Second circular for the Ninth Hutton Symposium
on the Origin of Granites and Related Rocks

The Hutton Symposium, the most important international meeting on granitic magmatism, will be held for the first time in China at the Xianlin Campus of Nanjing University from the 13th to the 18th of October 2019. Since the first event in Edinburgh, Scotland in 1986, the Hutton Symposium has become a classical meeting on granite geology. Every four years this event brings together leading scientists in granite geology and highlights the research trends in this field. China is host to large volumes of granitic rocks with ages peaking in the Early Archean, Paleoproterozoic, Neoproterozoic, Early Paleozoic, and Mesozoic, making it a fantastic location to host such a prestigious gathering. Nanjing University is located in the city of Nanjing, the ancient capital of six dynasties. It is one of the most esteemed universities/institutions for the study of granitic rocks in southern China. We hope you will take advantage of this unique opportunity and enjoy the scientific, cultural, and social experiences offered by this symposium.

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- State Key Laboratory for Mineral Deposits Research, Nanjing University
- State Key Laboratory of Lithospheric Evolution, Institute of Geology and Geophysics, Chinese Academy of Sciences
- Zhejiang University
Themes:

The symposium will focus on the following four themes.

1. Granites and the generation and evolution of the continental crust
   (Conveners: Jean-François Moyen, Xian-Hua Li, Williams Collins, Gary Stevens)

   This theme focuses on the nature of the granitic record, and the generation and evolution of the continental crust. What processes generated the magmas which created the Paleoarchean granitoid crust? What is the relationship between plutonic magmatism in the early Archean and the stabilization of Archean cratons? What can granitic rocks tell us about the episodic or continuous growth of continental crust? What is the relationship between granites and supercontinent cycles? Can we identify processes and parameters common to granites that define particular settings or periods of Earth’s history? Studies on the links between granite composition, tectonism, and continental evolution are welcome in this theme.

2. Processes that control the generation of granitic magmas in the deep crust
   (Conveners: Federico Farina, Jin-Hui Yang, Fernando Bea, Chang-Qian Ma)

   This theme covers the large volume of observations from experimental studies, field studies, whole-rock and mineral geochemical studies, and thermodynamic modeling that focus on the generation of granitic magmas. How to create and how to constrain the conditions, particularly temperature and fluid state, necessary to generate large volumes of granitic magma? What range of different mechanisms constitutes viable heat sources to drive granitic magmatism? What are the detailed processes that control crustal anatexis? What is the nature of the source rocks for granitic melts? What characteristics can be used to differentiate between granitic melts derived from crustal sources from those derived by differentiation of mantle-derived magmas? Can the physical properties of granite magmas be reconciled with the structural records in granitic plutons? Studies on granites and their accessory minerals, migmatites, nanogranites, experimental studies, and thermodynamic and geochemical modeling are critical to addressing these issues.

3. Mineralization associated with granitic magmatism
   (Conveners: Mei-Fu Zhou, Bernd Lehmann, Rui-Zhong Hu)

   This theme focuses on the different types of mineralization associated with granitic magmatism. What are the sources of the ore-forming elements? How do they migrate and accumulate during magma evolution and within magmatic fluids? Studies on the mineralogy, geochronology, and geochemistry of granitic pegmatites provide key
pieces of information to address these questions. The composition and physical conditions of fluid inclusions are also important. Experimental studies, theoretical modeling, and the application of new analytical techniques (e.g., stable metal isotopes) to characterize the behavior of elements within fluids are also welcome.

4. Magmatic processes of large granitoid plutons and felsic volcanic complexes

(Conveners: Xiao-Lei Wang, Calvin Miller, Yaoling Niu, Catherine Annen)

This theme deals with all of the magmatic processes (e.g., fractional crystallization/crystal accumulation, crustal assimilation, magma mixing, and magma dynamics, etc.) involved in shaping the final composition of granitic and felsic volcanic rocks. Over what time frame are granite plutons and batholiths constructed? Are granitoid plutons formed by many small pulses or one massive magma batch? What can accessory minerals tell us about the construction (including the size of magma batches and the residue time of these batches, etc.) of plutons? How to understand the texture, mineralogy and heterogeneities of granitic rocks? Are felsic volcanic rocks the extrusive counterparts of granitic plutons? This theme would cover the many different interpretations that can be applied to granitic rocks that at some levels are seemingly quite similar, in terms of mineralogy, geochemistry etc.

Any comments and suggestions on the themes are welcome. Please contact with Prof. Xi-Sheng Xu (xsxu@nju.edu.cn) or Prof. Xiao-Lei Wang (wxl@nju.edu.cn).

Important dates:

Third circular: June 15, 2019.
Deadline for on-line registration and field trip reservation: July 31, 2019.

Registration information:

Abstract fee: $50 USD (¥350 RMB).
Note that the abstract fee is non-refundable.

