Comments from Reviewer 2:

The submitted manuscript presents a database—called Valgarður—that contains petrophysical, mineralogical, and chemical properties of rocks from Iceland. Although there are gaps in the database, such as the lack of mechanical and thermal properties, I think that it will prove to be a useful resource. I recommend publication after the following comments have been addressed to the satisfaction of the editor.

Line 70: Valgarður.

Fixed

Figure 2: "Kr" is Krafla?

Added

Table 2: I think it's odd to describe lavas as "fine-medium grained" and "medium-coarse grained". Lavas do not contain grains, but crystals. Would aphanitic and porphyritic be more appropriate descriptors?

We already used the descriptor porphyritic for porphyritic basaltic lavas. Although the reviewer's point is well received, it has been customary in Iceland to describe basalts in terms of "grain" size. We added more discussion around this point to the text on lines 167-170:

> It has been customary in Iceland to classify lava flows based on crystal size (Guðmundsson et al.; 1995); in comparison to the classification scheme of Walker (1958), the lithological identifier "fine-medium grained basaltic lava" generally corresponds to the "tholeiitic basalt" type, while "medium-coarse grained basaltic lava" corresponds to the "olivine basalt" type.

Walker, G. P. L.: Geology of the Reydarfjördur area, Eastern Iceland, Quarterly Journal of the Geological Society of London, 114, 367–391, https://doi.org/10.1144/gsjgs.114.1.0367, 1958.

Line 153: The authors could refer here to the lava shown in Figure 1.

We added the reference to Fig. 1c for the porphyritic basaltic lava flow.

Line 165: Suggest to change "ash flows" to "pyroclastic density currents".

Suggestion adopted.

Line 175: Can the authors refer the reader to the paper(s) describing these rocks, or are these observations unique to this study?

We added citations describing these kinds of rocks as well as further clarification regarding volcaniclastic rocks and sedimentary rocks on lines 188-193:

> While many volcaniclastic rocks (e.g., hyaloclastite) show sedimentary textures related to deposition in a sub-aqueous or sub-aerial environment (Bergh and Sigvaldason, 1991; Schopka et al., 2006; Banik et al., 2014; Greenfield et al., 2020), they are not referred to as sedimentary rocks in the database. Examples of sedimentary rocks found in Iceland include clay-rich lacustrine sediments, glacial tillite and conglomerates, sandstone, as well as interbasaltic beds (e.g. Bennet et al., 2000; Arnalds et al., 2001; Thorpe et al., 2019; Eiriksson and Simonarson, 2021).

Arnalds, O., Gisladottir, F. O., and Sigurjonsson, H.: Sandy deserts of Iceland: an overview, J. Arid Environ., 47, 359–371, https://doi.org/https://doi.org/10.1006/jare.2000.0680, 2001.

Bergh, S. G. and Sigvaldason, G. E.: Pleistocene mass-flow deposits of basaltic hyaloclastite on a shallow submarine shelf, South Iceland, Bull. Volcanol., 53, 597–611, https://doi.org/10.1007/BF00493688, 1991.

Banik, T. J., Wallace, P. J., Höskuldsson, Á., Miller, C. F., Bacon, C. R., and Furbish, D. J.: Magma–ice–sediment interactions and the origin of lava/hyaloclastite sequences in the Síða formation, South Iceland, Bull. Volcanol., 76, 785, https://doi.org/10.1007/s00445-013-0785-3, 2013.

Bennett, M. R., Huddart, D., and McCormick, T.: An integrated approach to the study of glaciolacustrine landforms and sediments: a case study from Hagavatn, Iceland, Quat. Sci. Rev., 19, 633–665, https://doi.org/10.1016/S0277-3791(99)00013-X, 2000.

Greenfield, L., Millett, J. M., Howell, J., Jerram, D. A., Watton, T., Healy, D., Hole, M. J., and Planke, S.: The 3D facies architecture and petrophysical properties of hyaloclastite delta deposits: An integrated photogrammetry and petrophysical study from southern Iceland, Basin Res., 32, 1091–1114, https://doi.org/10.1111/bre.12415, 2020.

Schopka, H. H., Gudmundsson, M. T., and Tuffen, H.: The formation of Helgafell, southwest Iceland, a monogenetic subglacial hyaloclastite ridge: Sedimentology, hydrology and volcano–ice interaction, J. Volcanol. Geotherm. Res., 152, 359–377, https://doi.org/https://doi.org/10.1016/j.jvolgeores.2005.11.010, 2006.

