

Breiðdalur Central Volcano

Mapping the valley 50 years on



Outline

- Why are we remapping Breiðdalur?
 - What questions do we want to answer and how?
- A quick look at Walker's previous work – the building blocks of the project.
- Some thoughts and work so far:
 - The dykes and sheets of Breiðdalur
 - Lavas onlapping the volcano
 - Silicic lavas and composite lavas

Why Breiðdalur?

- Well exposed - the dyke swarm and flanks are easy to see and access.
- Already well documented.
- The area is poorly age constrained – further work adds to many of the key questions surrounding Icelandic volcano-tectonics.

Questions we hope to answer

- What is the genetic relationship between the Breiðdalur central volcano and its fissure swarm?
- What is the nature and style of the volcanic eruptions that produced the Breiðdalur volcanic succession and how do they relate to the magmatic evolution?
- What are the characteristics of the volcano's magma source and how does it relate to the source of the fissure-fed basalt succession?
- Does the silicic Skessa Tuff immediately beneath the central volcano signify the onset of activity that became the Breiðdalur volcanic system? If so, what does it reveal about magmatism in the embryonic stage of a volcanic system.
- The composite lavas are particular bi-modal mafic-silicic formations that typify the late-stage evolution of many Tertiary central volcanoes in East Iceland, including that of Breiðdalur. Does their appearance signify the end of the volcano's life cycle?

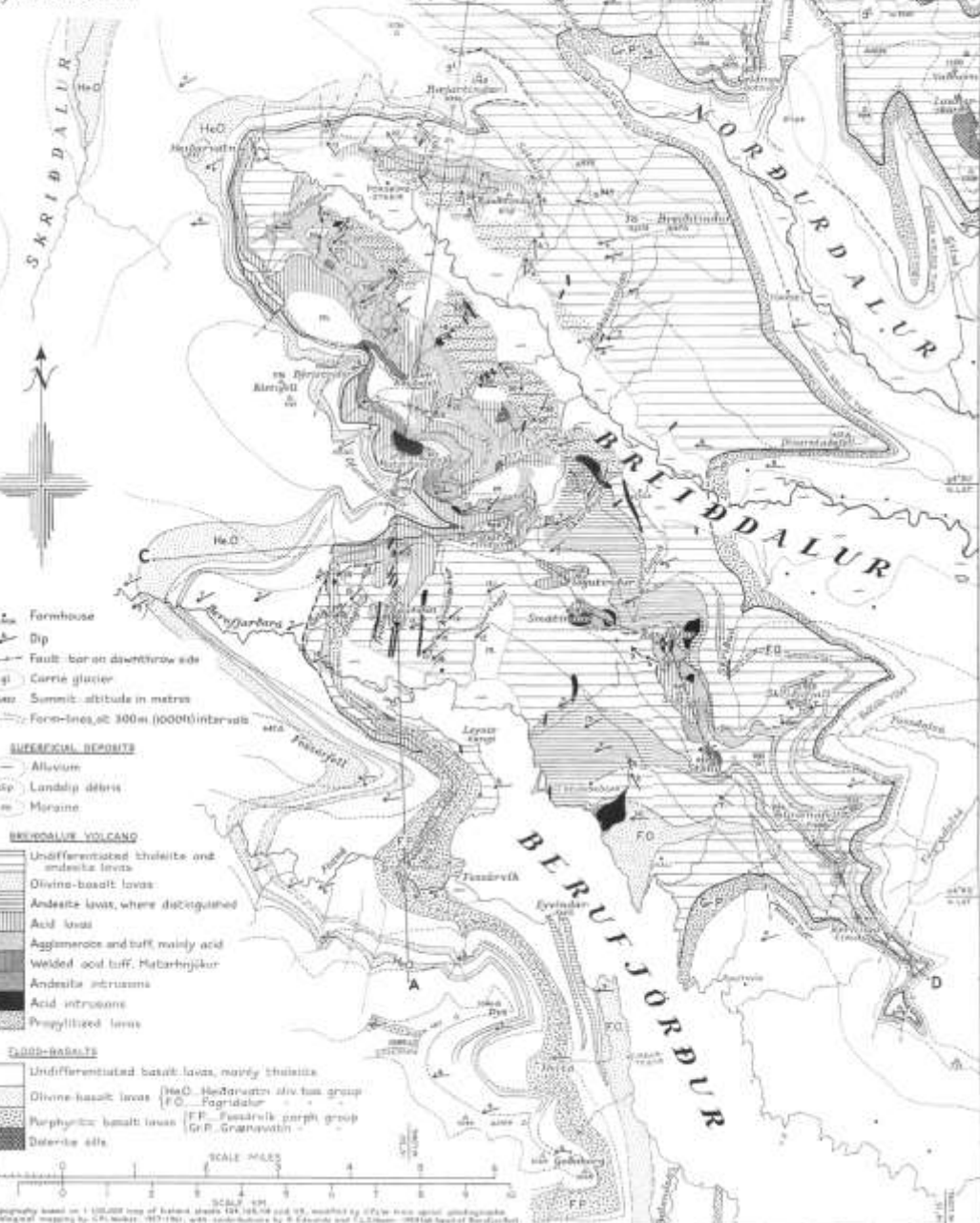
How will we go about the work?

