

GEOLOGY OF FILDES PENINSULA, KING GEORGE ISLAND, WEST ANTARCTICA

— A Study on the Stratigraphy and Volcanism

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Abstract On the basis of the geological mapping, isotopic chronological and petrological evidences, the authors suggested that the early Tertiary volcanic strata in the Fildes Peninsula could be divided into two formations and four members. The erupted centers in the peninsula were gradually migrating from the western coast to the eastern and the subvolcanic intrusives were regularly distributed along a series of NWW-SEE trending faults. All of these were basically formed in two stages of volcanic activities from Paleocene to Eocene.

Key words Volcanic stratigraphy, Volcanism, Fildes Peninsula, West Antarctica.

King George Island is the largest among the South Shetland Islands, West Antarctica. The Fildes Peninsula lies at its southern tip and is completely covered by the Cenozoic volcanic rocks. On the basis of the geological mapping from 1985 to 1987 and the preliminary researches (Li Zhaonai and Liu Xiaohan, 1987; Liu Xiaohan & Zheng Xiangshen, 1988; Zheng Xiangshen & Liu Xiaohan, 1988, 1989) the authors put forward here some new ideas on the geology of the Fildes Peninsula, mainly on the volcanic stratigraphical division and the volcanism.

New Division on the Volcanic Stratigraphy

Lots of research work have been done and several papers published, concerning the geological problems in the Fildes Peninsula and King George Island. It should be pointed out that on the basis of the work by Hawkes (1961), C.M. Barton (1965) summarized the work of his and J.S. Gibby's and proposed the first stratigraphic sequence of King George Island. Barton identified the age of the volcanics of the Jurassic valley and the area to its south with late Jurassic in his geological sketch map of the Fildes Peninsula at a scale of about 1:50,000, published in 1956, and defined the volcanics of other areas as the Fildes Peninsula Group of Miocene age.

There have been some developments in the research on the South Shetland Islands and King George Island during the late 1970s' and the 1980s'. R.C. Lucas and W.S. Lacey (1981) proposed that the flora of the volcanic-sedimentary sequence on King George Island may be attributed to Tertiary; S. Czajkowski and O. Rosler (1986) summarized the results of the researches on the paleobotany on the Fildes Peninsula gained by the predecessors and concluded that the age may be of early Tertiary; C.S. Lyra (1986) conducted a statistical study on the species and relative contents of the pollen on the Fildes Peninsula and came to the same conclusion. The Polish research expedition team headed by K. Birkenmajer has carried out a large amount of geological investigations on King George Island. A Paulo, Z. Rubinnowski and A.K.

Tokarski (1979—1980) completed a 1:50000 geologic map of the exposed area on King George Is.. Their map, however, does not include the Fildes Peninsula. Birkenmajer et al. published a series of papers on the Admiralty Bay and its neighboring areas, concerning the volcanic stratigraphy, chronology, lithofacies, petrology, mineralogy and petrochemistry. They explored the stratigraphic classification and correlation, basement structure and major geological events. These papers provide a large quantity of data and a great deal of new ideas on the geology of this area. On the basis of the stratigraphic division of Barton (1965) and Adie (1964), combined with the work by the Polish research expedition, Birkenmajer suggested a stratigraphic division on King George Island. Compared with the division proposed by Barton in 1965, Birkenmajer's division (1980) shows the following differences: the original Ezcurra Group is subdivided into three groups, i.e. the Paradise Bay Group, the Barnowski Glacier Group and the Ezcurra Bay Group; [the Admiralty Bay Group is added; the original Fildes Group is dismembered. Through comparison, Birkenmajer believed that according to the isotopic dating the "Upper Jurassic" volcanics at the southern tip of the Fildes Peninsula and the Ardley Peninsula should be of late Cretaceous age; the tuffaceous sandstone containing flora and bird foot prints on the peninsula might be the product in Miocene; the lava and the pyroclastic rocks of the middle and northern parts of these peninsulas could be correlated to the Ezcurra Bay Group and should be of middle and late Oligocene age; olivine basalt and pyroclastic rocks in the Cape Suffield should be of Miocene to Pliocene age; all the intrusive rocks on the peninsula were assigned to be the Admiralty Bay Group.