Thorpe, M. T., Hurowitz, J. A., and Dehouck, E.: Sediment geochemistry and mineralogy from a glacial terrain river system in southwest Iceland, Geochim. Cosmochim. Acta, 263, 140–166, https://doi.org/https://doi.org/10.1016/j.gca.2019.08.003, 2019.

Line 194: Presumably the measurements of permeability were made under a small confining pressure?

This is true and clarified in lines 211-212:

> Permeability measurements were made under a variable but low confining pressure (<5 MPa).

Table 4: Acronyms should be explained in the table caption.

Acronyms have been added to the table caption.

Line 203: I suggest to add that “effective porosity” is often called “connected porosity”. This porosity is that connected to the outside surface of the sample. I suggest that the authors refine their definition here.

We have adapted the suggestion of the reviewer and changed “effective” porosity to “connected porosity” throughout the database and the manuscript. We refined our definition of connected porosity on lines 232-233: “Porosity is differentiated between connected porosity (the fraction of bulk volume occupied by pore space connected to the outside surface of the sample; this is also referred to as “effective porosity”

Line 218: Suggest to change “brine” to “liquid”.

Suggestion adapted.

Line 224: It might be worth noting that this may not be the case for clay-rich, altered materials.

Suggestion adapted.

Line 225: Another source of error is that helium pycnometry requires the sample dimensions. The triple-weight method, however, only uses measurements of weight. Laboratory measurements of weight are often more accurate than measurements of length, which is another advantage of the triple-weight method over helium pycnometry.

We have added additional discussion of the uncertainty related to pynometry, triple-weighing, and compared this with the natural uncertainty present in the rock on lines 255-266:

> Figure 3b compares connected porosity measurements performed on a set of hyaloclastite samples using either He (Franzson et al., 2011) or air (Frolova et al., 2005) as the saturating gas, and shows that connected porosity of samples measured using air is lower at low porosities and higher at high porosities. While the former may be due to the lesser ability of air to penetrate the microporosity, the latter may result from adsorption of water contained in the air in the clay-rich, altered rock. An additional source of error is that helium (or air) pycnometry requires the sample dimensions, whereas the triple-weight method only uses measurements of weight. As laboratory measurements of weight are often more accurate than measurements of length, this is one advantage of the triple-weight method over helium pycnometry. However, repeat measurements of connected porosity on different core plugs obtained from a given rock outcrop (e.g. Fig. 1d) reveal natural uncertainty in the sampled rock of 5-10% (i.e. porosity can range from 5-15% for a given lava flow). Given the natural variability and heterogeneity present in the rock, particularly hyaloclastites or flow-top breccias, which show strong gradients in petrophysical properties over distances <1 m, the uncertainty resulting from different measurement devices and methods is likely less than (or comparable to) the natural variability present in the rock.

Franzson, H., Guðfinnsson, G. H., Frolova, J., Helgadóttir, H. M., Mortensen, A. K. and Jakobsson, S. P. Icelandic Hyaloclastite Tuffs. Iceland Geosurvey, ÍSOR-2011/064, 2011.

Frolova, J. V., Ladygin,, V. M., Franzson, H., Sigurðsson, O., Stefánsson, V. and Shustrov, V.: Petrophysical properties of fresh to mildly altered hyaloclastite tuffs, in: Proceedings World Geothermal Congress, Antalya, Turkey, 24-29 April 2005, 2005.

Line 227: Unless dried/filtered, air can also contain water, which can also influence measurements of porosity (especially clay-rock, altered materials).

This is mentioned in the text; see response to comment regarding line 225.

Line 229: Given the variability and heterogeneity of volcanic rock, this seems very likely.

This is mentioned in the text; see response to comment regarding line 225.

Line 250: Presumably this is because the alteration mineral assemblage formed at depth contains denser minerals? Is this true?

The alteration mineralogy assemblage between these sets of samples is similar (both are smectite-zeolite zone), but the alteration mineral assemblage may be denser in response to compaction and increasing confining stress. This is now on lines 277-283:

> Figure 4 shows that the range of grain density measured in smectite-zeolite altered lava flows is similar whether Hg displacement (blue lines) or triple-weighting (red lines) techniques are used (Fig. 4a). On the other hand, for altered hyaloclastites (Fig. 4b), samples analyzed by triple-weighting (~2.75 g cm^{-3}) show significantly larger average grain density than by Hg

displacement (~2.6 g cm^{-3}). However, other factors might also explain this discrepancy, most notably that many of the samples shown in Fig. 4b analyzed using Hg displacement were derived from surface outcrops, whereas those analyzed by triple-weighting were obtained from borehole samples in active geothermal systems. Although these samples are in similar alteration zones, rocks at depth are more compacted, and may contain a denser alteration mineral assemblage.

