploration industry)
- Application examples: GIS-based databases, geothermal energy, subsurface storage, tunnelling, hazard analysis, nuclear waste repository, hydrocarbon exploration, shale gas etc.
- Data reprocessing with state-of-the-art applications and modern interpretation methods → significant improvement of the imaging
- DEKORP/KTB profiles reprocessed so far: 85-4N, 8501, 8503, 88-9N, 84-2S, 86-2N, 90-3A, 90-3B, 88-1C, 87-1B, 87-1A, 86-2Q, 8502, 8504

Literature

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www.gfz-potsdam.de **Acknowledgement:** Philip Webb of OvationData Ltd., Kent, UK for tape transcription; Kirsten Elger from GFZ Data Services and Jörn Krupa from GFZ Technology Transfer for their help realising the DEKORP data publications; Bernd Schmidt from Landesamt für Geologie und Bergbau Rheinland-Pfalz for funding the reprocessing of '88-1C by the seismic contractor DMT Petrologic, Hanover.