In view of the previous work, combined with the concentrated investigations in 1974—1975 and 1975—1976, J.L. Smellie *et al.* (1984) summarized the stratigraphy, geochemistry and geological evolution of the South Shetland Islands, and divided the stratigraphic sequence of the South Shetland Islands into four sequences and described the characteristics of the petrology, major oxides and trace elements of the volcanic rocks on the entire South Shetland Islands. In their geological map of the Fildes Peninsula the authors subdivided the volcanic rocks of this peninsula into three lithological units: 1) trachybasalt and basaltic andesite in the lower section; 2) pyroclastic rocks (locally containing fossils) interlayered with a small amount of basalt and basaltic andesite in the middle section; and 3) fine-grained and microporphyritic andesite and dacite in the upper section. In the map, the lower unit is widespread and the middle and upper units are limited to the northeast corner with a more confined distribution for the latter.

There is no, however, consistent view on the division of volcanic strata, even if the same name, Fildes Peninsula Group (FPG), has been given by previous researchers to the volcanic rocks on the Fildes Peninsula. It is the Prof. Li Zhaonai and Dr. Liu Xiaohan, who first divided the FPG in the southern part of the peninsula into five volcanic stratigraphical members in 1987. On the basis of this division and our geological mapping in the northern part of the peninsula in 1987, we suggest here a new division on the volcanic stratigraphy (Table 1). The new division is comparable with those of the previous workers and has some differences (Table 2).

Description on the Volcanic Strata

In our new division of the volcanic stratigraphy, the volcanic strata are subdivided into two formations, Great Wall Formation (GWF) and Fossil Formation (FF), within which

Table 1. Stratigraphical division of volcanic rocks on the Fildes Peninsula.

Group	Formation	Member	Petrologica Characteristics
Fildes Peninsula	Fossil	Block Hill	agglomerate, breccia and lava
		Fossil Hill	tuffaceous sandstone, conglomerate, plant-bearing tuffaceous siltstone, tuffaceous mudstone
	Great Wall	Agate Beach	upper part: dacitic lava; middle part: interbedding lava and breccia; lower part: agglomerate and breccia
		Jasper Hill	upper part: lava and breccia; lower part: agglomerate and breccia

