North Eastern Geological Society

Newsletter, September 2021

Hello and welcome to the first newsletter of this brave new not quite post Covid world and to exciting news about field trips and lectures

Field Trips

Have recommenced and a report on the first trip in July is included in this newsletter which is coming to you shortly after the 21st August trip (report to follow in due course) which explored outcrops of the Whin sill. On September 19th there will be a visit to Upper Weardale. Contact the Field Secretary, Gordon Liddle for details.

Lectures

Prof Gillian Foulger has used this opportunity to bring us lectures from her colleagues across the New World (and one or two from the Old). The lectures will be on the last Friday of the month save for December, so feast your eyes and ears on the following:

29th October, 2021 Prof. Robert B. Smith, Univ. Utah, Salt Lake City, Utah, U.S.A.

The Yellowstone Hotspot and the Anatomy of Old Faithful

26th November, 2021 Prof. Alexander Peace, McMaster University, Hamilton, Ontario, Canada

Volcanic Passive Margins

17th December, 2021 Prof. Karen Harpp, Colgate University, Hamilton, New York, U.S.A.

Geological Vignettes from the Galápagos Islands

28th January, 2022 Edgardo Cañón Tapia, CICESE- División de Ciencias de la Tierra, Ensenada, Baja California, Mexico

Spatial distribution of volcanic vents and their relation with the plumbing system

25th February, 2022 Dr. Jon J. Major, Scientist-in-Charge, Cascades Volcano Observatory, U.S. Geological Survey, Vancouver, Washington, U.S.A.

Volcano hazards in the Pacific Northwest USA—what they are, why they matter, and the challenges of crisis management

25th March, 2022 Prof. Andrew Moore, Rhodes University, Makhanda (Grahamstown), South Africa

The geology of diamonds

We will use the ticketing app Eventbrite to distribute "tickets" to the lectures. These are free but you must register through Eventbrite. Details will be emailed to

members as a priority each month before going on "general release. We anticipate high demand when the links are made generally available. Prof Foulger is to be thanked for providing us with this special opportunity.

FIELD TRIP / LECTURE REPORTS

NEGS field excursion 17th July 2021.

Leader: Louis Golightley, location: Southdean Law, Chesters, near Bonchester Bridge.

The first field excursion of the 2021 COVID year enjoyed glorious weather in the Borders. Louis had circulated an exceptional outline of the geological phenomena that were to be examined, a prominent peak with multiple evidence of quarrying activity in a dark, heavy crystalline rock.

Southdean Law, a Nepheline Basanite plug, roughly 70 metres E/W and 55 metres N/S [Tomkeieff 1952], poses a number of interesting questions – why Basanite, when the suite of 50 or so other intrusions in the general locality is basalts, dolerites and trachytes? Is it contemporaneous with other visible intrusion remnants, or of a different date? It intrudes through upper Old Red Sandstone to the West and Carboniferous calciferous sandstones to the East and North, is there a connection with greater tectonic changes and geological events in the region?

Southdean Law Quarry Main Face 30-40m high

The investigation started in the roadside quarry, standing in a central location, we examined the exposure and discussed the characteristics thoroughly. We determined two styles of jointing, a massive block to the east, thinner layers of similar material to the west. Visual evidence suggests a fault may lie in the centre of the exposed quarry face and there is evidence of slickensides and re-mineralisation reported, but no 'fault' is recorded on BGS Solid Sheet 17E. We chose not to approach the feature due to the potential danger of the cliff. Discussion considered the exposure may be a composite structure with multiple pulses of eruption contributing to the apparent anomaly. Hand specimens confirmed a fine grained basic igneous rock that Louis supplemented with multiple thin section images enabling the group to recognise the mineral Nepheline [a feldspathoid]. This identified the rock as a basanite, a quartz free material, silica under-saturated, characteristic of a spreading ridge and unique in this area of Scotland, with the nearest other basanites being at Dunbar

[Dove Rock] and in the Scottish Midland Valley [Monaghan and Pringle 2004].

Rubers Law – a Dolerite and Jedburgh type Basalt plug approx. 5 km NNW of Southdean

The basanite may easily be accounted for by differentiation and fractional crystallization removing silica minerals whilst the magma was occupying a chamber before eruption.

We moved to the east of the quarry and climbed the flank of the peak, the flank had multiple exposures of the rock. These were carefully examined, the orientation of the jointing had been recorded on a rose chart in the quarry, it now was recorded at the exposures, quickly revealing a radial character. Discussion combined the recognition of the rock type, the shape of the peak and the jointing to propose a volcanic plug as a likely feature that would account for the evidence we had seen.