Line 259: Higher, and also much more accurate. I think that the authors should clearly state that estimating porosity using thin section images is problematic and often underestimates the porosity. For example, it is often not possible to identify micropores and small microcracks on thin section images, which can form a large proportion of the porosity in some volcanic rocks.

We have taken the reviewers suggestion, and made to revisions to the section concerning petrographic estimation of porosity and primary porosity on lines 276-293 and in Figure 5:

Porosity was also assessed in 352 samples by point-counting. In point-counting, a thin section (around 30 micrometers thick) of the sample was prepared, and a regular grid with a given number of points (usually 200 or 1000 points) was arrayed onto the thin section image. Identification of mineralogy or pore space at each point was performed, with the different studies applying different levels of classification between primary minerals, glass, pore space, and alteration minerals. The primary porosity formed during magma emplacement and cooling was estimated as the sum of remaining open-space porosity in the rock as well as that of secondary alteration minerals that have precipitated into vesicles (Petford, 2003). This technique does not measure the cross-sectional area of microcracks, but rather only identifies macroscopic pores on the order of 1 mm or larger (Neuhoff et al., 1999; Manning and Bird, 1995; Chayes, 1956). Although the contribution of the latter to the porosity is often large, note that distinction between open-space porosity created by post-eruptive processes (fracturing/veining) was not made by all studies. Therefore, we estimate that the uncertainty of porosity measurements by point counting is considerable (>5-10%). Figure 5 shows that the remaining open-space porosity measured by point counting is generally lower than that obtained by gas expansion, particularly for altered, high-porosity hyaloclastites, indicating the dominance of microporosity on the total porosity. However, a significant number of samples (~50) had higher porosity recorded using petrographic analysis than by gas expansion. As porosity and permeability are scale-dependent (Manning and Bird, 1995), such variability could also indicate natural heterogeneity in the rock and preparation of the thin section from a particularly compact or porous part of the material.

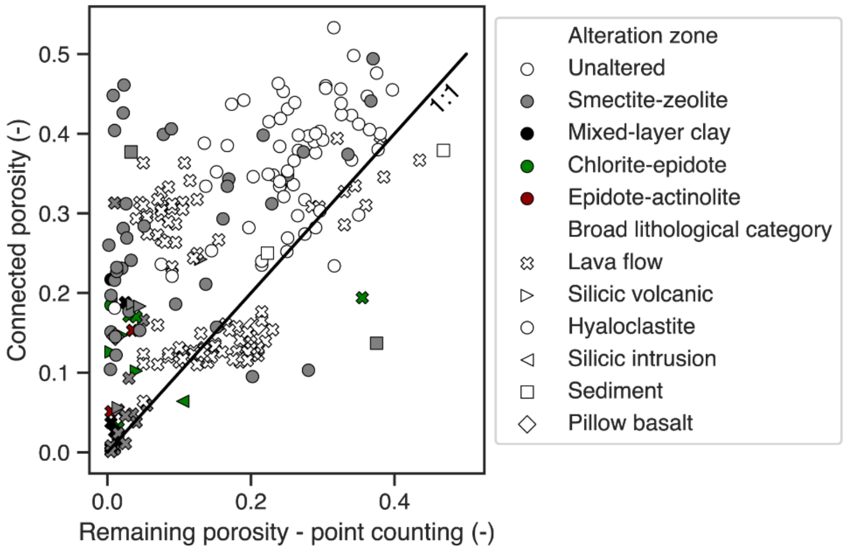


Figure 5. Remaining porosity estimated by point counting compared with connected porosity measured using He pycnometry.

Chayes, F.: Petrographic model analysis: an elementary statistical appraisal, John Wiley and Sons, New York, New York, United States of America, 1956.

Manning, C. E. and Bird, D. K.: Porosity, permeability and basalt metamorphism, 123–140, in: Low-Grade Metamorphism of Mafic Rocks, edited by: Schiffman, P. and Day, H.W., Geological Society of America Special Paper 296, https://doi.org/10.1130/SPE296-p123, 1995.

Neuhoff, P., Fridriksson, T., Arnórsson, S., and Bird, D. K.: Porosity evolution and mineral paragenesis during low-grade metamorphism of basaltic lavas at Teigarhorn, eastern Iceland, Am. J. Sci., 299, 467–501, 1999.