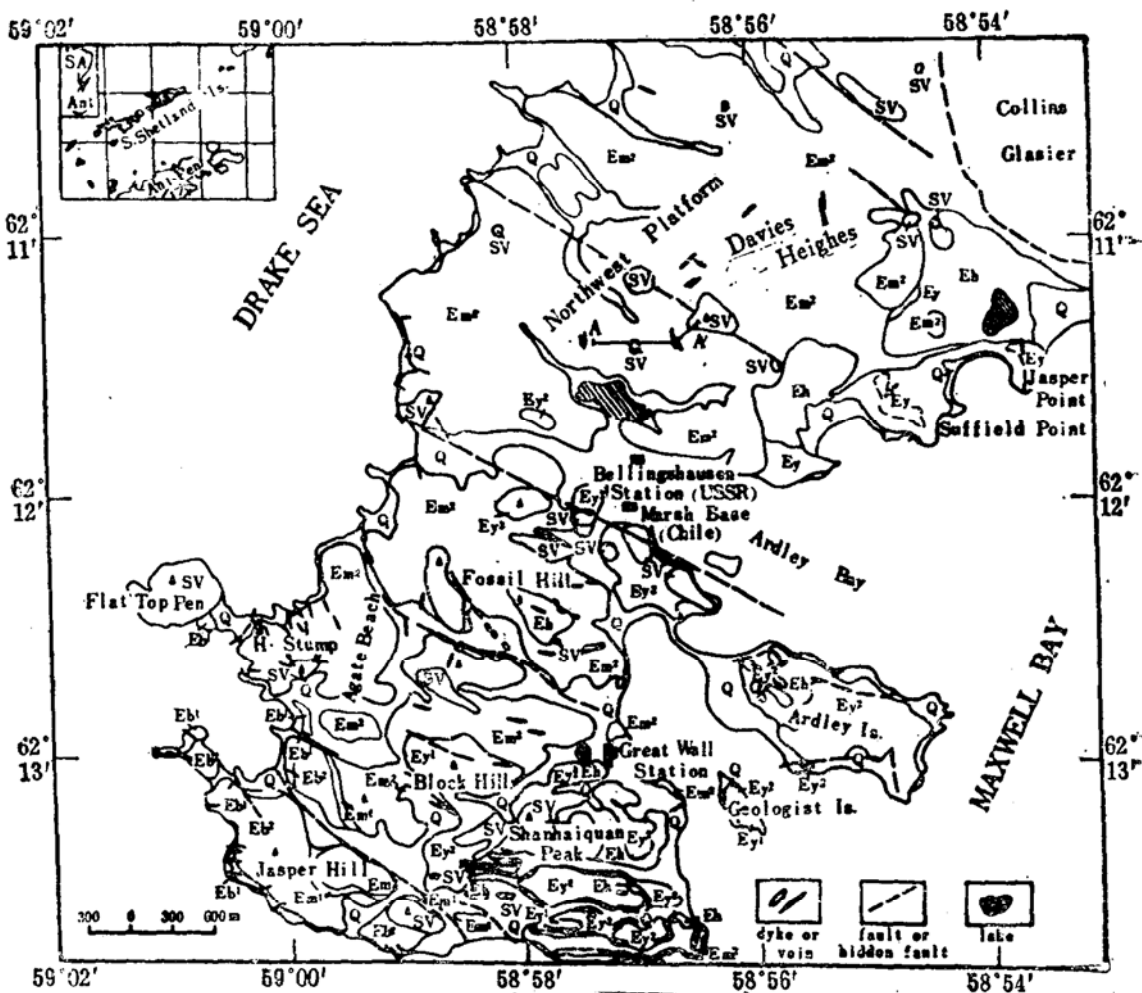


Fig. 1 Geological Map of the Fildes Peninsula (The southern part was mapped by Li Zhaonai & Liu Xiaohan, 1986; the northern peninsula by Zheng Xiangshen, 1987), Q-Quaternary: Ey²-upper part of BM; Ey¹-lower part of BM; Eh-FM; Em²-upper part of AM; Em²-middle part of AM; Em¹-lower part of AM; Eb²-upper part of JM; Eb¹-lower part of JM; SV-subvolcanics.

there are two members distinctively. GWF consists of Jasper Hill Member (JM) and Agate Beach Member (AM) and FF is composed of Fossil Hill Member (FM) and Block Hill Member (BM) (Fig. 1).

Table 2. Correlation of stratigraphical division on the Fildes Pen. group.

Time	Hawkes (1961)	Barton (1965)	Birkenmajer (1980, 1983)	Zheng & Liu (this paper)
Pliocene				
Miocene	L			
	M		ABG	
	E	FPG		
Oligocene				
Eocene		FPG	FPG	FPG, FF, BH, FH, AB, JH
Paleocene				
Cretaceous (L)				
Jurassic (L)		UJVG		

note: FPG-Fildes Peninsula Group; ABG-Admiralty Bay Group; UJVG-Upper Jurassic Volcanic Group; FF-Fossil Formation; GWF-Great Wall Formation; BH-Block Hill Member; FH-Fossil Hill Member; AB-Agate Beach Member; JH-Jasper Hill Member.

I. Jasper Hill Member (JM)

It is distributed over the Geography Bay and Jasper Hill in the southeast of the peninsula with a gentle northeast dip of 10—15 degrees and a thickness of 53—107 meters. Above sea level its base is composed of greyish-purple agglomerates and variegated volcanic breccia with a thickness of 14—25 meters (no bottom seen), overlain by multi-layered basalt of a thickness of 39—82 meters. In the areas of Jasper Hill and Geography Bay, brick-red or dark-red iron-jaspers are common, which occur as veins, pockets and nodules filling the intersections of the fractures in the basalt. But they are not developed in the basalt of the overlying AM strata.

The basalt cross section of the Jasper Hill Member along the southwest slope of the Jasper Hill has a thickness of 107 meters and is described from the top downwards as follows:

- 8: dark grey medium- to fine- porphyritic basalt with a thickness of 2.3 meters, exposed on the top of the Jasper Hill.
- 7: dark grey medium- to fine- porphyritic basalt with a thickness of 9.8 meters.
- 6: dark grey coarse- to medium- porphyritic basalt with a thickness of 6.3 meters.
- 5: dark grey fine-porphyrific basalt, 16.3 meters thick, containing dense micro to fine plagioclase phenocrysts.
- 4: dark grey medium- to fine- porphyritic basalt, 5 meters thick.
- 3: dark grey medium- to fine- porphyritic basalt, 7.5 meters thick.
- 2: dark grey medium- and fine- porphyritic basalt, 35 meters thick.