- Mapping and systematic sampling of:
 - Dykes in the Breiðdalur dyke swarm
 - Lavas – those enveloping Breiðdalur and those within the volcano
- Chemical composition and isotope analysis of the lavas and dykes to determine magmatic system evolution and a possible geochemical relationship with currently active systems.
- Ar/Ar age dating will be key to unravelling the evolution story and in determining the longevity of central volcanoes in Iceland

THE BREIÐDALUR VOLCANO

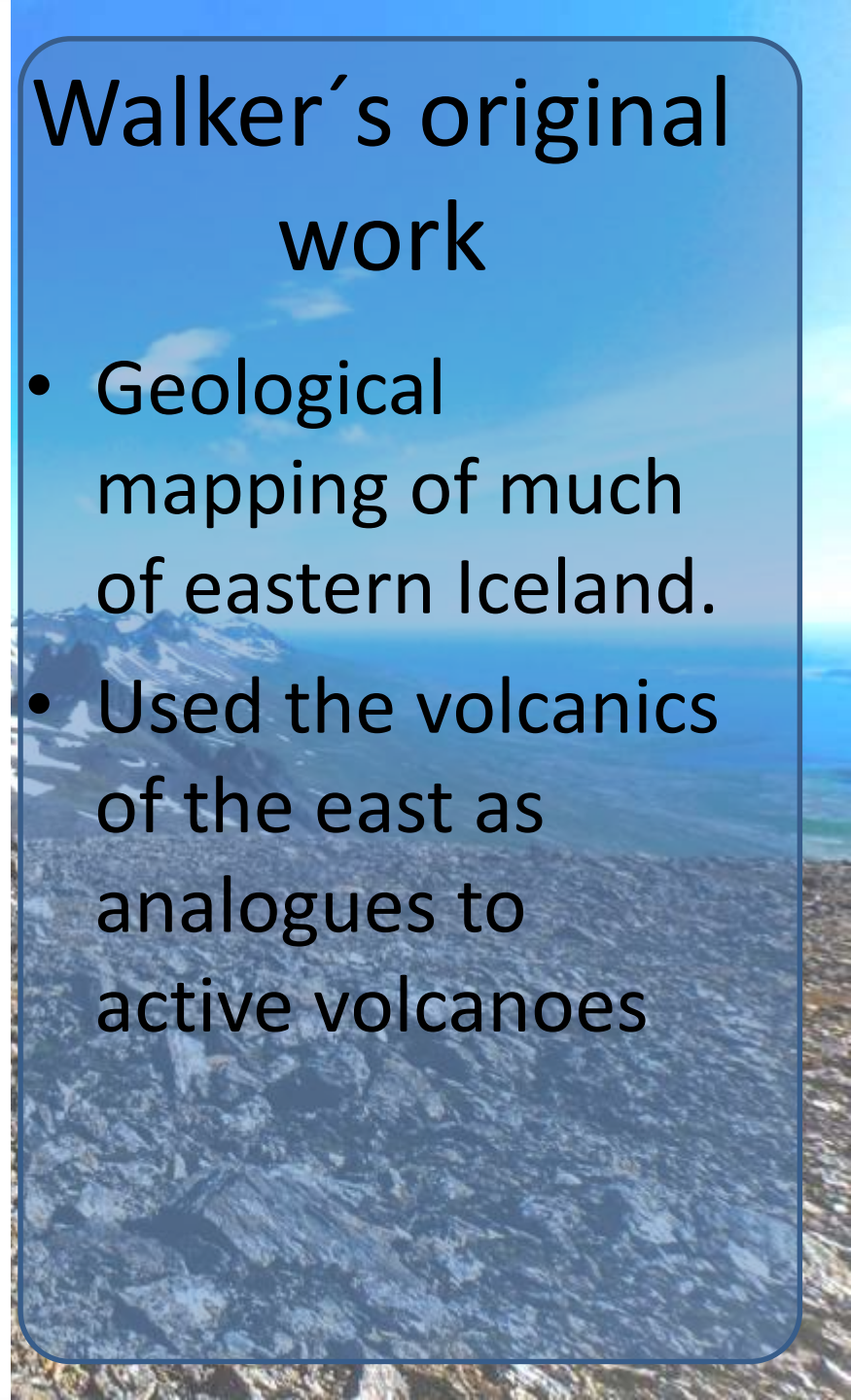
EASTERN ICELAND

by G.P.L. WALKER, 1961



Walker's original work

- Geological mapping of much of eastern Iceland.
- Used the volcanics of the east as analogues to active volcanoes



