U3A Port Fairy

Science…naturally!

The lava on South Beach at Port Fairy – Self guided walk

Mike Raetz April 2020

This is the first Geo-walk near Port Fairy, part of the U3A self-guided walk series to relieve the tedium of COVID-19. It highlights the structure of the Mount Rouse basalt lava flow so prominent in the coastal exposures on South Beach. I hope you will enjoy the outing and share my excitement in trying to understand the processes that allowed the longest mapped lava flow in Victoria which erupted around 300,000 years ago, to travel over 60 km from Penshurst. The lava flowed down a very gentle sloping surface. Then sea levels were likely about 50 meters lower so the lava would have been able to flow beyond the present shore line; how far is not known.

Directions

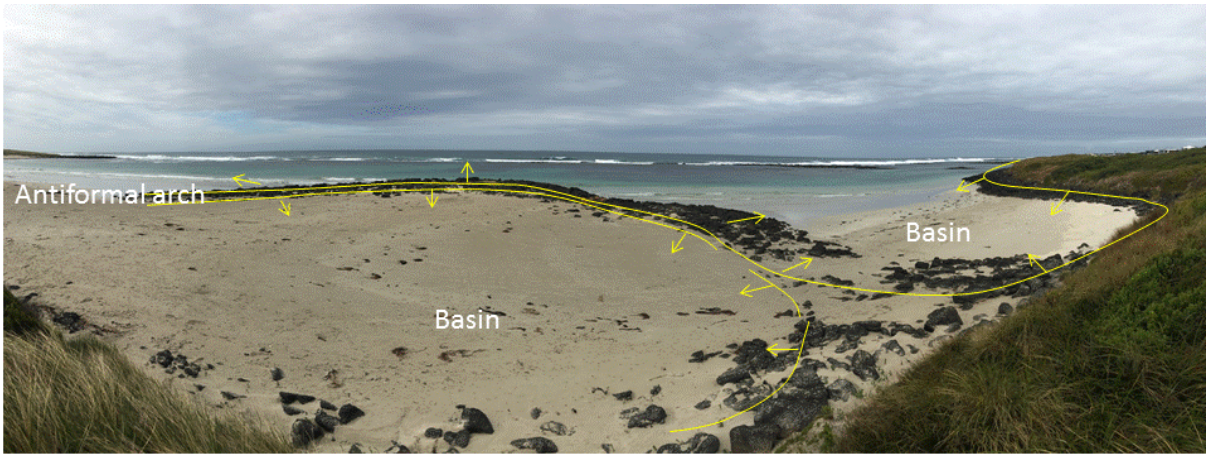
Walk around the two stops on South Beach shown below to observe the structure in the lava surfaces.

Stop 1 is opposite the ablution block on South Beach near the steps.
Stop 2 is the platform overlooking Pea Soup Beach.

Look at the form lines in the panoramic view from both areas then take a closer look.

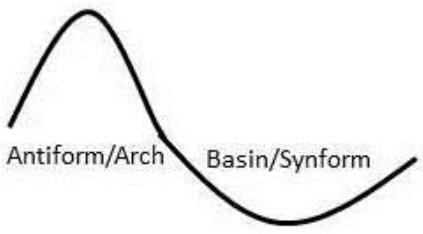
Try and see the gently dipping sub-horizontal surfaces on the mosaic of rocks. These formed on the top of the lava flow during cooling. Look for these surfaces and try and imagine how the offshore islands and gullies relate to the structure we see onshore?

You know these are primary flow top surface (meaning the earliest surface) because it's attitude sits always at right angles to the sub-vertical polygonal joints (cracks) that form as the lava cools [see below]. Count the sides on each polygonal block about 1-2 metres across, most will be five sided, because these are also shrinkage cracks. As the lava cools the rock shrinks, much like how mud cracks form when mud dries out and shrinks.



South Beach location 1 – opposite the ablution block

The view above illustrates the form lines on the primary lava surface as it cooled and solidified. The structure is actually quite complex with a ridge making an anti-formal arch between basin shaped low areas, now sand covered.



South Beach location 2 – Pea Soup Beach platform lookout

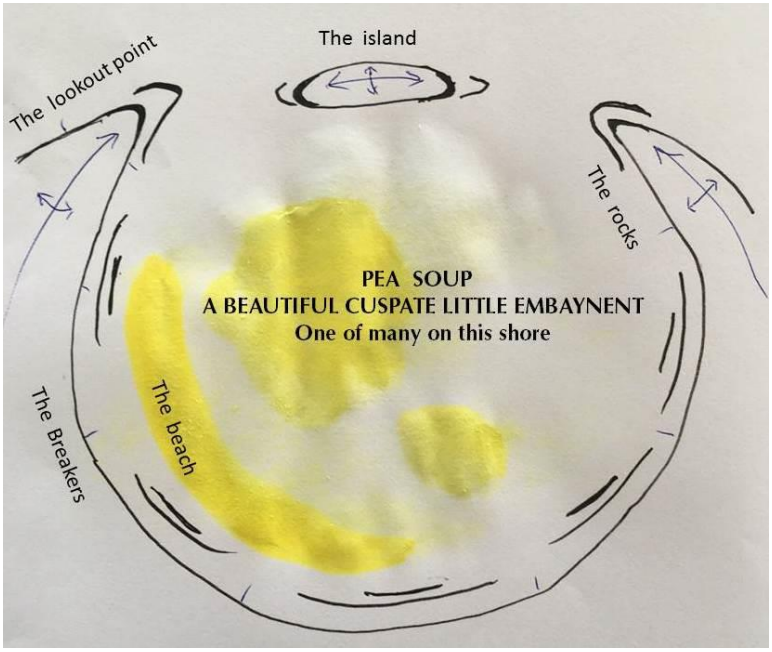
Look back up at the satellite image and view the point from above. Then look straight out at the dome like flow surface plunging west and dipping both right and left at around 20 degrees. Then swim out to those islands and see if they show any primary dips? Ha ha!