1: dark brown and variegated basaltic volcanic breccia, 25 meters thick.

The central phase of the basalt usually forms cliffs along the southwest slope of the Jasper Hill, while the breccia lava at the top and bottom in two adjacent layers (such as from the layer 2 to 4 of above section) forms gentle debris slopes due to the freezing and weathering. Therefore, a step-shaped morphology can be seen on the slopes with a dip opposite to that of the JM. The number of basalt layers can be calculated by counting the number of steep slopes. The lithology of the basaltic volcanics from the Geography Bay to the Jasper Hill is similar and there is no significant variation in the texture. Their main differences are: as the Geography Bay is closer to the eruption center, its pyroclastic assemblage consists of agglomerate and coarse volcanic breccia and changes into fine-grained volcanic breccia towards the Jasper Hill. The lava near the Geography Bay shows smaller single-layer thickness.

II. *Agate Beach Member (AM)*

The Agate Beach Member volcanics covers almost the entire area with a monolinal structure and local undulation. The strata dip NEE or SEE at a dip angle of 5 to 15 degrees. Generally speaking, it is composed of basaltic and basalt-andesitic lavas and volcaniclastic rocks, and can be distinguished into three parts according to the succession of strata and the contact relationship of rocks. The rocks at the bottom of AM are agglomerates and breccia, 30—50m in thickness, outcropping from Banana Mt. through the western coast to the northern end of the peninsula. The middle part of AM in the south and north of the peninsula shows certain changes in both the lithological assemblage and the thickness. In the south, the AM is 51—79 meters thick. The bottom is composed of basaltic agglomerates and volcanic breccia, 25 meters thick. It is overlain by ten to twenty layers of amygdaloidal lavas. The AM pyroclastic rocks and lava in the north of the peninsula exhibit a larger thickness, more than 330 meters. The basaltic pyroclastic rocks and the lava appear in a frequent alternation but the vesicles and amygdaloidal structure of the lava are the common feature of the entire island. The vesicles and fissures of the AM basaltic lavas are filled with milky quartz and agate, with occasional crystal, calcite and zeolite crystal druses. The cross sections south of the Horatio Bay in the southern peninsula and in the northern peninsula are taken as the representatives of the middle AM and are described here.

The section south of the Horatio Bay is described from the top downwards as follows:

- 12: Dark grey medium- to fine- basalt, 4.2 meters thick, exposed on the northern slope of the Horatio Bay. The top of this layer is eroded.
- 11: Dark grey medium- to fine- basalt, 5.1 meters thick.
- 10: Dull grey basaltic breccia lava, 17.5 meters thick, containing lava lenses.
- 9: dark grey medium- to fine- porphyritic basalt, 3.2 meters thick.
- 8: dull greenish-grey medium- to fine- porphyritic basalt, 3.7 meters thick.
- 7: dark grey medium- to fine- porphyritic basalt, 5 meters thick.
- 6: dark grey fine porphyritic basalt, 4.6 meters thick.
- 5: dark grey medium- to fine- porphyritic basalt, 5.6 meters thick.
- 4: dark grey medium- to fine- porphyritic basalt, 8 meters thick.
- 3: dark grey medium- to fine- porphyritic basalt, 6.8 meters thick.
- 2: dark grey medium- to fine- porphyritic basalt, 4.8 meters thick.

1: dark grey medium- to fine- porphyritic basalt, 10.8 meters thick.

The basalts usually form cliffs, while the breccia between adjacent layers are used to distinguish the different layers of lavas with the same lithological features in above section.