Registration fee of 5-day meeting (October 13 –18, 2019):

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<th>Before May 31, 2019</th>
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<tr>
<td>Regular</td>
<td>$500 USD (¥3500 RMB)</td>
<td>$600 USD (¥4200 RMB)</td>
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<td>Student*</td>
<td>$300 USD (¥2100 RMB)</td>
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To qualify for the student pricing, proof of status must be provided (e.g., course registration certificate). Otherwise, the regular registration fee will be charged.

- Registration has been open since January 31, 2019. The registration fee will be fully refunded for cancellations made before May 31, 2019. Cancellations made after May 31, 2019 or after July 15, 2019 will be refunded for 40% and 10% of the registration fee, respectively. Please send us an email if you have paid the registration fee (Dr. Gang Zeng, Email: hutton9nj@126.com).

- The registration fee covers the conference materials, refreshments, meals, and the mid-conference field trip to the *Cretaceous adakitic quartz diorite and sedimentation around Nanjing* (October 16, 2019).

- **Field trips:** There are two pre-conference and two post-conference options for field trips. Any trip with fewer than 30 registrants will be canceled. The current estimated price for each trip includes the lodging, transportation, food, field trip guidebook, insurance, and tickets for related scenic points. The default lodging option is a standard twin room. Single rooms can be requested for an additional fee covered by the delegate.

<table>
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<tr>
<th>Trip No.</th>
<th>Content</th>
<th>Time</th>
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<tr>
<td>Pre-conference field trip - 1</td>
<td>Paleoproterozoic and Late Mesozoic Granitic rocks in Beijing, North China Craton</td>
<td>Oct. 9 – Oct. 13</td>
<td>$450 USD (¥3150 RMB)</td>
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<tr>
<td>Pre-conference field trip - 2</td>
<td>Late Mesozoic I- and A-type granites and volcanic-intrusive complexes along the coast of Zhejiang Province</td>
<td>Oct. 9 – Oct. 13</td>
<td>$550 USD (¥3850 RMB)</td>
</tr>
</tbody>
</table>

- Chinese participants can pay the registration fee by transferring money to Nanjing University’s bank account, using Nanjing University’s online payment link.

  转账或直接网上支付时请备注“姓名+Hutton”
  户名：南京大学
  开户行：中国工商银行南京市汉口路支行
  帐号：4301011309001041656

- Foreigners can pay the registration fee in U.S dollars by transferring money to Nanjing University’s bank account. Please provide your full name followed by “Hutton” when you pay the registration fee.

  Beneficiary’s Name (Account Name): NANJING UNIVERSITY
  Bank Name: BANK OF CHINA NANJING CENTER BRANCH
  Bank Account No.: 524858209957
  Bank Address: NO. 29 HONGWU ROAD, NANJING, JIANGSU, CHINA
  SWIFT No.: BKCHCNBJ940
**Visa requirements:**

If necessary, a formal letter of invitation to obtain a Visa from the Chinese Embassy will be issued upon receipt of the registration fees.

Participants should check their Visa requirements at the Ministry of Foreign Affairs of the People’s Republic of China (www.fmprc.gov.cn/mfa_eng/) or at their local Chinese Consulate. Please contact the Organizing Committee if you need help with this matter.

**Field trips:**

**Pre-conference field trip - 1:**

**Paleoproterozoic and Late Mesozoic Granitic rocks in Beijing, North China Craton**

*Time: Wednesday October 9th – Sunday October 13th, 2019*

*Price: $450 US dollars*

The North China Craton (NCC) is the largest Archean craton in China. It was stabilized in the Paleoproterozoic and was subsequently covered by a thick sequence of Proterozoic to Paleozoic sediments. It was destabilized during the Mesozoic and since then experienced intense compressional–extensional deformation, magmatism (i.e., dekratization). This trip offers an excellent opportunity to examine the cratonization and dekratonization processes of the NCC through visits to the ancient basement rocks, the sedimentary cover, the Paleoproterozoic rapakivi pluton, and the Late Mesozoic plutons associated with the Late Mesozoic Yunmenshan metamorphic core complex (MCC) around Beijing.

![Simplified geological map of the granitoids in the Beijing area.](image)
The regional Archean basement rocks comprise magnetite quartzite, granulite, and tonalite gneiss with zircon U–Pb ages of about 2.52 Ga. These rocks were intruded by the 1.68 Ga rapakivi pluton at Miyun. The Late Mesozoic Yunmenshan MCC is the first recognized MCC in China. Late Jurassic dioritic to granitic rocks and Early Cretaceous granodiorite to granite intruded the Archean basement and its sedimentary cover. They make up the majority of the core of the Yunmenshan MCC. The ductile extensional shear zone along the southeastern margin developed between 131–114 Ma. It is overprinted by the brittle Hefangkou normal fault, which is associated with the development of the Huairou rift basin on the hanging wall. There will be plenty of opportunities to examine the relationships between the emplacement of the granitic plutons and the ductile–brittle structures that they contain. As an additional benefit, because the trip will take place during Beijing’s golden season, there will be excellent opportunities to see and photograph the beautiful Great Wall.

