Review of earthquake location quality since 2020 for Austria

Maria-Theresia Apoloner, *Niko Horn & Helmut Hausmann*

EGU22-4410 SM2.3 Thu, 26 May, 08:30–09:55 (CEST)
Enhancing seismic network operations from site scouting to waveform services and products

EGU European Geosciences Union

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Abstract

When monitoring seismicity, detection thresholds for magnitude and location accuracy for epicentres are basic quality factors used. However, these factors can be estimated in numerous ways, depending on available data, the tasks the network is built for and customer/legal guidelines.

In this work, we focus on location quality. We analyse location quality for the area of Austria. For this purpose, we calculate location errors with NLLoc (Lomax, et al. 2009) for Austria and compare them with location errors automatically computed for each earthquake located by the Austrian Seismological Service within the last 2 years. Additionally, we use the quality parameters given in Bondar, et al. (2004) for further analysis.

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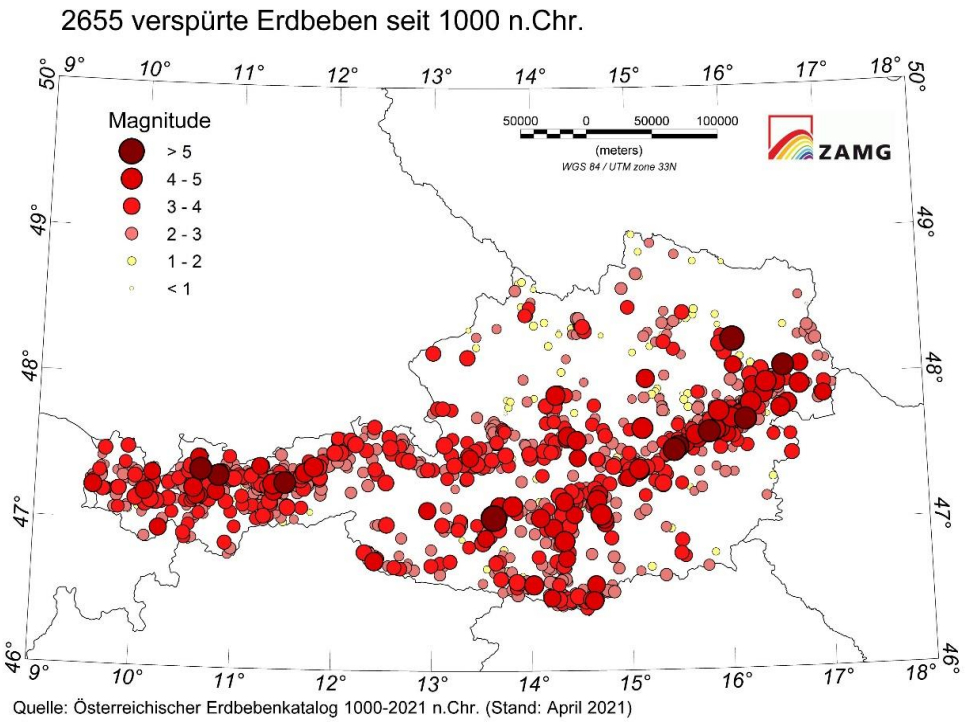
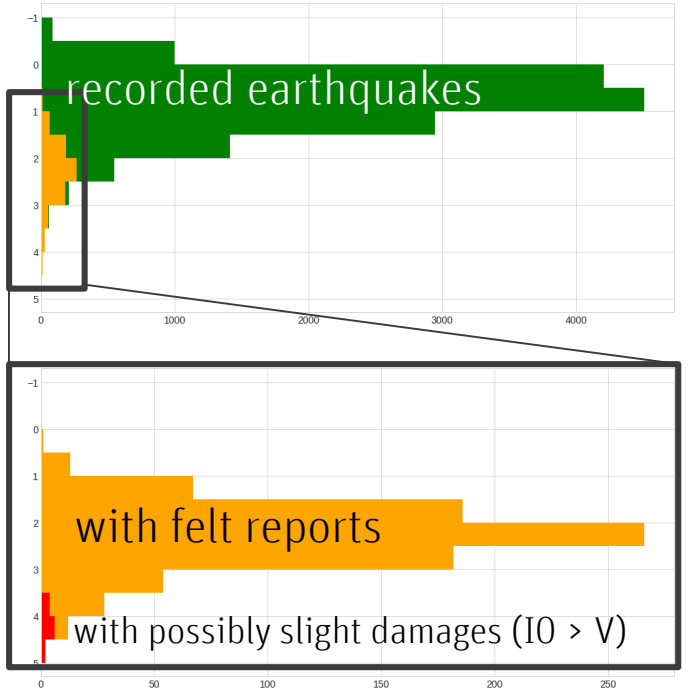
Austrian Earthquake Catalog

