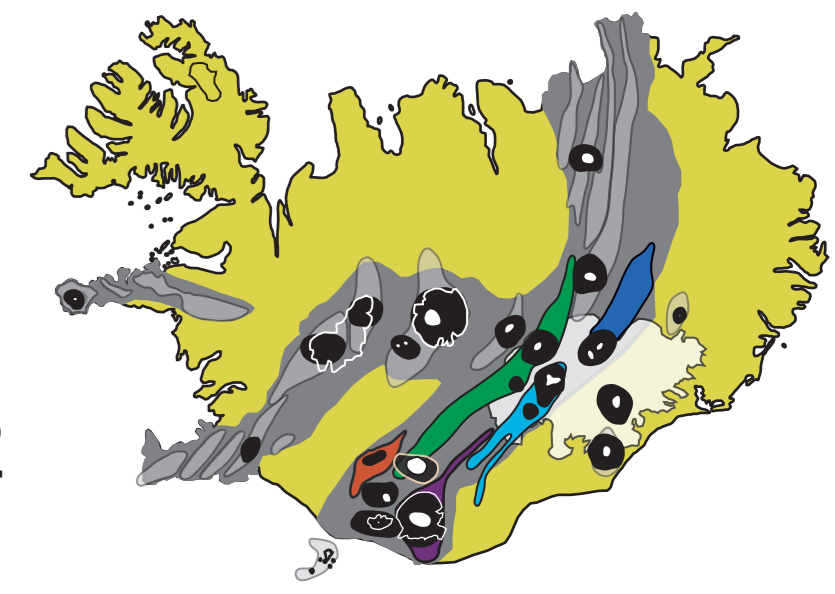




# Database on Icelandic Holocene tephra layers



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