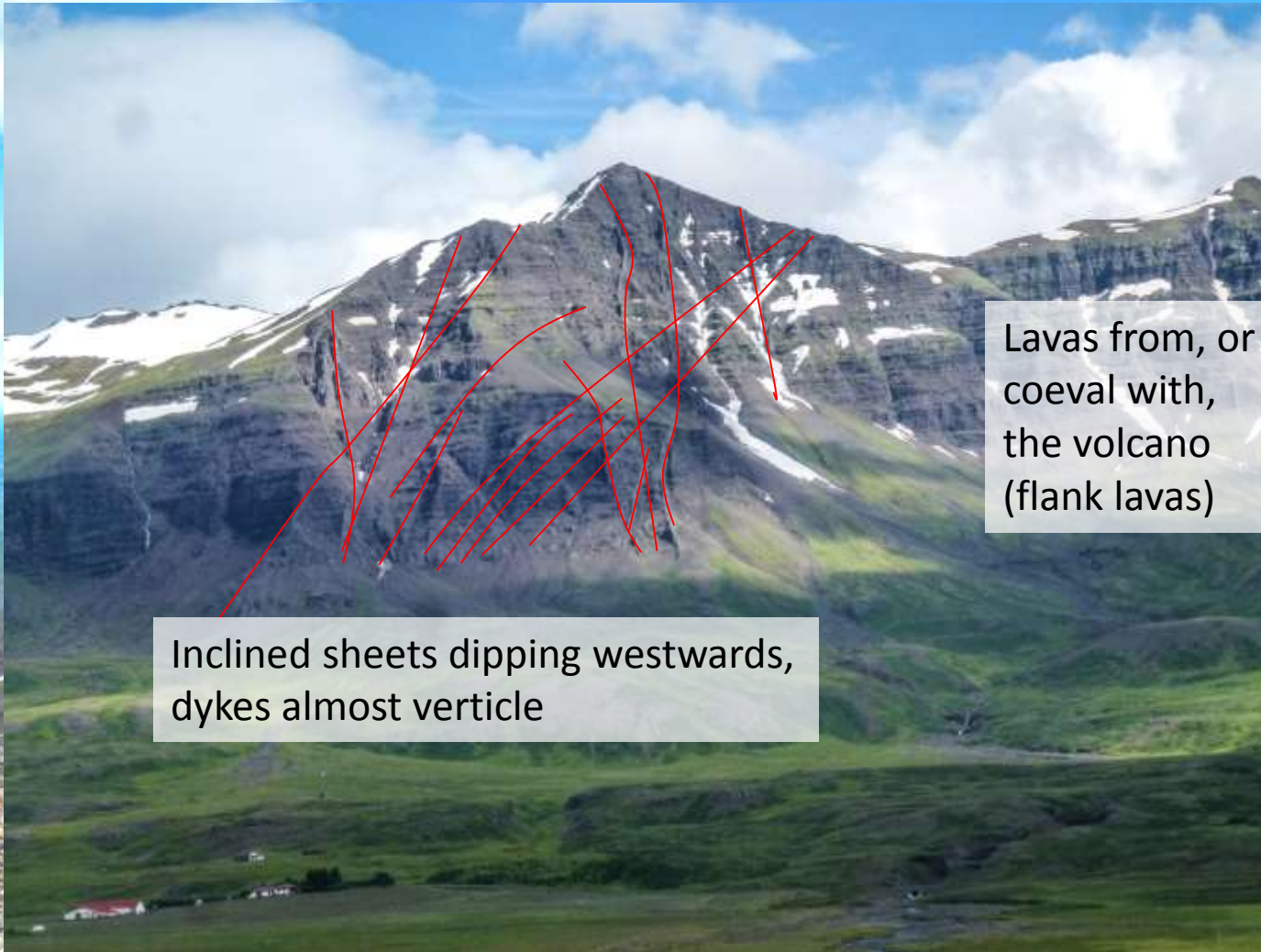
Some observations so far

- The dyke swarm physically cross cuts much of the volcano and dykes are predominantly verticle.
- The summit sequence is largely silicic.
- The caldera of the volcano held water at many times (sediment and pillow basalts).
- The volcano is not simple! Even the flank lavas have complications.