… contains earthquake data since 1000
+ since 2020 location quality data is available



Quelle: Österreichischer Erdbebenkatalog 1000-2021 n.Chr. (Stand: April 2021)



Earthquakes since 2006 in AT
according to AEC(2022)

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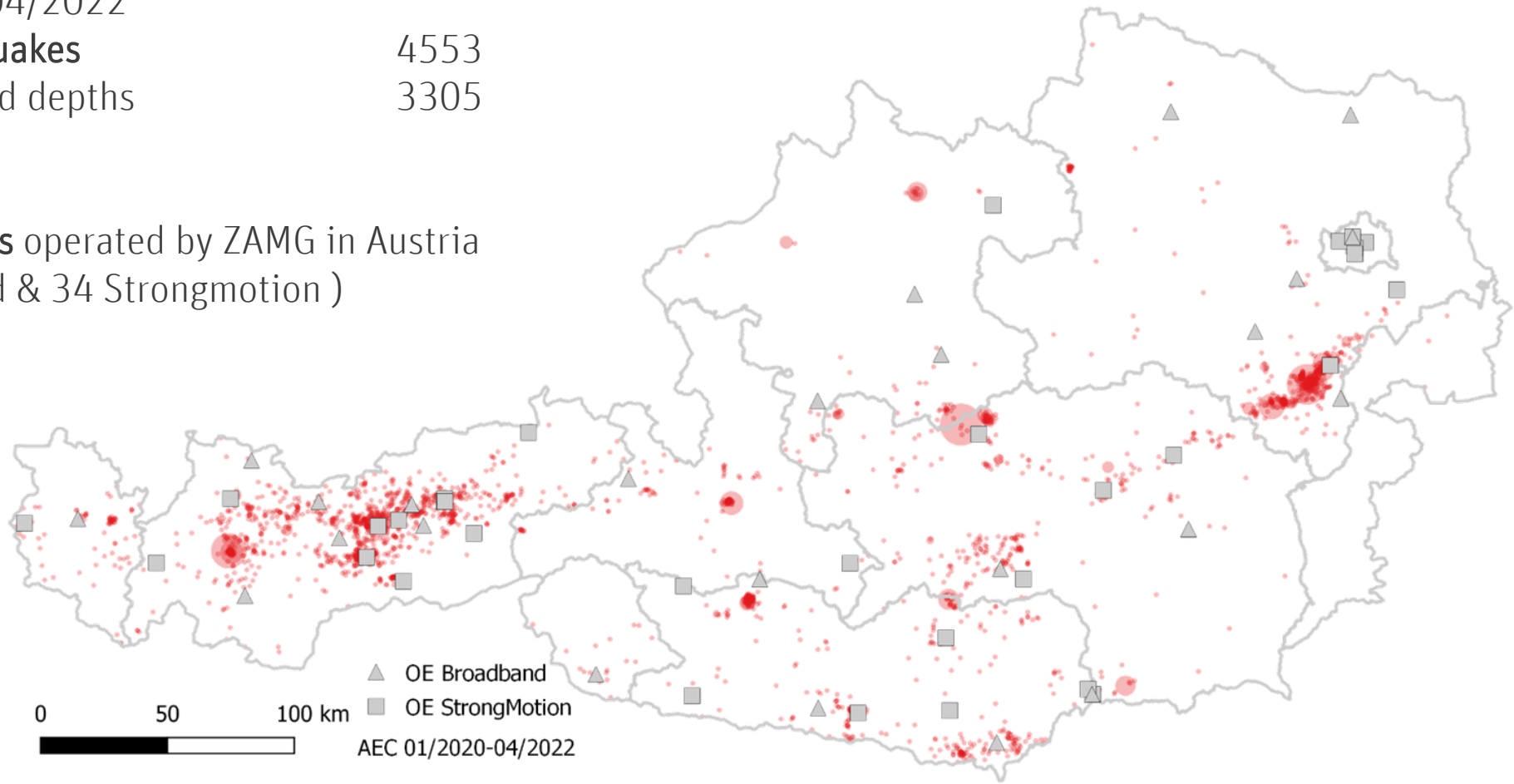
Earthquakes & Stations