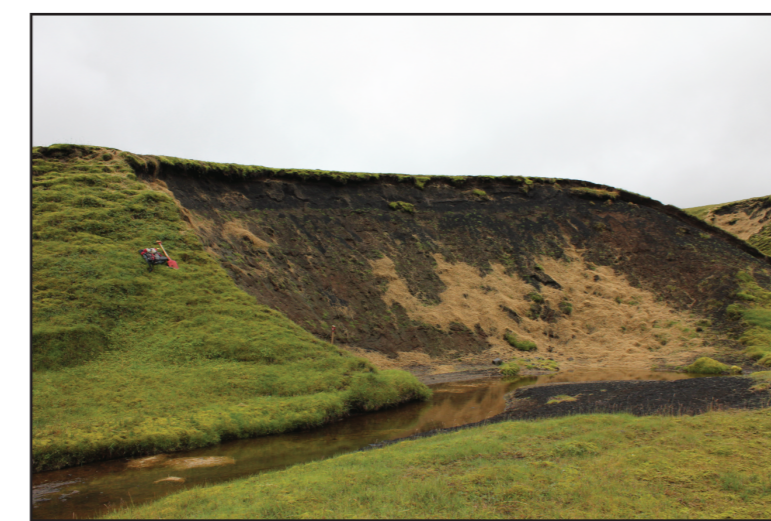
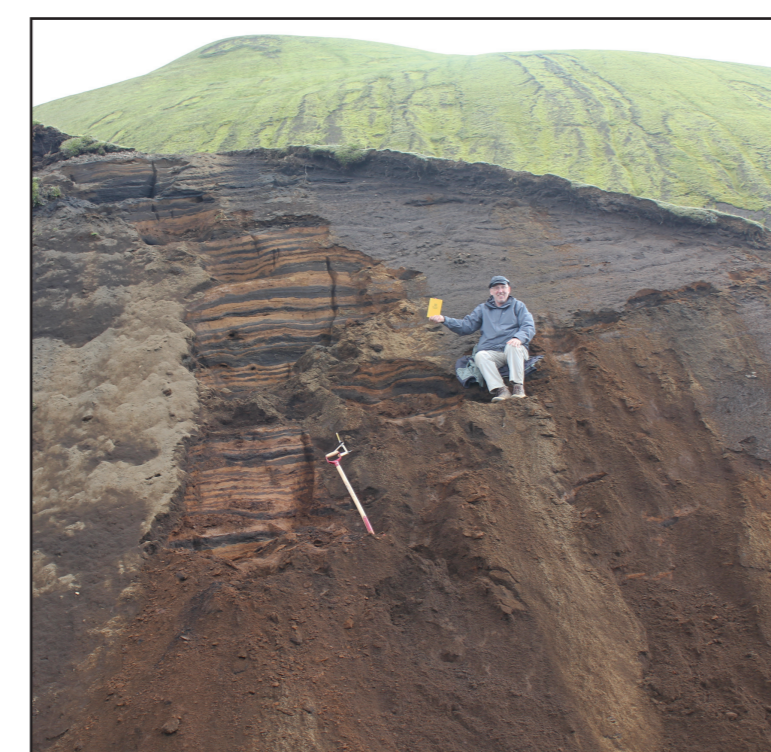
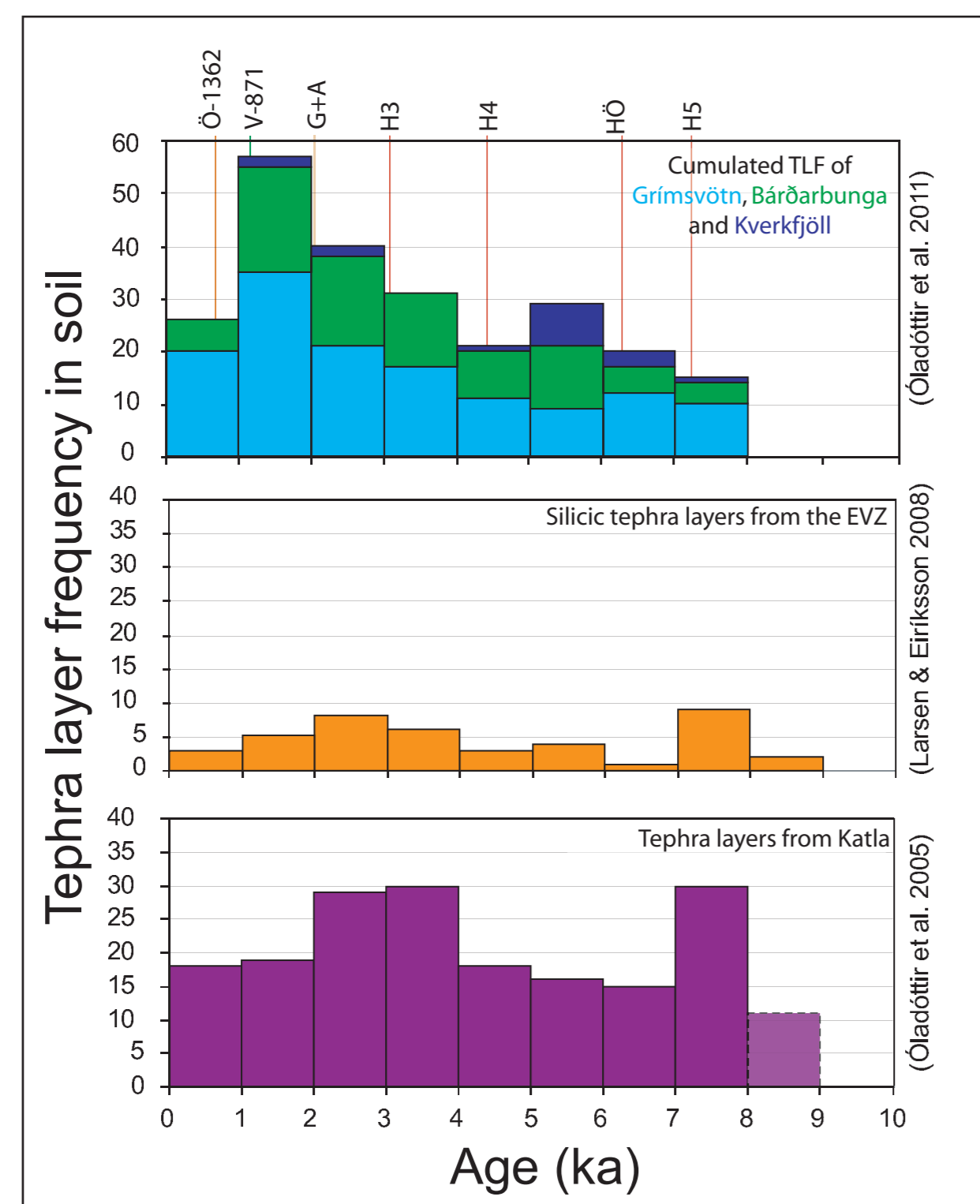