The measured cross section in the northern bank of the Gitack lake to the Davies Heighes can be considered as a representative of the middle part of AM on the northern peninsula. They are described from the top downwards as follows (Fig. 2):

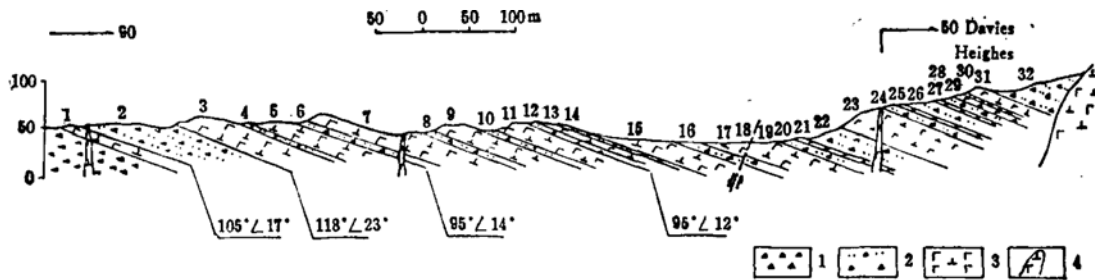


Fig. 2 Cross Section showing the middle part of AM on the northern pen. This section was made by Zheng Xiangshen in the field, 1987, 1-agglomerate and lava; 2-breccia; 3-basalt and basaltic andesite; 4-subvolcanics; The layer numbers are the same as in the paper.

- 32: dark grey basaltic andesite containing a large amount of plagioclase phenocrysts and numerous amygdales, with a total thickness of 6.3 meters. A spheroidal structure is seen in its lower section.
- 31: dark grey to variegated breccia of 35.5 meters thick, interlayered with thin lava beds and grown into thin lava layers at the top.
- 30: amygdaloidal thick-planar basaltic andesite of 4.3 meters thick.
- 29: grey breccia of 2.8 meters thick.
- 28: greyish-black basalt of 4.7 meters thick, containing vesicles with weathered light grey or greyish-yellow surface.
- 27: grey breccia of 7 meters thick.
- 26: dark grey massive basalt of 1.7 meters thick, containing coarse plagioclase phenocrysts and amygdales. A red top is seen.
- 25: greyish-black breccia of 19.4 meters thick containing a 0.8 meter thick layer of grey basaltic andesite.
- 24: black basaltic andesites of 17.8 meters thick, containing few plagioclase phenocrysts and intruded by a black basaltic dike.
- 23: greyish-black breccia of 19.8 meters thick.
- 22: greyish-black massive basaltic andesite of 2.1 meters thick.
- 21: greyish-black breccia of 4.3 meters thick.
- 20: grey to greyish-black massive basaltic andesite of 6.3 meters thick with an increasing number of amygdales on the top.
- 19: greyish-black breccia of 2 meters thick.
- 18: grey thick-planar basaltic andesite of 4.3 meters thick.
- 17: grey breccia lava of 5.6 meters thick.
- 16: thick-planar dark grey basaltic andesite of 12 meters thick, penetrated by a subvolcanic body.

- 15: greyish-green breccia of 3.3 meters thick.
- 14: greyish-black basaltic andesite of 3.6 meters thick containing vesicles and amygdales.
- 13: breccia lava of 3.1 meters thick.
- 12: greyish-black thick-planar basaltic andesite of 15.3 meters thick.
- 11: greyish-green breccia of 4.9 meters thick.
- 10: thick-planar vesicular basalt of 14.2 meters thick.
- 9: breccia lava of 9.4 meters thick.
- 8: thick-planar basaltic andesite of 20.5 meters thick containing locally developed vesicles and penetrated by a 1 meter thick dike striking 24—204 degrees.
- 7: greyish-black breccia of 10.5 meters thick.
- 6: greyish-black massive basalt of 15.7 meters thick, with columnar joints.
- 5: greyish-green breccia of 6.3 meters thick.
- 4: greyish-black basaltic andesite of 24.7 meter thick.
- 3: light brownish-yellow agglomerates and breccia of 30.9 meters thick, heavily weathered, containing pebbles decreasing upward.
- 2: dark grey thick-planar massive basalt of 8.9 meters thick.
- 1: variegated agglomerate and breccia of more than 4 meters thick.