Petford, N.: Controls on primary porosity and permeability development in igneous rocks, Geol. Soc. London, Spec. Publ., 214, 93 LP – 107, https://doi.org/10.1144/GSL.SP.2003.214.01.06, 2003.

Line 264: What was the confining pressure used by Gudmundsson et al. (1995)?

Although the confining pressure used by Guðmundsson et al. (1995) is not clearly stated in the report, we assume that the confining pressure is relatively low based on the technical specifications of the CMS-300 device. We clarified this in the text on lines 305-308 and also added a reference where measurements at variable confining pressure were performed on a few samples:

> While permeability of the samples from Guðmundsson et al. (1995) were measured using a low (<4 MPa) confining pressure, measurements performed on a few samples under varying confining pressure showed little dependence of permeability on confining pressure (Johnson and Boitnott, 1998).

Johnson, J. & Boitnott, G. N.: Velocity, Permeability, Resistivity and Pore Structure Models of Selected Basalts from Iceland. New England Research, Vermont, U.S.A, 1998.

Line 265: What is meant by the “stationary method”? The steady-state flow method?

This has been changed to the steady-state flow method.

Line 287: The authors should also discuss the Forchheimer correction. This correction is often needed when measuring the permeability of porous rocks using gas. The data were also checked for the Forchheimer correction? If yes, the authors should discuss this here. If not, I think that the authors should clearly state that these data were not checked for the Forchheimer correction, and so may not represent the "true" or "intrinsic" permeability.

The data were checked for Forchheimer correction. More discussion of the Forchheimer correction has been added to the text on lines 333-341:

> However, in high permeability rocks, turbulent flow regimes may develop, and Darcy's law needs to be modified in order to take into additional flow resistance resulting from inertial forces, as given by the second term in the Forchheimer equation (Forchheimer, 1901; Zeng and Grigg, 2006):
>
> $$\frac{dp}{dx} = \frac{\mu}{k}\frac{q}{A} + \beta\left(\frac{q}{A}\right)^2 \quad (7)$$
>
> For the samples analyzed by Guðmundsson et al. (1995), the inertial coefficient β was calculated for a sample using repeat measurements at different flow rates. For the samples analyzed by Levy et al. (2018, 2020b), the Forchheimer correction was applied using a similar method outlined in Heap et al. (2018), with a modified version of Darcy's law that accounts for fluid compressibility.

Forchheimer, P.: Wasserbewegung durch boden, Z. Ver. Deutsch, Ing., 45, 1782–1788, 1901.

Heap, M. J., Reuschlé, T., Farquharson, J. I., and Baud, P.: Permeability of volcanic rocks to gas and water, J. Volcanol. Geotherm. Res., 354, 29–38, https://doi.org/10.1016/j.jvolgeores.2018.02.002, 2018.

Lévy, L., Gibert, B., Sigmundsson, F., Flóvenz, O. G., Hersir, G. P., Briole, P., and Pezard, P. A.: The role of smectites in the electrical conductivity of active hydrothermal systems: Electrical properties of core samples from Krafla volcano, Iceland, Geophys. J. Int., 215, 1558–1582, https://doi.org/10.1093/gji/ggy342, 2018.

Lévy, L. E., Gibert, B., Escobedo, D., Patrier, P., Lanson, B., Beaufort, D., Loggia, D., Pezard, P. A., and Marino, N.: Relationships between lithology, permeability, clay mineralogy and electrical conductivity in Icelandic altered volcanic rocks, in: Proceedings World Geothermal Congress 2020+1, Reykjavik, Iceland, April-October 2020, 2020b.

Zeng, Z. and Grigg, R.: A Criterion for Non-Darcy Flow in Porous Media, Transp. Porous Media, 63, 57–69, https://doi.org/10.1007/s11242-005-2720-3, 2006.

Line 289: The authors should state/discuss whether these data are influenced by rock type. It's also interesting to note that the lava samples cover almost the entire permeability range.

Further discussion of the influence of rock type and alteration and added to the results section in the new version of the manuscript.

Line 289: What was the concentration of brine used?

We believe it was misleading to label these as "Brine permeabilities" as the salinity of the liquid was very low (<1 wt %). However, the brine concentration was different for the different studies, and not all studies provided the salinity of the brine. We clarify this in the new version of the data base by using the term “Liquid apparent permeability” rather than “Brine apparent permeability” and moreover state clearly that low-salinity water was used for permeability testing. Unfortunately,

Line 290: The authors should offer a reason for this here, in my opinion. This difference is often attributed to the presence of swelling clays (see, for example, Tanikawa and Shimamoto, 2009). Even in clay-free volcanic rocks, liquid permeabilities can also be lower than gas permeabilities due to water adsorption on narrow, tortuous microstructural elements (see Heap et al., 2018).