Data selected from AEC:

- 01/2020 - 04/2022
- only **earthquakes** 4553
- exclude fixed depths 3305

For simulation:
seismic **stations** operated by ZAMG in Austria
(24 Broadband & 34 Strongmotion)



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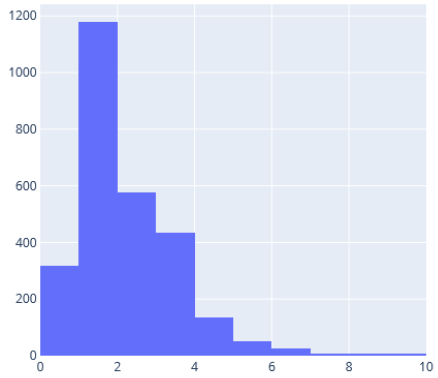
Location Quality

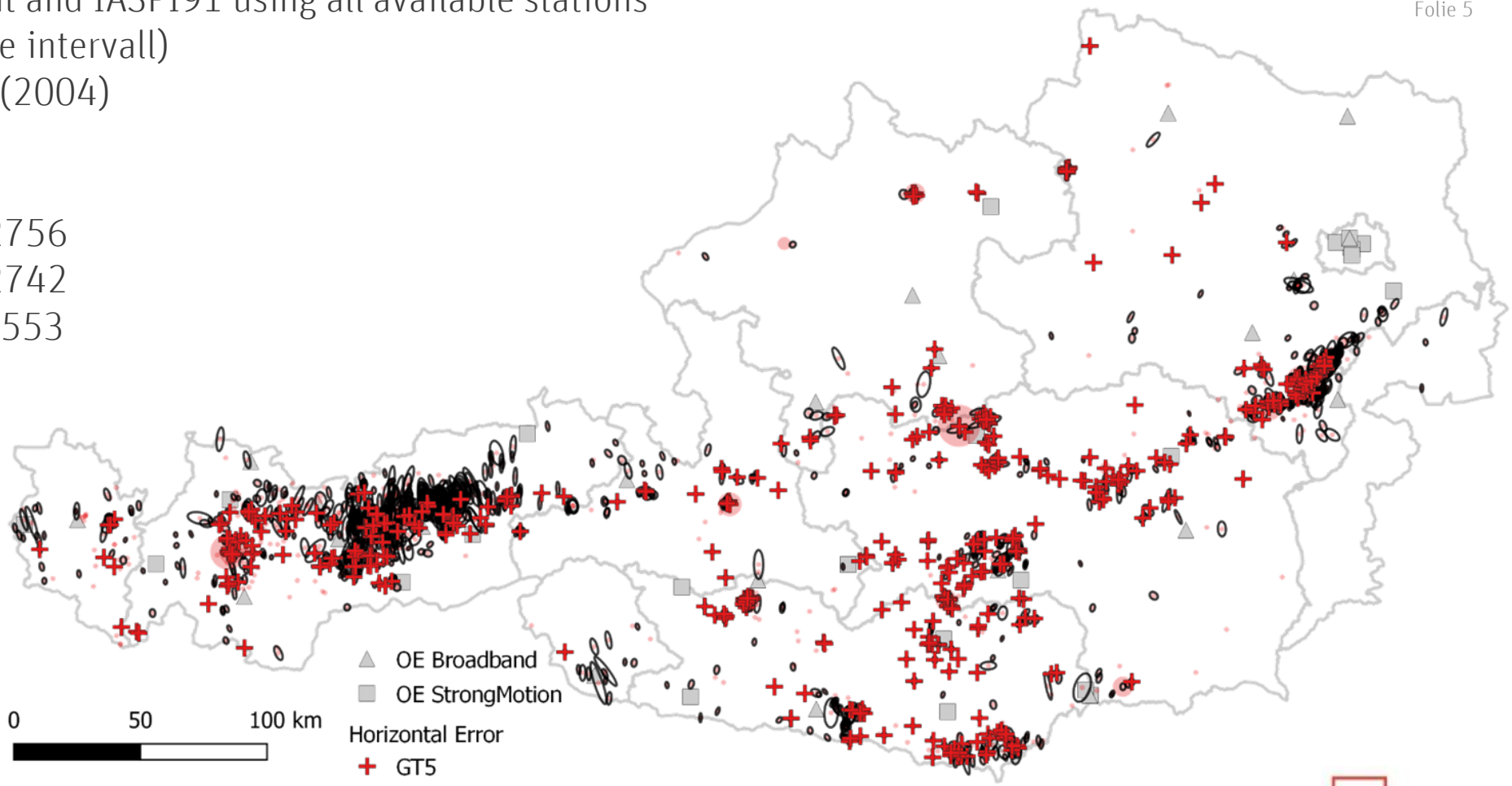
Location with ANTELOPE/Locsat and IASPI91 using all available stations
-> Error Ellipses (0.9 confidence intervall)
-> GT5 following Bondár et. al. (2004)

Selection:

depthError < depth	2756
horizError < 10 km	2742
GT5	553



Horizontal Semi Major Axis [km]