The geological and lithological characteristics of the two AM cross sections described above are different, because the positions section measured are different. The former is near the volcanic center, Horatio Stump, so more lavas are seen in that section than in the latter which is far away from ancient eruptive centers. The individual characteristics of the AM are different also, especially in the east of the Geography Bay where the differences among the three areas along the southern coast and the three northwestern platforms are apparent. Although these sections are distant from each other, their bottoms show that large agglomerates are possible products of the nearby volcanic eruptions, which indicates that the AM probably occurred during the eruption of the same episode from a few different centers.

The top part of AM has only been found in the northeast area of North Heightes, lying on the layered breccia of the middle part of AM and being 30—50m in thickness, and is composed of cryptomerous, lamellos andesite-dacites.

III. *Fossil Hill Member (FM)*

The volcanic breccia and pyroclastic-sedimentary rocks of the Fossil Hill Member are distributed mainly on the west of the Rocky Cove, east of the peninsula, the Fossil Hill and the western part of the Ardley Island. The variation in lithology of this member is substantial. Three types are identified based on different occurrences and lithological assemblages. The first type occurs in small shallow water basins and forms volcanic breccia showing bedding, crystal or rock fragmental tuff, sedimentary volcanic breccia, sedimentary tuff, tuffaceous sandstone, tuffaceous siltstone and tuffaceous pelite, usually containing flora fossils and bird's foot prints. The second type includes those volcanic fragments piled on land containing variegated or purplish-brown thin-planar volcanic breccia and tuff. It vanishes following the paleo-relief and shows limited and sparse distribution. The third type is produced in the lowland of the paleo-relief not far from the lava eruption center. It contain basaltic or basaltic-andesitic thin lava layers against volcanic breccia, tuff, sedimentary breccia and sedimentary

tuff. The attitude of the FM is gentle, which may be a reflection of the effects of a low angle inclination of the paleo-relief. The thickness is obviously controlled by the ancient topography and ranges from 0 to 60 meters.

IV. Block Hill Member (BM)

The Block Hill Member is characterized by agglomeratic lava, breccia lava, and only small amount of lava are found in the east side of the peninsula. They belong to the near-crater facies and the uprake part of lava flows, therefore, their thickness and grain size are greatly variable. At Jasper Point and Suffield Point the yellow to greenish yellow agglomerate, breccia, and irregular lava are accumulated together, in which huge blocks and fine grains are cemented with tuff or lava. The blocks and grains range from less than one centimetre to several meters in diameter, angular to round in shape.

V. Subvolcanics

Subvolcanics are fairly developed and distributed over nearly the entire region. The occurrence of the subvolcanics includes small stocks, small offshoots, and dikes.

The spatial distribution of the subvolcanics in this area is apparently controlled by the structure factors. The first factor is the control of the central structure of the paleo-volcanics, mainly composed of a central column or stock associated with the surrounding radial dikes, all with limited distribution. It should be pointed out that it is possible that the paleo-volcanic center appears to be a near equal axial subvolcanic body, the plug root, owing to the intense erosion at this location. This includes the column of the Flat Top Hill, the Horatio Stump and radial dikes as well as the Shanhaiguan peak and the radial dikes (Fig. 1). The second is controlled by the basement faults of the volcanos, forming small "beady" stocks along the same line. In the masses overlying the oriented volcanics, however, no large and continuous faults are found. The subvolcanics at 55.5, 53.0, 55.0, 62.0, 53.0, 131.4 156, 99, and 110.5 Highland aligning in the SEE 120 direction distributed along the western coast of the Storm Bay to Cape Grekurov south of the Davies Heightes in the northern part of the peninsula can be classified into this type. The ancient volcanic centers, such as the Flat Top Hill, Horatiostump and Shanhaiguang peak south of the peninsula are distributed along the SEE 120 line and may also be controlled by the basement faults. The series of subvolcanic bodies of different size along the front of the Collins Glacier also extends in the NWW-SEE (near 120—300) direction. The third type is controlled by the regional fissures in the overlying layers and the fracture system. Some dikes and offshoots are controlled by both the basement faults and the fissures in the overlying layers.