Sheets and dykes

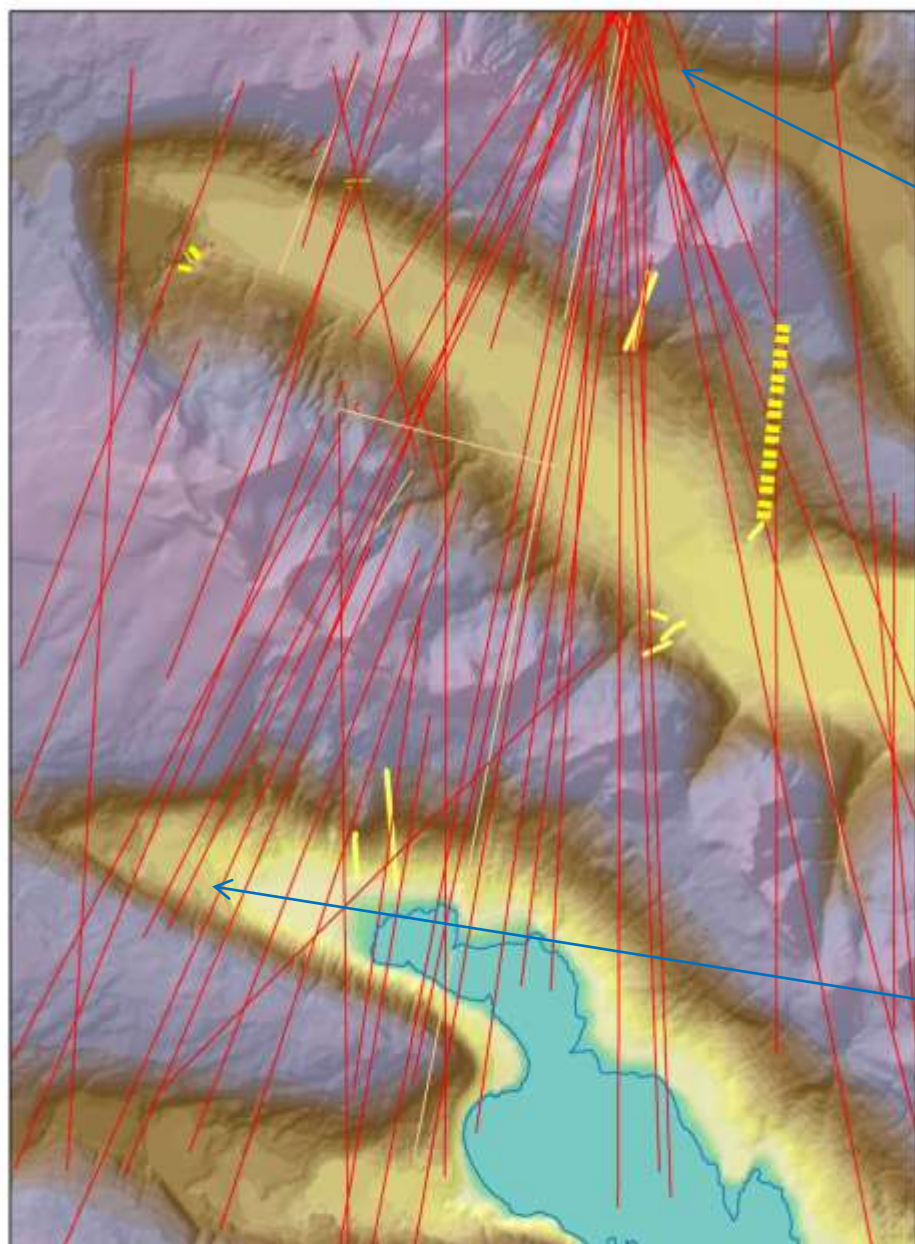


Above Yorvík – this cliff, formed after part of the valley wall collapsed, shows a flow packages and fissure fed lavas being cross cut by sheets from mafic to silicic composition. These are cross cut by larger dykes.