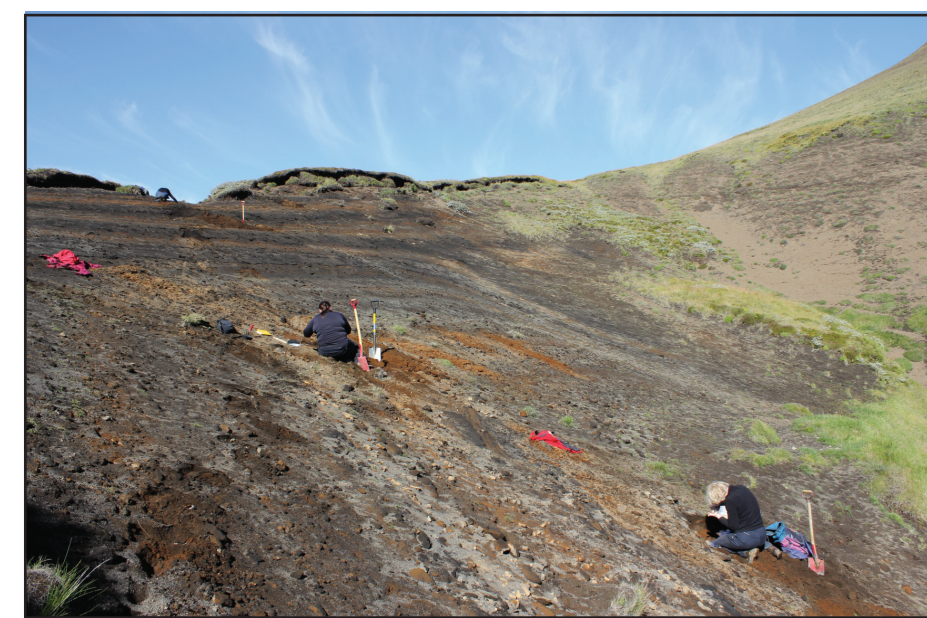
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## Introduction

