Overview of the shallow magma reservoir, conduit properties and effusion style throughout the 2021 eruption near Fagradalsfjall, Iceland

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21 March 2021

View from S
Vent 1

25 April 2021

Vent 6
View from NW
Vent 3
Vent 5
Vent 1

2 May 2021

View from SE
Vent 5

8 June 2021

View from S
Vent 5

21 August 2021

Volcano Heli (www.vh.is)
Volcano Heli (www.vh.is)

Eibl et al. (2023) Bull. Volc.


Eibl, E. P. S., et al. (in review at JGR) Illuminating the Transition from an open to a semi-closed volcanic vent system through episodic tremor duration and shape
Seismic stations near the Geldingadalir 2021 eruption

Eibl et al. in review

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Times of lava effusion and volcanic tremor align

Kymograph by Sandeep Karmacharya

Eibl et al. (2023) Bull. Volc.
We mark the start and end of 8,696 tremor episodes

Marked by Eva Eibl, Alea Joachim, Undine Gnauck, Shaig Hamzaliyev @ UP

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We calculate the mean tremor amplitude between the markers.
Definition of episode duration, cycle duration & repose time
The generated tremor patterns are diverse

Eibl et al. (2023) Bull. Volc.

Tremor + wind noise

RMS ground vel.,
0.5-4 Hz
(10^-6 m/s)

Time in 2021 (dd-mm)
01-04 16-04 01-05 16-05 31-05 15-06 30-06 15-07 30-07 14-08 29-08 13-09
Eibl et al. 2023

Eibl et al. in review
We define 6 phases during the Geldingadalir eruption 2021

Eibl et al. in review

Eibl et al. 2023
Transitions between states

Effusion rate doubled

Cumulative duration (d)

Continuous

Minutes-long

Cont. min. & hour

Hours-long

Min. & hour

New vent

Effusion rate doubled

RMS ground vel

0.5-4 Hz

(10^-6 m/s)

Time in 2021 (dd-mm)

Eibl et al. 2023

Eibl et al. in review
Possible trigger: 11 July collapse event

https://www.youtube.com/watch?v=OEXI9wlV1Cc
Minutes and hour-long episodes reflect different system states

Eibl et al. in review
Let’s zoom into May – mid June

Eibl et al. in review

Eibl et al. 2023

Eibl et al. in review
Seismic amplitude & fountain height decrease linked to mechanical erosion of vent & its size increase

Eibl et al. (2023) Bull. Volc.
Episode duration indicates a growing, shallow magma compartment from 2 to 11 May

Eibl et al. (2023) Bull. Volc.
Repose time linked to viscosity & amount of degassed magma at the bottom of the crater

Eibl et al. (2023) Bull. Volc.
• We interpret the **seismic amplitude** in the context of the **size of the vent**.
• We interpret the **episode duration** in the context of the **size of the magma compartment**.
• We interpret the **repose time** in the context of the **accumulated outgassed material** in the crater.
• Minute-long and hour-long episodes reflect open vent system and semi-closed vent system.