Lavas from, or coeval with, the volcano (flank lavas)

Inclined sheets dipping westwards, dykes almost verticle



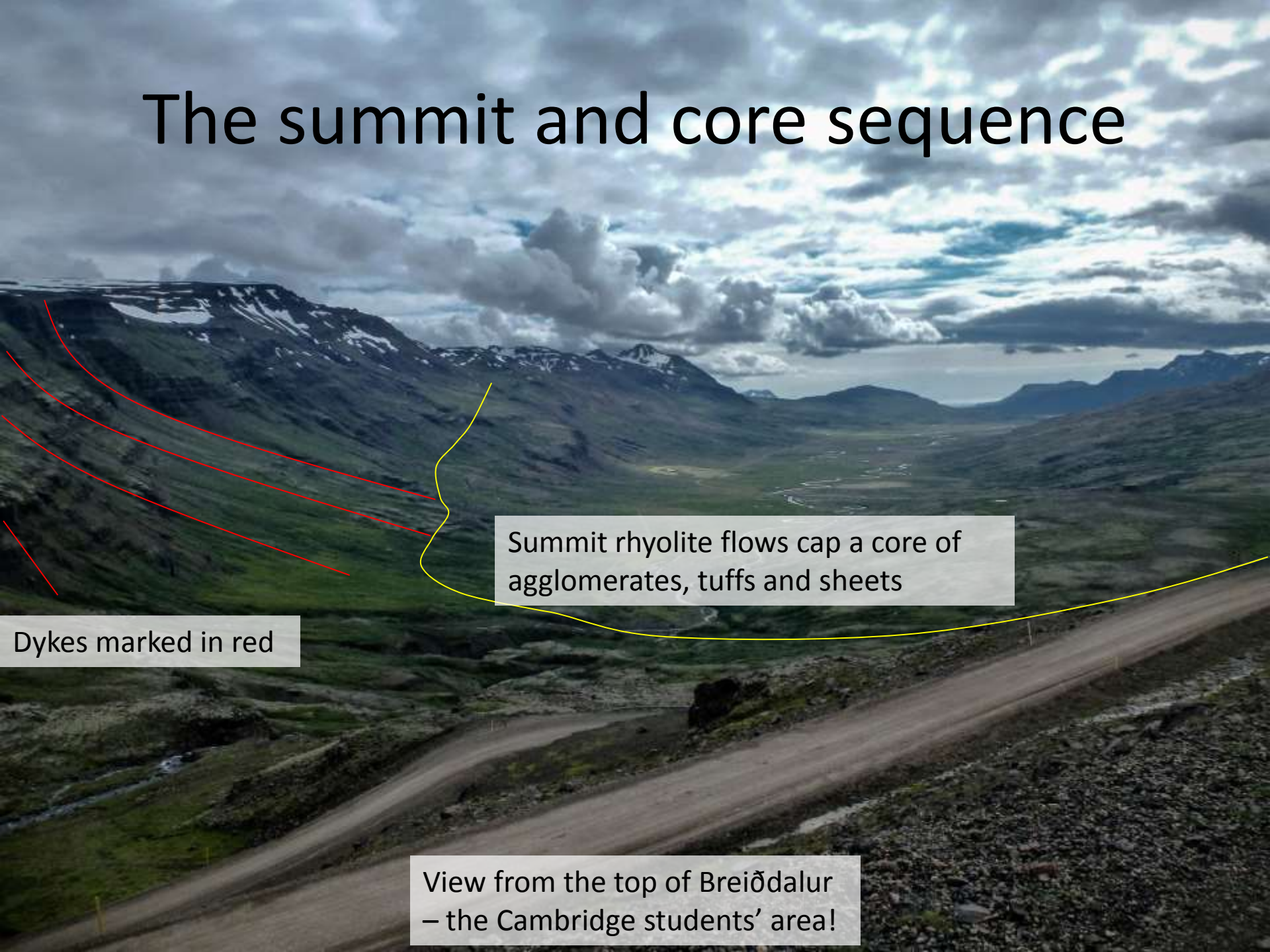
Norðurdalur – highest dyke density around 20% dykes



Breiðdalur dyke swarm – not all dykes are plotted and lengths are fairly arbitrary. Yellow lines are silicic dykes.

Berufjörður – dyke city... Around 10% density

The summit and core sequence



Summit rhyolite flows cap a core of agglomerates, tuffs and sheets

Dykes marked in red

View from the top of Breiðdalur
– the Cambridge students' area!

In Berufjörður the relationship between the summit group and the overlapping lavas is obvious – see the Berufjörður poster



The questions



How long did it take to bury the volcano and where were the lavas sourced?

Are composite intrusions and eruptions purely a late stage affair?

Was the volcano split apart by the dyke swarm?

Is the Skessa tuff the precursor to a concentration of activity? If so, why is there little silicic volcanism until the summit sequence?

Breiðdalur Central Volcano

The first field season is over and could not have been done without the help of Breiðdalssetur – analysis will be undertaken over the coming months and field mapping completed next year.