Volcanoes in Iceland erupt on average every 3-5 years, of which two-thirds are explosive events. Only about 1/4 of the total number of explosive events is represented in the tephra record in Iceland as the majority of tephra layers produced is too small to be conserved. Nevertheless, Iceland is by far the main tephra producer in the Northern Atlantic region and Icelandic tephra is widespread over North Europe and Greenland.

A data base of Holocene tephra in Iceland will, therefore, be a great asset for all studies using Icelandic tephra, such as volcanology, petrology, geochemistry, archaeology, climate studies etc. Due to the high frequency of tephra forming eruptions in Iceland such data base will contain a large part of Icelandic Holocene eruptions. The data base focuses on number, origin, chemical composition, volume and dispersal of Holocene tephra layers.



## Questions addressed by the database

- 1) What tephra layers are found in different locations?
- 2) What is the main dispersal axe of each tephra layer?
- 3) Is tephra dispersal variable in time?
- 4) Have prevailing wind directions changed with time?
- 5) Are eruption frequency and tephra layer volume correlated?
- 6) What chemical range is known for individual tephra layers?
- 7) Is there a correlation between volume of tephra layers and their chemical composition, and if so, can it possibly be related to magma chamber behaviour, or even deeper-seated processes?

The tephra base will also make the following aspects more accessible:

- 1) Chemical characteristics of tephra from different volcanic systems.
- 2) Correlation between tephra layers in soil outcrops and between different environments.
- 3) Tephra marker layers, both local and regional, their age and dispersal.
- 4) Identification of basaltic tephra layers or series of layers applicable as marker layers.
- 5) Finding tephra of specific age from selected volcanic systems.
- 6) Dispersal of tephra layers and associated isopach maps.
- 7) Volume calculation of thoroughly mapped and measured tephra layers.

## Icelandic Holocene Tephra Layer Database - Construction

**IST 120:2012**  
Features in accordance to obligatory standards on registration and classification of geoinformation in Iceland

**Feature Design Process**  
CODED; Integer; 1; (Designed)

**Input Date**  
Date

**Date of Correction**  
Date

**Update Date**  
Date

**Data Owner**  
CODED; Text; 10; JHI-ESI

**Reference**  
CODED; Integer; Reference to publication  
Text; 255; Reference to publication

**XY Accuracy**  
Float

**Name of Database**  
Text; 50; Iceland Holocene Tephra layer database

**Geographic Position**  
and optional standards set by IST 120:2012

**Methods for XY Coordination**  
CODED; Integer; 5; GPS uncorr

**Latitude**  
Float

**Longitude**  
Float

**Original Datum**  
CODED; Integer; 4; WGS 84\*

**Elevation Z (cm)**  
Float

**Basis for Given Elevation**  
CODED; Text; 12; Measured depth below ground surface

**Surface Elevation based on Vertical GPS**  
Float

**Vertical datum**  
CODED; Integer; 5; WGS 84\*

**Relative geographical position**  
CODED; Integer; 6; Below ground surface

**Field Work**  
Lists field workers and data sampled in the field along with information on data storage and management

**Date of Measurement**  
Date

**Date of Sampling**  
Date

**Field Worker**  
CODED; Text; 5

**Field Assistant**  
CODED; Text; 5

**Sampling Order**  
CODED; Text; 1  
T - Top down  
B - Bottom up

**Log Hand Drawn**  
Text; 255

**Log Comp Drawn**  
Text; 255

**Section Photos**  
Text; 255

**Primary Data**  
Text; 255

**Outcrop info**  
General information on the outcrop study area

**Landmark**  
Text; 255

**Section Type**  
CODED; Text; 4; Soil Ice Lake Marine

**Section Name**  
Text; 50

**Section Time Span**  
Text; 40

**Measured Period**  
Text; 20

**Topography**  
Text; 255

**Vegetation**  
Text; 255

**Sediments**  
Info on sediments in tephra sections

**Thickness**  
Min thickness over Tephra - Float  
Max thickness over tephra - Float  
Average thickness over tephra - Float  
Min thickness under tephra - Float  
Max thickness under tephra - Float  
Average thickness under tephra - Float

**Tephra in Sediment**  
Integer

**Sediment Description**  
Text; 255

**Tephra Layers**  
Information on tephra gathered in the field

**Tephra Layer Number**  
Text; 50

**Section Name and number of Tephra layer**  
Text; 50

**Thickness**  
Min - Float  
Max - Float  
Average - Float  
Probable real - Float

**Characteristics**  
Colour - CODED; Text; 50  
Grain Size 1 - CODED; Text; 10  
Grain Size 2 - CODED; Integer  
Crystals - CODED; Text; 30  
Grain Characteristics - Text; 255  
Lithics - Text; 255  
Depositional Structure - Text; 255  
Other Observations - Text; 255

**Marker Layer**  
Marker Layer? - Text; 50; Name  
Code; 10; Local/Regional  
ML above - Text; 50; Name  
ML below - Text; 50; Name

**Lab Work**  
Tephra information gathered during lab work

**Thinsection Name**  
Preparation  
Sample Dry - CODED; Text; 3; Yes / No  
Sample Sieve - CODED; Text; 3; Yes / No

**Visual analysis of hand-samples**  
Sample Colour - CODED; Text; 50  
Sample Grain Type - CODED; Text; 5  
Sample Crystals - CODED; Integer  
Sample Lithics - Text; 255