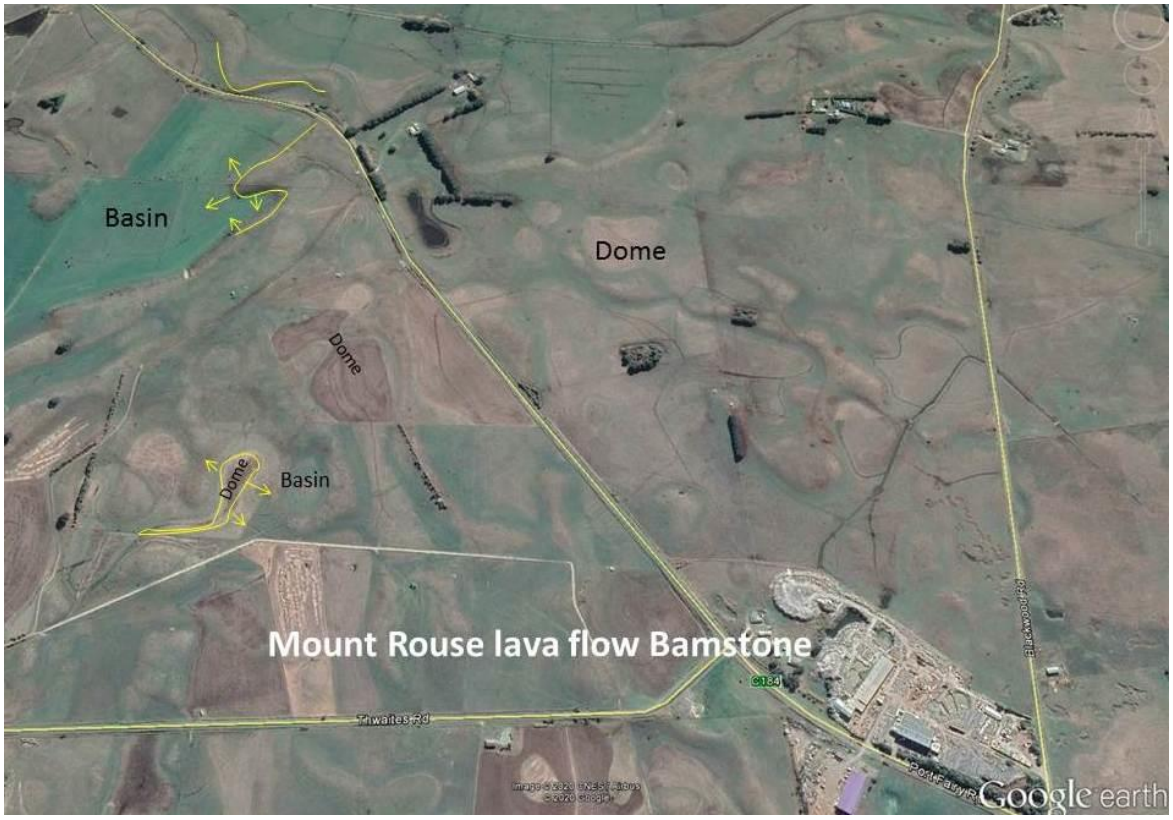
Then just ponder how lava flows?

It starts out very hot, over 1200 degrees Celsius, but to get here the lava travelled at least 60km before it finally froze. The lava came creeping down to the coast in wide valleys over a flat landscape.

The lava remained fluid by travelling inside flattish tubes underneath the protection of an insulating skin of solidified rock that finally cracks into the polygonal blocks that you see now. Gas escaped leaving a trail of bubbles in the rock. You can also see such gas bubbles in the pavement along Sackville Street.

Have you ever wondered how Pea Soup formed? Here is my take on the structure below.

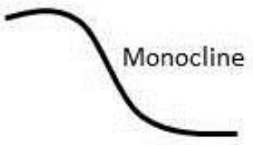




Finally, the landscape cooled leaving some thick layers with relatively few gas bubbles; the prized rock quarried by Bamstone. Fortunately for the stone masons who cut this rock it has no free silica, so less risk of lung disease. Free silica, as the mineral quartz, only forms when the total silica content exceeds the levels found in these rocks.

So when next you drive to Hamilton take time to admire this unique landscape. Something we share with those special places in the world where such long lava flows are preserved – such as the Undara flow in Far North Queensland (100km) and the Payen flow in Argentina (180km).

You may wonder how those random humps and valleys form, below a volcanic plain strewn with stony rises, occasional tumuli (oval shaped hillocks where lava has pushed up) and hillsides marked by monoclinal dips.



That is the question!

Geologist think the answer relates to a thermally efficient “inflation” mechanism; whereby low viscosity (near liquid) lava moves down very gently inclined surfaces. Pushed by gravity the lava inflates areas some later deflating as it moves on creeping below a skin of solidified rock.