Tanikawa, W., & Shimamoto, T. (2009). Comparison of Klinkenberg-corrected gas permeability and water permeability in sedimentary rocks. International Journal of Rock Mechanics and Mining Sciences, 46(2), 229-238.

Heap, M. J., Reuschlé, T., Farquharson, J. I., & Baud, P. (2018). Permeability of volcanic rocks to gas and water. Journal of Volcanology and Geothermal Research, 354, 29-38.

Further discussion of this point has been added to the text on lines 342-350:

> Figure 6a shows that apparent permeability measured using air generally exceeds that measured using water, often by several orders of magnitude. This difference is often attributed to the presence of swelling clays (see, for example, Tanikawa and Shimamoto, 2009). Even in clay-free volcanic rocks, liquid permeabilities can also be lower than gas permeabilities due to water adsorption on narrow, tortuous microstructural elements (Heap et al., 2018). Measurements of air permeability that are less than brine permeability are generally considered unreliable. Figure 6b compares air apparent permeability and intrinsic permeability, showing that the magnitude of the Klinkenberg correction increases with decreasing permeability, consistent with increased gas slippage during flow through microstructural elements in low-porosity, low-permeability rock (Heap et al., 2018).

Line 292: Is it not worth adding a plot that shows permeability as a function of porosity? It would be interesting to show whether permeability increases as a function of porosity, as seen in, for example, Farquharson et al. (2015). Is it worth adding another plot that differentiates the data by their alteration?

Farquharson, J., Heap, M. J., Varley, N. R., Baud, P., & Reuschlé, T. (2015). Permeability and porosity relationships of edifice-forming andesites: a combined field and laboratory study. Journal of Volcanology and Geothermal Research, 297, 52-68.

Plots showing the relationship of porosity and permeability to lithology and alteration have been added to the results section (Fig. 11).

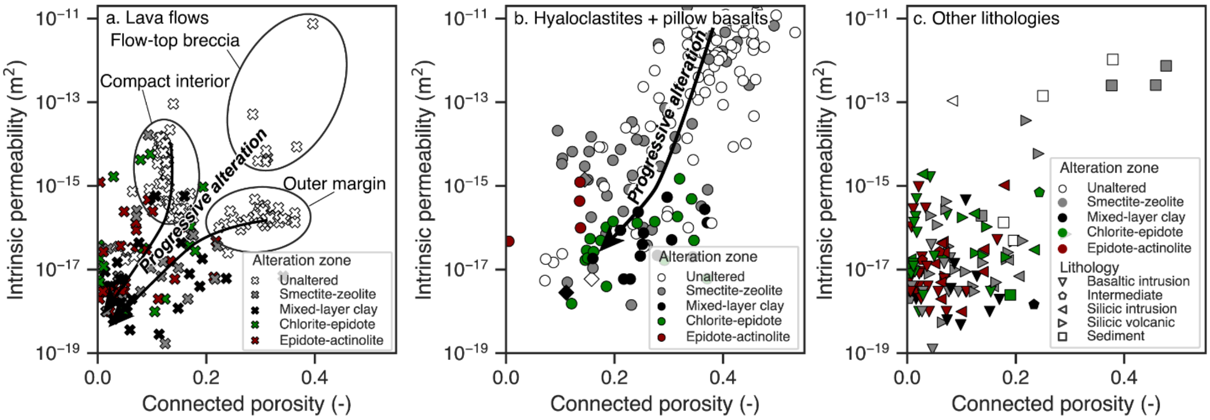
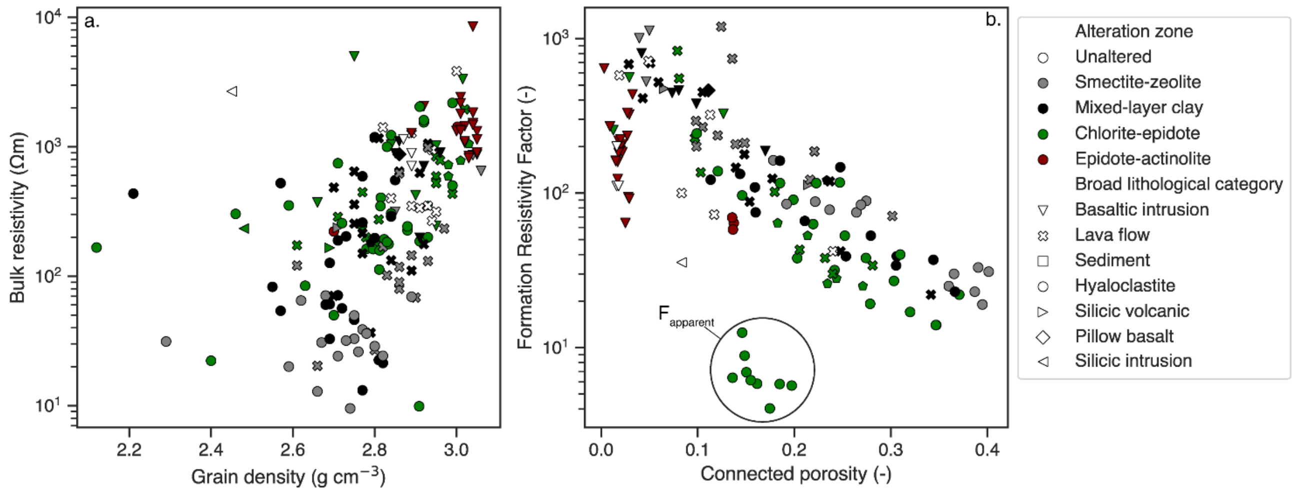