Evidences of New Stratigraphy Division

We have found following factors as the evidences for the new stratigraphical division:

1. The unconformity between the strata of AM and that of FM shows that there was a long time break of the volcanic activities in the peninsula. Its main features are: 1) The dip of the bedding in the AM is commonly larger (12—20 degrees) and its bearing varies (NEE, NE, E and SE), whereas the dip of the bedding in the Fossil Hill Member is relatively smaller.
- 2) The pyroclastic-sedimentary rocks of the FM may cover different horizons of the lava in the

AM, for instance, it overlies three layers of lava in the west of the Fossil Hill. 3) On the top of the AM (also the surface of the paleo-relief), a weathered zone of various thickness is seen, and so is the eroded amygdaloidal zone on the top of the lava layer. It is the paleo-weathered zone of the central lava phase that directly contacts the FM. 4) The structure features of the paleoweathered zone include a fading in color, from fresh dark grey dense massive lava upwards into greyish-purple and greyish-green. 5) In the southeast coast of the peninsula, the fissures in the top layer of the AM are seen to be filled by fragments of the FM, thus forming "sedimentary veins" and showing the appearance of volcanic breccia, brecciated tuff, tuffaceous sandstone and siltstone.

2. The plant fossils found in tuffaceous siltstone and mudstone of FM indicate that the eruptive gap between AM and FM had persisted for a long period.

3. The results of researches on plant fossils, spores, and pollens (Orlando, 1963, 1964; Schauer & Fourcarde, 1964; Czajkowski & Rosler, 1986; Solangelyra, 1986; Shen Yanbin, 1989) fully prove that FM was formed in early Tertiary, most probably in Eocene to Oligocene.

4. The ages determined with whole rock K-Ar dating method by previous researchers have basically suggested that the Fildes Peninsula Group volcanic rocks as a whole are Tertiary (Grikurov *et al.*, 1970; Watts, 1984). Recent studies confirm that they are the products in early Tertiary (Pankhurst & Smellie, 1983; Smellie *et al.*, 1984). After sorting out the published data and the data determined by the authors, it can be found that the age ranges of GWF are from 64.6 ± 1 to 51 ± 2 Ma, the FM and BM from 52 ± 1 to 43 ± 2 Ma, belonging to Paleocene and Oligocene, respectively (Fig. 3a, after Li, Liu & Shang, 1990). From Fig. 3b we can see that the volcanic activities in Fildes Peninsula were concentrated within a period, from Paleocene to Oligocene, especially around 60—50 Ma. It is explained by the senior author (in PH. D. thesis, 1988) as that the two peakes of volcanic activities were influenced by the varing subduction rate of Pacific Plate under Antarctic Plate.

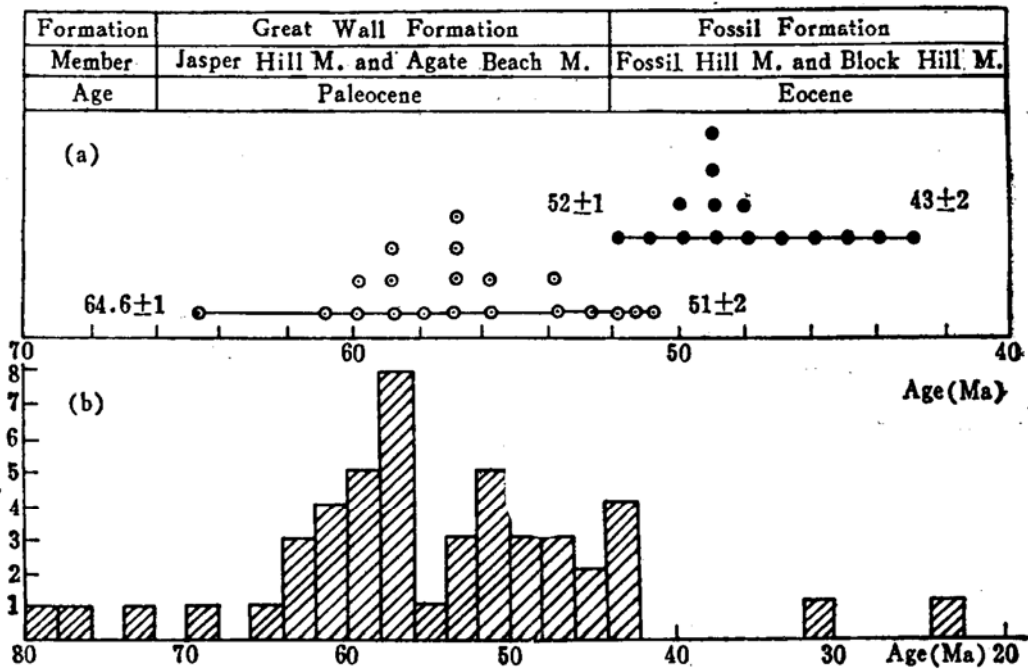


Fig. 3 Age ranges of Great Wall formation and fonil formation.