! for all eq with GT5 met → < 2.5 km

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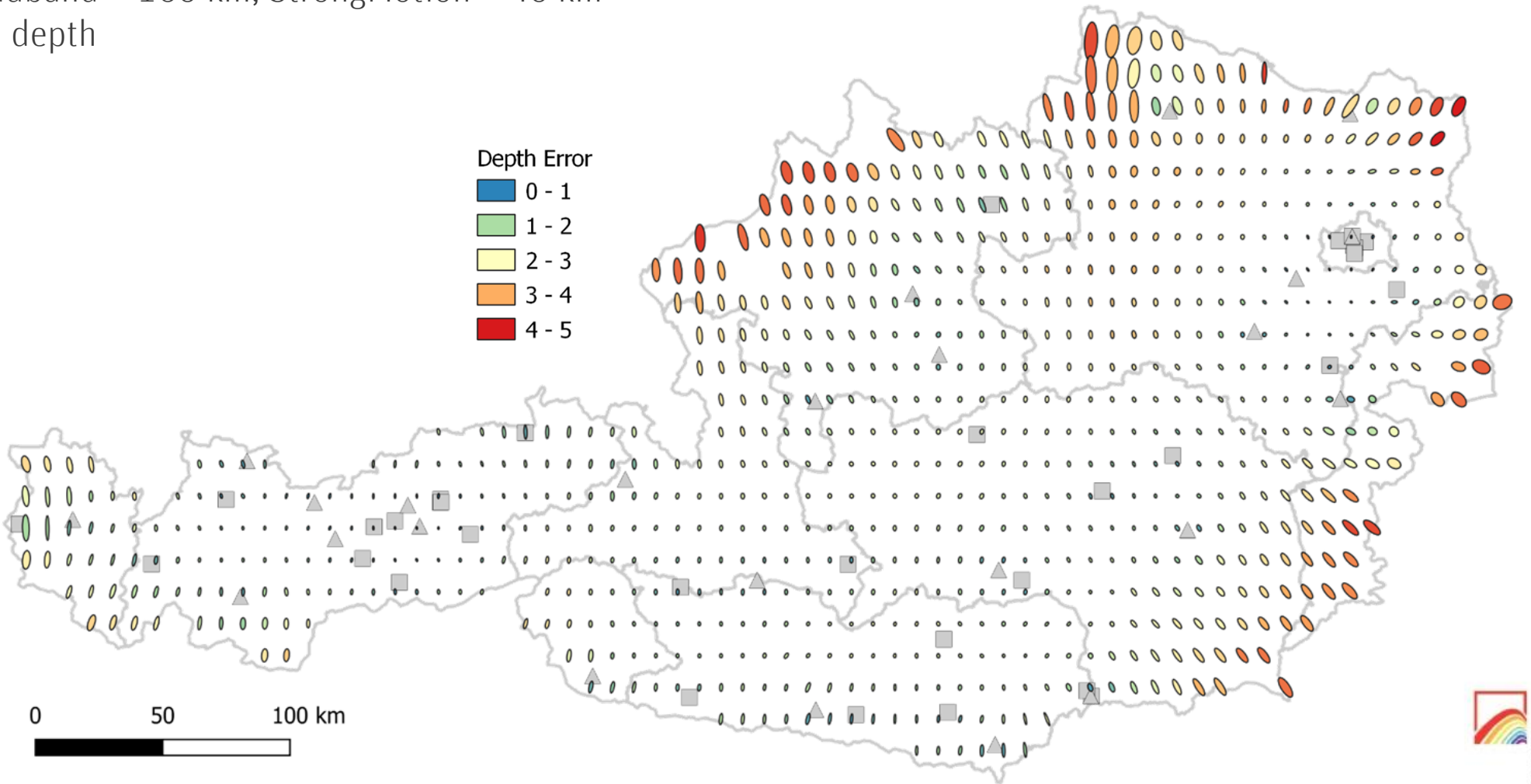
Location Quality Estimation

with NonLinLoc by Lomax et. al (2017), 2-D Model from Hausmann et. al (2010),
for Ml > 2.0: broadband < 160 km, StrongMotion < 40 km
0.1° Grid in 5 km depth