Figure 11. Relationship between connected porosity and intrinsic permeability in a) lava flows, b) hyaloclastites and pillow basalts, and c) other lithologies, including basaltic intrusions, silicic intrusions, silicic volcanics, intermediate rocks, and sediments. Samples colored by alteration zone, with symbols corresponding to different lithology.

Line 353: Why not show formation factor and/or surface conductivity as a function of porosity for the data in the database?

Plots showing the formation factor as a function of porosity have been added to the results section



(Figure 12).

Figure 12. a) Relationship between grain density and bulk resistivity. Smectite-rich rocks which usually constitute the cap rock have a lower resistivity and grain density than rocks that compose the resistive core or fresh, unaltered rocks. b) Relationship between formation resistivity factor and connected porosity. Note that the outliers used the apparent formation resistivity factor, i.e. calculated using only a single salinity (see text).

Lines 356-357: These acronyms have already been defined above.

We removed the definitions of these acronyms from this part of the text.

Line 370: Is there a reference for these standard techniques?

We provided more detail concerning used XRF techniques in the new version of the manuscript on lines 410-414:

> Bulk rock chemical analyses were performed by two commercial chemical laboratories, The Caleb Brett Laboratory in England and McGill University in Canada, using standard XRF

techniques (e.g., Potts and Webb, 1992; Rousseau et al., 1996). Both labs used the fused bead technique for major elements and pressed powder pellets for the determination of trace elements. Values for samples analyzed by both laboratories are generally within analytical error (Rousseau et al., 1996).

Potts, P. J. and Webb, P. C.: X-ray fluorescence spectrometry, J. Geochemical Explor., 44, 251–296, https://doi.org/https://doi.org/10.1016/0375-6742(92)90052-A, 1992.

Rousseau, R. M., Willis, J. P., and Duncan, A. R.: Practical XRF Calibration Procedures for Major and Trace Elements, 25, 179–189, https://doi.org/10.1002/(SICI)1097-4539(199607)25:4<179::AID-XRS162>3.0.CO;2-Y, 1996.

Line 410: Is it worth adding another plot that differentiates the data by their alteration? Or providing a plot that shows that the saturated velocities are higher than the dry velocities?

We added a plot that differentiates the data by alteration and also compares saturated and dry velocities in the new version of the manuscript (Fig. 13).