5. The ancient volcanic structures which produced GWF are located on the west side of the peninsula, such as the Flat Top Hill and Horatio Stump, and filled with later lavas. These towering rock columns are cylinder-like, usually over a hundred meters high and disintegrated, around which there are many radiating dykes subject to strong hydrothermal alteration. The volcanic centers are obviously migrating eastwards during the formation of Fossil Formation. The occurrence of the subvolcanic intrusion, Shanhaiguan Peak, is very much like that of Horatio Stump and can be considered as an ancient crater, which erupted some of FM (Li & Liu, 1987). The rocks of FM and BM are mainly distributed on the east of the peninsula, so the eruptive centers should be located in the sea.

Discuss on the Process of Volcanism

On the basis of the above evidences we consider that the volcanic rocks and the strata in the Fildes Peninsula were produced by two stages of volcanism which resulted from the subduction of Pacific Plate. At least after middle Jurassic, the Antarctic Peninsula gradually evolved into a magma arc. The South Shetland Islands were situated in front of the arc and near the edge of subducted plate and had formed by arc volcanism since the late Cretaceous. The back-arc extension led the formation of Bransfield Rifts and separation and northwestward migration of South Shetland Islands from Antarctic Peninsula (Gonzalez-Ferran, 1982; Smellie, 1983). Under such a tectonic background Fildes Peninsula have been subjected northwest-southeast compressive stress for a long time and developed a series of parallel or subparallel NWW-SEE trending faults, along which paleovolcanic centers and subvolcanic intrusives are distributed.

During the Paleocene (perhaps to Oligocene) the volcanic activities focused on the west side of Fildes Peninsula and reached its climax. The early eruption produced the volcanic rocks of JM. The following large scale eruption constructed a complete cycle of volcanism, that is, the amount and grain size of breccia decreased, the volume of lavas increased with continuing volcanic eruption, and there was dacitic lava at the top of the volcanic cycle. The successively compositional changing of lavas from basaltic, basalt-andesitic at the lower and middle part of AM, to dacitic (upper part of AM) represents a typical calc-alkaline rock assemblage of island-arc volcanism.

After the first stage of volcanism, the volcanic activities in the Fildes Peninsula ceased and the outcropped rocks of JM and AM suffered from heavy weathering.

At the end of Oligocene to Eocene the vigorous explosion of volcanoes on the east side of the peninsula ejected a great amount of ash, tuff, and breccia, that fell down quickly, piled up and buried forest, covered the whole peninsula. The Fossil Hill Member appeared. Another eruption in the late Eocene period gave out lots of blocks and some lavas, then agglomerates, agglomeratic lavas and lavas near the crater and on the east side of peninsula, which are the main elements of BM.

At the two stages of volcanic activities described above some magma intruded along the faults and formed the linearly distributed subvolcanic intrusions, the dykes and veins, however, came out along small faults or near the ancient eruptive centers.

Summary

The Cenozoic volcanic rocks belonging to Fildes Peninsula Group are the products of island-arc volcanism. On the basis of the geological mapping, the petrological characteristics, the isotopic chronological data, as well as the fossils found from the peninsula, the authors analysed the volcanic activities of this peninsula and divided the FPG into two formations and four members in detail. Such a new division is consistent with the volcanism rule in South Shetland Islands, that is, the volcanic activities have been gradually migrating from southwest towards northwest since Jurassic (Pankhurst & Smellie, 1983) and is also compatible with the volcanic stratigraphy in King George Island, that is, the FPG corresponds to Ezcurra Inlet Group in Warszawa block determined by Birkenmajer *et al.* (1983), which incloses some basaltic lavas at bottom, the overlying andesitic layer with a hundred meters or more in thickness, and the sedimentary beds containing coal or plant fossils. There is also some unconformity between andesites and sedimentary rocks (Birkenmajer *et al.*, 1983)

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