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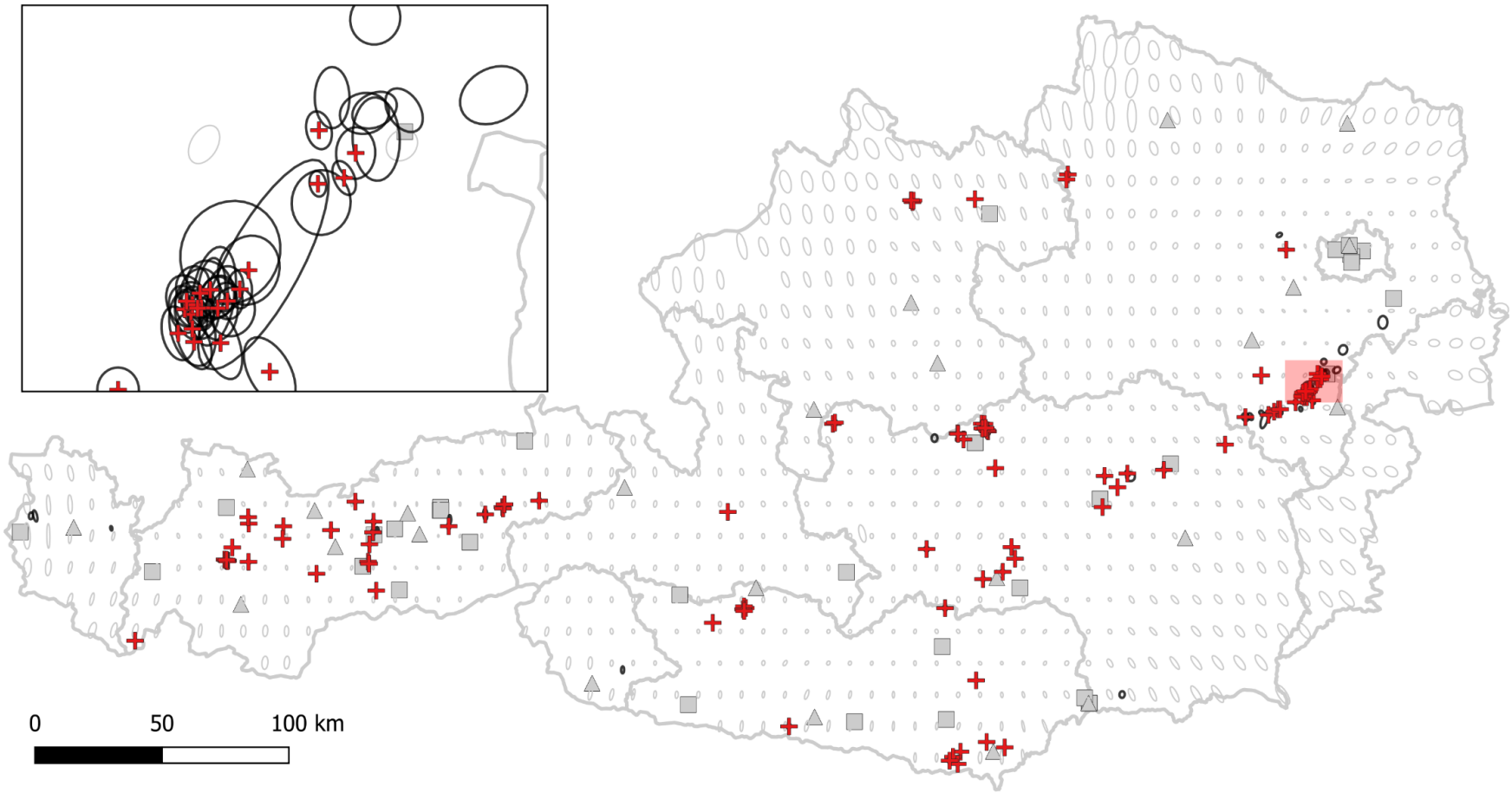
Location Quality Comparision