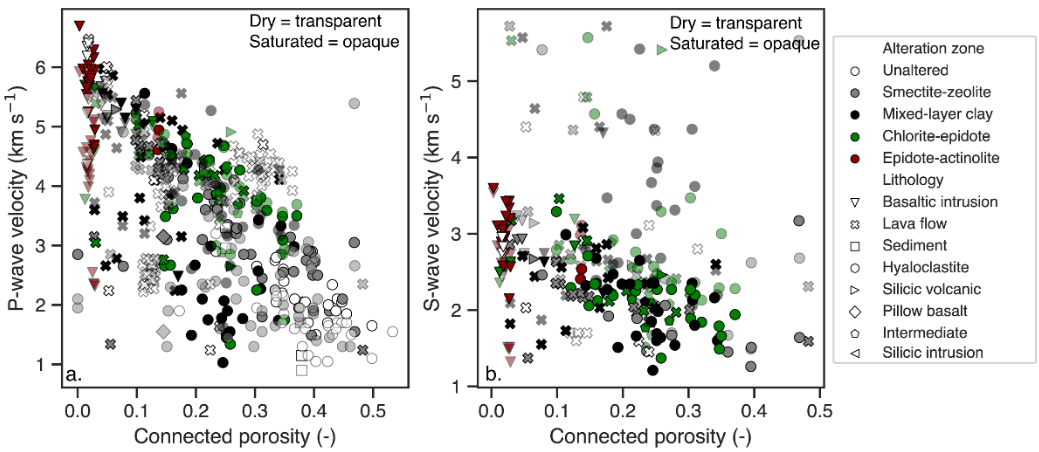


Figure 13. Acoustic velocities under dry (unsaturated) conditions versus connected porosity. Samples colored by lithology. A. P-wave velocities, b. S-wave velocities

Line 411: I think it would help to state that this trend of often seen for rocks, including volcanic rocks (with references).

This suggestion was adapted in the new results section, on lines 645-647:

Figure 13a shows that P-wave velocities are typically inversely correlated to porosity: crystalline basalts show the highest velocities and the lowest porosities, while hyaloclastites have the lowest velocities and higher porosities. This relationship has been seen in several previous studies of volcanic rocks (e.g., Pola et al., 2014; Frolova et al., 2014; Wyering et al., 2014; Heap et al., 2015; Durán et al., 2019; Frolova et al., 2021).

Durán, E. L., Adam, L., Wallis, I. C., and Barnhoorn, A.: Mineral Alteration and Fracture Influence on the Elastic Properties of Volcaniclastic Rocks, J. Geophys. Res. Solid Earth, 124, 4576–4600, https://doi.org/10.1029/2018JB016617, 2019.

Frolova, J., Ladygin, V., Rychagov, S., Zukhubaya, D. Effects of hydrothermal alterations on physical and mechanical properties of rocks in the Kuril-Kamchatka island arc, Eng. Geol. 183, 80–95, https://doi.org/10.1016/j.enggeo.2014.10.011, 2014.

Frolova, J. V, Chernov, M. S., Rychagov, S. N., Ladygin, V. M., Sokolov, V. N., and Kuznetsov, R. A.: The influence of hydrothermal argillization on the physical and mechanical properties of tuffaceous rocks: a case study from the Upper Pauzhetsky thermal field, Kamchatka, Bull. Eng. Geol. Environ., 80, 1635–1651, https://doi.org/10.1007/s10064-020-02007-2, 2021.

Heap, M. J., Kennedy, B. M., Pernin, N., Jacquemard, L., Baud, P., Farquharson, J. I., Scheu, B., Lavallée, Y., Gilg, H. A., Letham-Brake, M., Mayer, K., Jolly, A. D., Reuschlé, T., and Dingwell, D. B.: Mechanical behaviour and failure modes in the Whakaari (White Island volcano) hydrothermal system, New Zealand, J. Volcanol. Geotherm. Res., 295, 26–42, https://doi.org/https://doi.org/10.1016/j.jvolgeores.2015.02.012, 2015.

Pola, A., Crosta, G. B., Fusi, N., and Castellanza, R.: General characterization of the mechanical behaviour of different volcanic rocks with respect to alteration, Eng. Geol., 169, 1–13, https://doi.org/10.1016/j.enggeo.2013.11.011, 2014.

Wyering, L. D., Villeneuve, M. C., Wallis, I. C., Siratovich, P. A., Kennedy, B. M., Gravley, D. M., and Cant, J. L.: Mechanical and physical properties of hydrothermally altered rocks, Taupo Volcanic Zone, New Zealand, J. Volcanol. Geotherm. Res., 288, 76–93, https://doi.org/10.1016/j.jvolgeores.2014.10.008, 2014.

Lines 412-413: The authors should provide a reference in support of this statement. The scatter in these data is a result of the fact that porosity is just a scalar, and elastic wave velocities are sensitive to the nature of the porosity (microcracks versus pores).

We provide more detail as well as references on lines 655-659:

> However, as P- and S-wave velocities are strongly dependent on crack density and geometry, low porosity but highly cracked rocks may display in some cases very low velocities at room conditions (e.g., Nur and Simmons, 1969; Guéguen and Palciauskas, 1994; Vinciguerra et al., 2005; Nara et al., 2011).

Guéguen, Y. and Palciauskas, V.: Introduction to the Physics of Rocks, Princeton University Press, 1994.

