

Short special report Exceedance Activity Rate February 2018

Summary

This short report is written as direct consequence of exceeding a parameter of the Groningen Measurement and Control Protocol (MRP) at a threshold value. The report¹ discusses the exceeding of the activity rate at signaling level. This exceedance was caused by an M2.0 earthquake on February 8th, 2018, in Loppersum. This also resulted in a further rise of the earth-quake density parameter, as well as a further rise in the activity rate number. Two additional earthquakes ($M \geq 1.5$), in Garrelsweer and Scharmer, followed shortly thereafter and caused the activity rate to rise to 23. The PGA and PGV numbers (associated with the Loppersum, 8th of February, earthquake) were low as expected with an earthquake of this magnitude. This report is kept short because all the context of this exceedance has extensively been discussed in recent reports (ref 1 & 2) and its common cause is understood as mainly driven by renewed pressure decline in the Loppersum area. More importantly, the control measures already advised, of which some are already implemented (closing in of the Loppersum clusters and production restriction for the Bierum cluster), are thought to address this as well.

MRP status

The current MRP status is shown in table 1. The recent Loppersum earthquake caused the Activity Rate to cross the “signaling level” and the 12-month number subsequently rose to 23 on February 11th. Earthquake density also rose and reached a number just under the intervention level (0.39).

MRP status					
	11 Februari 2018	8 January 2018	Grenswaarden		
			Waakzaamheid	Signalering	Interventie
Activity Rate (# aardbevingen, $M \geq 1.5$)	23	19	15	20	25
EQ density (aantal \times km ² jr ⁻¹ , $M \geq 1$)	0.39	0.38	0.17	0.25	0.40
PGA (in “g”, laatste M2+)	0.005 (Loppersum)	0.11 (Zeerijp)	0.05	0.08	0.10
PGV (meest recente maximum, in mm/s)	1.0 (Loppersum)	32 (Zeerijp)	5	50	80
Damage State	DS1 ?	No DS2 observed (yet)	Δ (model, actual)		
Other patterns	Loppersum $M \geq 1$ trend	Loppersum $M \geq 1$ trend	“Expert Judgement”		

Table 1. Status of MRP parameters on the 11th of February, 2018.

- ¹ NAM issued this report on 14th February as per normal operating procedure of the MRP. It was resubmitted after a specific request by SodM to also include the earthquakes that occurred between the 8th of February and the 11th of February.

The PGA associated with this earthquake was 0.005 g and the PGV was 1.0 mm/s, values normally associated with very little damage. Although, the earthquake is still being analyzed, there is no indication at this moment of unusual or unexpected aspects. As already indicated in a previous report (ref 2), the actual number of earthquakes in the Loppersum area slightly exceeds the modelled expectation number.

The trend in activity rate is shown in figure 1. It shows that the activity rate has been increasing since 2017, and has basically doubled since January 2017.

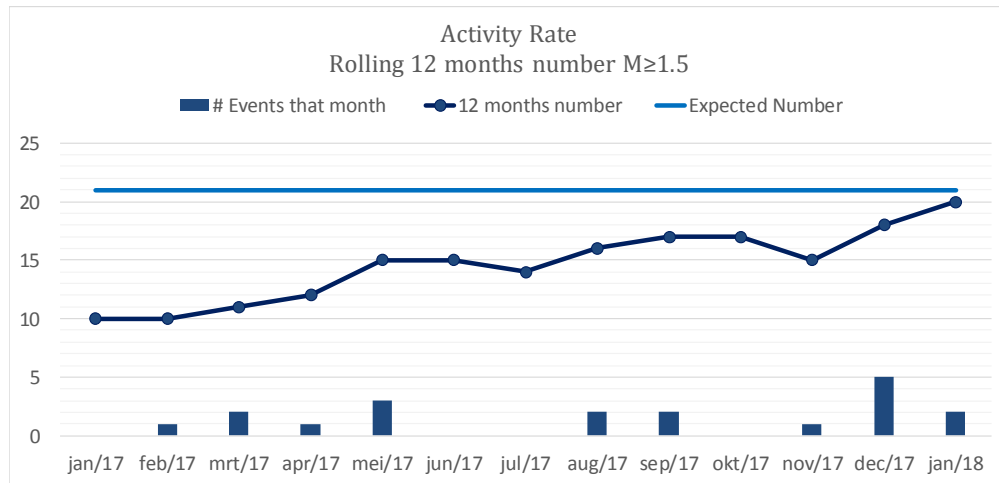


Figure 1. Trend in activity rate over the last year.

Control measures

The following control measures have already implemented after the Zeerijp 8th of January earthquake.

1. Closing in of 5 Loppersum clusters
2. Production restrictions for the Bierum cluster

Both SodM and NAM argue that these measures are by themselves insufficient to have a long-term effect on earthquake density and activity rate (and ILPR) and both SodM and NAM have advised additional production volume reductions. The level of future production levels will be decided by the Minister in the course of 2018. The Minister has also instructed NAM/GasTerra to minimize 2017/2018 production as much as demand allows.

The current exceedance of the MRP parameter “Activity Rate” does not represent a new trend or development. The control measures discussed above are thought to also address the current exceedance of the activity rate. It is expected that the combination of closing in the Loppersum cluster and reducing production volume will have its effect in about 6 months after implementation.

References

1. Advies Groningen-gasveld n.a.v. aardbeving Zeerijp van 8 januari 2018. SodM report.
2. Special Report on the Zeerijp Earthquake, 8th of January. NAM report