**Thinsections**  
Size Fraction - CODED; Integer  
Thickness - CODED; Integer  
Sideromelane Ratio - CODED; Integer  
Tachylite Ratio - CODED; Integer  
Crystals - CODED; Integer  
Other observations - Text; 255  
Storing - Text; 255  
Photos - Text; 255

**Major Element Analyses (EMP)**  
Lists information on EMP settings and analyses

**Analyses File Name**  
Text; 30

**Info**  
EMP Type - CODED; Text; 50  
EMP Location - CODED; Integer  
Analyser - Text; 100  
Date of Analyses - Date  
Photo Location - Text; 255

**Settings**  
Analyses Type - CODED; Integer  
Analyse Number - Text; 10  
Major Ext Standard - CODED; Text; 25  
Acc Voltage - Integer  
Beam Size - Integer  
Beam Current - Integer  
Grain Number - Text; 20  
corr/uncorr. - CODED; Text; 12  
Calibration crystal - Text; 100  
Counting Time - Float

**EMP Results**  
Major Element - Mean results  
Standard Deviation - Float

**Trace Element Analyses**  
Lists information on instrument and trace element analyses

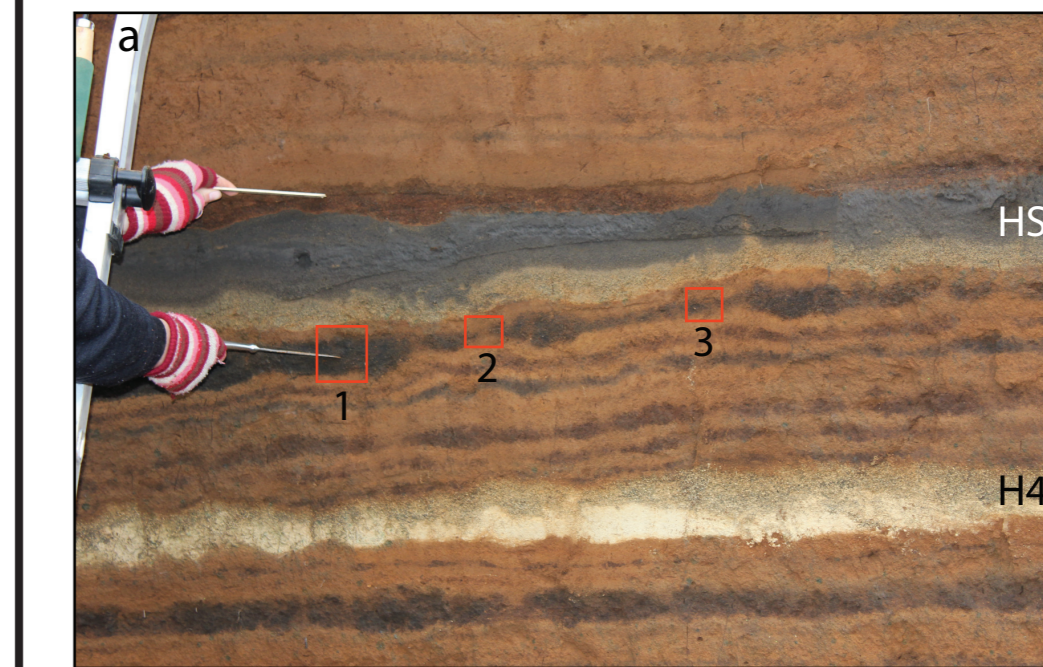
**Trace Analyses File Name**  
Text; 30

**Info**  
Trace Instrument Type - CODED; Text; 50  
Trace Location - CODED; Integer  
Analyser - Text; 100  
Date of Analyses - Date  
Photo Location - Text; 255  
Have Major Elements been Analysed? - CODED; Text; 3