Data selection: Ml > 2.0 140 earthquakes

→ Small modelled ellipses coincide with GT5 criteria met

→ location quality very variable



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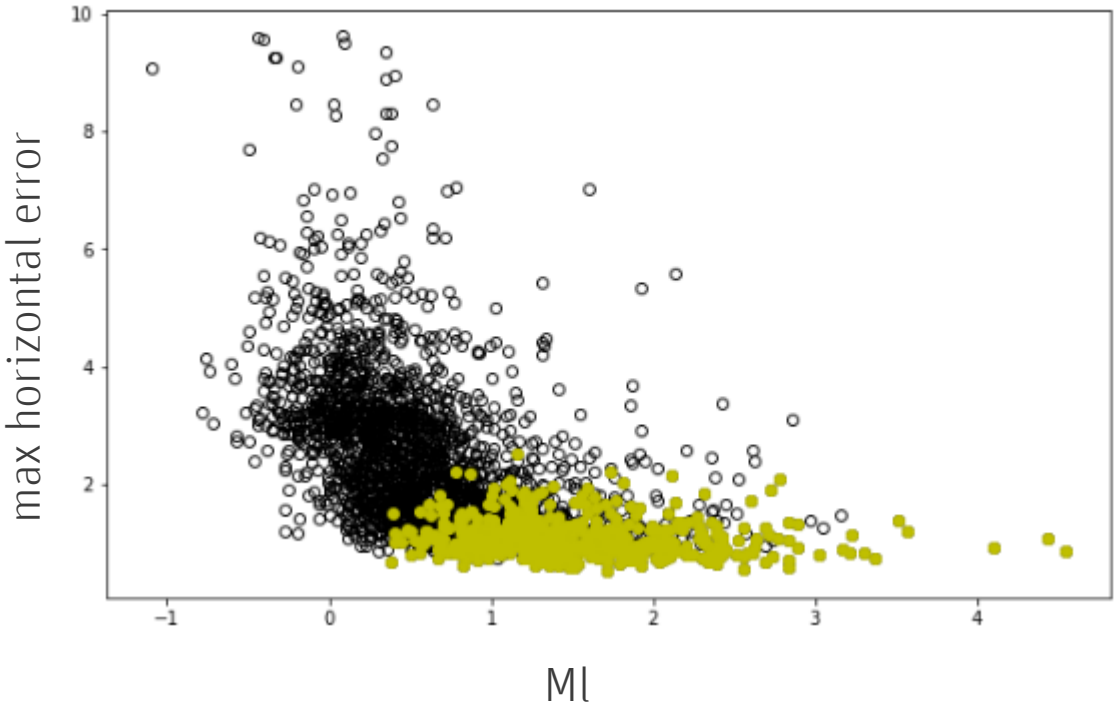
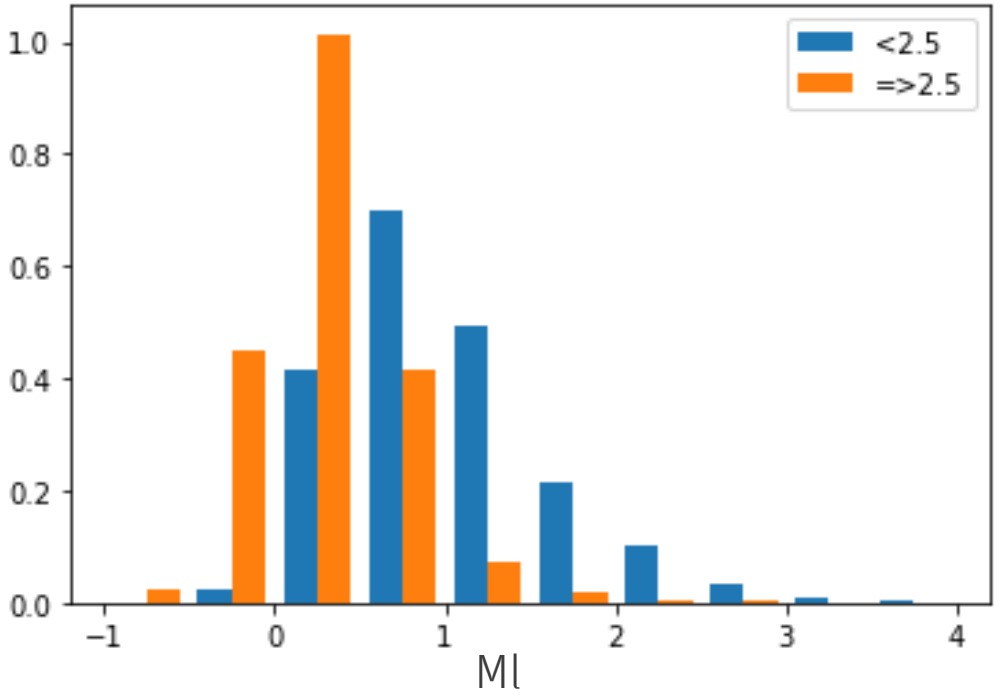
Conclusions

- Location quality strongly varies → modelling not sufficiently accurate





- GT5 criteria good indicator for high quality location (error < 2.5 km)
- Horizontal error for Ml > 2.0 below 2.5 km

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