Nara, Y., Meredith, P. G., Yoneda, T., and Kaneko, K.: Influence of macro-fractures and micro-fractures on permeability and elastic wave velocities in basalt at elevated pressure, 503, 52–59, https://doi.org/10.1016/j.tecto.2010.09.027, 2011.

Nur, A. and Simmons, G.: The effect of saturation on velocity in low porosity rocks, Earth Planet. Sci. Lett., 7, 183–193, https://doi.org/10.1016/0012-821X(69)90035-1, 1969.

Wyering, L. D., Villeneuve, M. C., Wallis, I. C., Siratovich, P. A., Kennedy, B. M., Gravley, D. M., and Cant, J. L.: Mechanical and physical properties of hydrothermally altered rocks, Taupo Volcanic Zone, New Zealand, J. Volcanol. Geotherm. Res., 288, 76–93, https://doi.org/10.1016/j.jvolgeores.2014.10.008, 2014.

Vinciguerra, S., Trovato, C., Meredith, P. G., and Benson, P. M.: Relating seismic velocities, thermal cracking and permeability in Mt. Etna and Iceland basalts, Int. J. Rock Mech. Min. Sci., 42, 900–910, https://doi.org/10.1016/j.ijrmms.2005.05.022, 2005.

Lines 418-420: Although the data are few, I think the authors should offer more details as to how these data were collected and, briefly, describe the data obtained.

In the new version of the manuscript, we describe in more detail how the mechanical data was collected by the different studies on lines 492-500:

> For the hyaloclastites samples analyzed by Frolova et al. (2005) and Franzson et al. (2011), the uniaxial compressive strength test was performed by standard testing procedures in accordance with State Standards 21153.2-84 (1984) and ASTM D7012 (American Society for Testing Materials, 2013). Uniaxial compressive strength was measured using a German hydraulic press CDM-10/91 and was determined for samples in dry and water-saturated states. The samples analyzed by Árngrimsson and Gunnarsson (1999) were analyzed at the Technical University of Denmark (DTU), which performed triaxial tests on five samples, and the Danish Geotechnical Institute (GEO), which performed Brazil tests on 55 samples and unconfined compressive strength tests on 36 samples, with methods according to IRSM standard (Ulusay and Hudson, 2007). The elastic constants given for the samples from Frolova et al. (2005), Franzson and Tulinius (1999) and Jaya et al. (2010) were calculated from the measured wave velocities and the bulk density (e.g. Mavko et al., 2009).

American Society for Testing Materials. ASTM D7012-13. Standard test methods for compressive strength and elastic moduli of intact rock core specimens under varying states of stress and temperatures. American Society for Testing Materials, Pennsylvania, USA, 2013

Arngrímsson, H. Ö. and Gunnarsson, Þ. B.: Tunneling in Acidic, Atered and Sedimentary Rock in Iceland - Búðarhálsvirkjun, Master's thesis, Technical University of Denmark, 162 pp., 2009.

Franzson, H., and Tulinius, H.: Rannsóknir á kjarna úr holu ÖJ-1, Ölkelduhálsi (Research on core from hole ÖJ-1, Ölkelduháls), Orkustofnun (OS-99024), Reykjavik, Iceland, 1999.

Franzson, H., Guðfinnsson, G. H., Frolova, J., Helgadóttir, H. M., Mortensen, A. K. and Jakobsson, S. P. Icelandic Hyaloclastite Tuffs. Iceland Geosurvey, ÍSOR-2011/064, 2011.

Frolova, J. V., Ladygin, V. M., Franzson, H., Sigurðsson, O., Stefánsson, V. and Shustrov, V.: Petrophysical properties of fresh to mildly altered hyaloclastite tuffs, in: Proceedings World Geothermal Congress, Antalya, Turkey, 24-29 April 2005, 2005.

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Line 443: I think it would also be interesting to measure thermal properties.

We made sure to add available data for thermal conductivity to the database (Franzson and Tulinius, 1999; Árngrimsson and Gunnarsson, 1999). In addition, in the new version of the manuscript we discuss thermal properties in more detail in the conclusions on lines 693-691:

> Thermal conductivity measurements are only available for a relatively small number of samples, most of which were derived from a single lava flow in the Reykjavik area (Guðlaugsson, 2000). Other studies have measured the thermal properties of Icelandic rocks (Ruether, 2011), and thermal conductivity and thermal diffusivity was measured on a large number of samples obtained from a nearly 2 km long core in the Reyðarfjörður region (Oxburgh and Agrell, 1982; Drury, 1985; Flovenz and Saemundsson, 1985). However, to the authors best knowledge, the data obtained in these studies does not exist in tabulated form, at least accessible over the internet.

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