**Settings**  
Trace Analyses Type - CODED; Integer  
Trace Analyse Number - Text; 10  
Trace Ext Standard - CODED; Text; 25  
Trace Int Standard - CODED; Text; 25  
Laser Energy - Float  
Pulse Rep Rate - Integer  
Laser Beam Size - Integer  
Grain Number - Text; 20  
corr/uncorr. - CODED; Text; 12

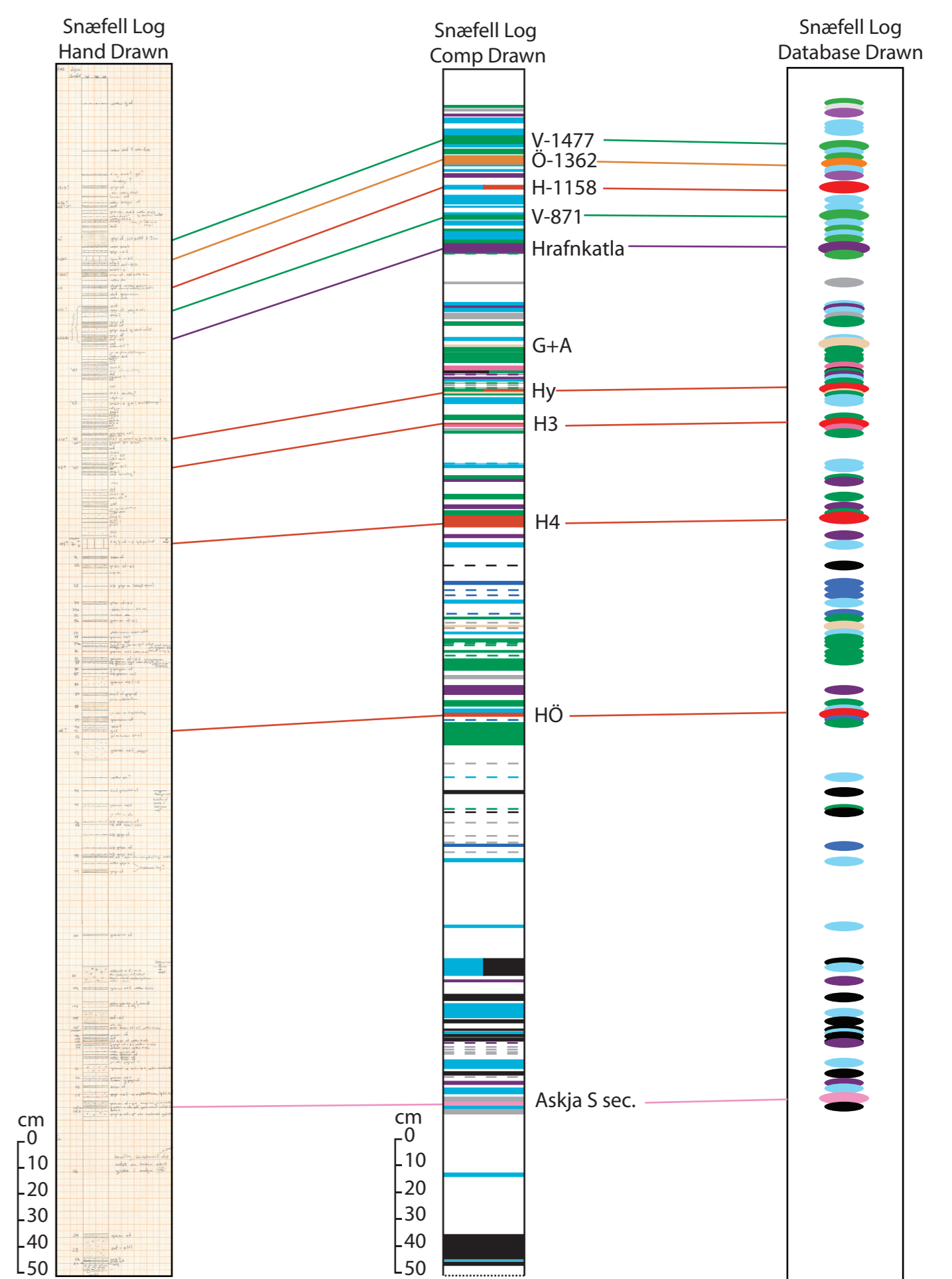
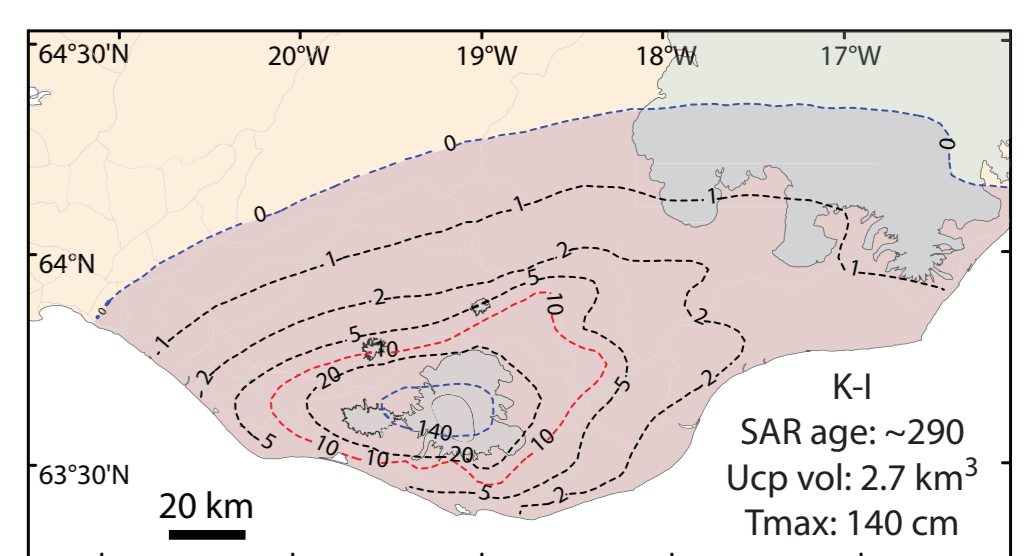
**Trace Element Results**  
Trace Element - Mean results  
Standard Deviation - Float