We returned to the roadside quarry for an in-depth discussion of the observations. Louis had researched much of the literature and explained that radiometric dating and facies relationships offered dates at the very early Carboniferous OR early Permian, being the only exposure of the rock type in the Southern Uplands, and a radiometric dating of 299 +/- 9 Ma [de Souza 1979] relying on potassium isotope analysis,(the rock contains little potassium!) left scope for much more research on this dating.

West face of old quarry – paraboloidal and vertical jointing. The face is 10-12m high

Looking at the distribution of volcanics across the Southern Uplands – Birrenswark Lavas 96 km from Dumfriesshire through southern Roxburghshire, approximately 50 volcanic necks, in a NE-SW swathe, and Kelso lavas to the NE – all of early Carboniferous age and the development of the Northumberland trough structure Louis outlined an hypothesis linking the volcanic activity with the trough development [Leeder 1974]. However, a possible source of late Carboniferous/early Permian magmatism in Scotland and Northumberland might be linked with the triple Plate junction in the Skagerrak Centered large igneous province [SCLIP] noted by Torsvik [2008]. Earlier work by

Upton et al [2004], contradicts this view and specifically rejected any need for plume or hot-spot explanation for the South of Scotland magmatism, relying on post-Iapetus closure extensional tectonics, a small degree of asthenospheric mantle melting and migration into crustal reservoirs beneath the Southern Uplands. Thus the work was integrated into very large scale geological processes that may have been central to the evolution of the area. An extensive pack of support materials from Louis, gave the group a superb base to review the observations and consider the local and regional processes that may have been operating.

The excursion ended with a very warm vote of thanks for an outstanding day.

Gordon Liddle, Field Trips Secretary and Louis Golightley

References:

SI Tomkeieff, 1952: Nepheline Basanite of Southdean Roxburghshire. Transactions of the Edinburgh Geological Society, 14 pp 349-360

MR Leeder, 1974: The origin of the Northumberland Basin, Scottish Journal of Geology, 10 (4) 283-296

HAF de Souza, 1979: The Geochronology of Scottish Carboniferous Volcanism. University of Edinburgh PhD thesis. Freely available on the internet.

BJ Upton, D Stephenson, PM Smedley, SM Wallis and JG Fitton 2004; Carboniferous and Permian magmatism in Scotland, in Wilson et al, Eds, Permo-Carboniferous Magmatism and Rifting in Europe, Geological Society of London, Special Publication 223. Freely available on the internet.

AA Monaghan and MS Pringle, 200440Argon/39Argon geochronology of Carboniferous-Permian volcanism in the Midland Valley Scotland, in Wilson et al, Eds op cit. Freely available on the internet

Trond H Torsvik, Mark A Smethurst, Kevin Burke, Berhard Steinberger, 2008: Long term stability in deep mantle structure: Evidence from the approximately 300 Ma Skaggerak-Centered

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Membership

We have welcomed twelve new members during our Covid induced period of minimal activity. In an attempt at getting to know a little more about each other (and others who might input on the Facebook page) the following activity has been developed. Please do take part by sending your story to newsletter editor John McNulty OR by sending it in messenger to NEGS Facebook Page

My miracle moments

We want you to share one of your geological experiences that motivated your love of Geology. Just write a short outline to share the magic, to appear in the Newsletter and/or on the Facebook page.

An example is provided below, courtesy of Chairperson, Field Secretary, Gordon Liddle.

My miracle moment

Last century my University staff took our year group to the flanks of the Pennines for a mapping week. Horrible weather, dreadful clothing etc. did not mar our pleasure at working outdoors. In groups of three we were allocated an area to map. I had a section of the River Rawthey, I now know it crossed the Dent Fault.

Working along the river and its tributaries, I recorded a series of sedimentary logs, noted the outcrop patterns and some spectacular fluvial features. The area adjacent to what I now know was the Dent Fault, caused much difficulty. There were exposures of limestone, massive beds with strong jointing, so easily confused with bedding when you are young and inexperienced.

Much writing up and conceptual thinking led me to realise that the beds at the location were in fact vertical (a new phenomenon in the field for me). Joining up with the structure upstream, the beauty of the structure revealed itself and convinced me that I could actually do this field work stuff. My miracle moment was developing the interpretation of the geological structure.

Other news

The Natural History Society of Northumbria is running a course on seaside geology led by Derek Teasdale, well known to all of us of course. The course runs for six weeks from 8th September. You need to be a member of the society and there is a course fee to pay in addition. The link is here https://www.nhsn.org.uk/events/seaside-geology-2/

Walk with an expert...

"Northumberland and the Borders have a treasure chest of rocks telling so many different stories in a landscape of extraordinary beauty. **Northumbrian Earth** has been set up to explore these stories, walking out into our beautiful coast and countryside, and looking at the rocks in the company of Dr Ian Kille, an expert and enthusiast on all things geological."

https://www.northumbrianearth.co.uk/

Any news you think fit to print in the newsletter please get in touch

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https://www.negs.org.uk

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