## Examples of data in database

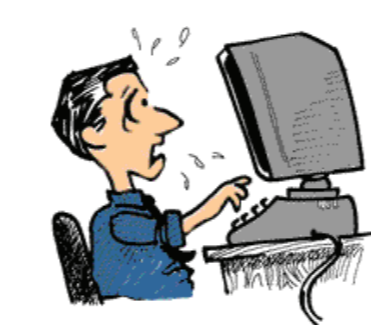
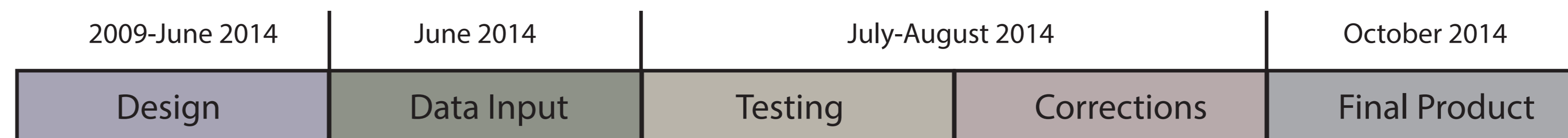


Features recorded in the Tephra layer part of the tephra base. Tephra layers with different colours, different grain size and some depositional structures. The numbered boxes show max (1), min (2) and average (3) thicknesses of the same tephra layer.

Isopach map of a Katla tephra layer. Location of published isopach maps of tephra marker layers will be included in the database and with time the database will be used to draw isopach maps of tephra layers.



## Timeline



2014-Future

Maintenance and public use

Data base will be left with the Nordic volcanological centre



## Aims

By constantly adding data to the data base (previously published and new data) the tephra base will considerably improve access to current knowledge on Icelandic tephra layers and aid long term research goals such as the estimation of magma productivity of the Icelandic volcanic systems and volcanic zones through the Holocene.