Fig. 2 An overall view of the Great Wall in the field.

Day 1 (Oct. 9):
Participants should arrange their own transportation to Beijing and arrive before October 9th. We will provide the name and address of the hotel to all of the participants.

Morning: Depart from hotel to the Miyun district of Beijing at 8:30 am.
We will examine the Archean basement rocks (~2.5 Ga Kf granite) and the unconformity between the basement and its Proterozoic sandstone cover. A ~1.68 Ga rapakivi stock intruded into the Proterozoic sandstones.

Afternoon: We will visit the Miyun (or Shachang) rapakivi pluton that intruded into the ~2.52 Ga Archean magnetite quartzite and tonalite.
If time permits, we will visit the Early Cretaceous diorite–granodiorite–granite
Siganding pluton.

**Evening:** We will arrive at the hotel at the University of Chinese Academy of Sciences in the Huairou District of Beijing.

**Day 2 (Oct. 10):**

**Morning:** Departure at 8:30 am.

This day will focus on the Late Jurassic to Early Cretaceous Yunnengshan diorite and granite pluton that represents syn-tectonic magmatism, as well as the Yunnengshan metamorphic core complex. They are all related to the decratonization of the North China Craton. We will also have an opportunity to visit the Great Wall.

**Evening:** Arrive at the hotels in the Changping District of Beijing.

**Day 3 (Oct. 11):**

**Morning:** We will meet in front of the hotel and depart for Badaling batholith at 8:30 am. We will examine the Early Cretaceous gabbros, diorites, and granites, as well as the gabbro-related iron ores. We will be able to observe beautiful textures that serve as evidence for magma mingling/mixing. These textures illustrate the complex relationships between these rocks.

**Evening:** We will arrive at the hotels in Changping District of Beijing. This is the end of the field trip.

**Day 4 (Oct. 12):**

Depart from Beijing to Nanjing.

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**Pre-conference field trip - 2:**

**Late Mesozoic I- and A-type granites and volcanic-intrusive complexes along the coast of Zhejiang Province**

**Time:** Wednesday October 9th – Sunday October 13th, 2019

**Price:** $550 US dollars

During this field trip we will visit the felsic intrusive and volcanic rocks that formed in a Mesozoic active continental margin along the coast of Zhejiang Province.

We will first visit the Mount Putuo I- and A-type granites. Mount Putuo is an island in the northeast of Zhejiang Province that derives its name from a sacred Buddhist mountain at the center of the island. It is a renowned site in Chinese Buddhism and records multiple episodes of Mesozoic granitic magmatism. The island mainly comprises I-type and A-type composite granitic complexes. Zircon age dates suggest that the island is composed of three Mesozoic intrusions, which were generated at 110 Ma, 90 Ma, and 70 Ma, respectively. The intrusions are thought to have been generated in response to subduction of the paleo-Pacific plate. Mafic microgranular enclaves (MME) are common suggesting that magma mixing was an important mechanism for petrogenesis of the granites.
Afterwards we will move to the Yandangshan UNESCO Global Geopark, which is located in the southeast of Zhejiang Province. It lies on the southeastern edge of the Asian continent – the tectonic domain where China borders the Pacific. The terrain of the Geopark includes the 900–1100 m tall Bai Gangjian, Wu Yanjian and Yan Hugang mountains, which form a northeast-trending mountain chain. Yandangshan often exhibits conspicuous layering that corresponds to the four different episodes of eruptions, giving rise to terrace-like structures. The main rocks consist of ignimbrite, rhyolite, syenite, and tuff. The Mount Yandangshan provides a natural three-dimensional model of a caldera and it is also known as a natural museum for rhyolitic volcanics. As a 5A scenic area (i.e., a top-tier tourist attraction in China), “more than 5,000 poems have been inspired by Mount Yandangshan”.

Fig. 3 A geographic map showing the two locations we will visit on the field trip. The dotted lines show the route from Shanghai Pudong international airport to Putuoshan, Yandangshan, and then to Nanjing.
Fig. 4 The island of Mount Putuoshan in the northeast of Zhejiang Province.

Fig. 5 Mount Yandangshan, a natural museum for rhyolitic volcanics.
Day 1 (Oct. 9):

Morning: Meet in the city of Ningbo, Zhejiang Province (10:00 am) and depart for the Zhoushan Islands. (Participants are requested arrange transport to the city of Ningbo)

Afternoon: We will examine Cretaceous felsic volcanic rocks, diabase, and marine landforms at Zhairuoshan Island.

Evening: Arrive at the hotel in the Zhoushan Campus of Zhejiang University.

Day 2 (Oct. 10):

Morning: Meet in front of the hotel and depart for Putuo Island.

Afternoon: We will examine the late Mesozoic I- and A-type granitoids and their enclaves, as well as the related diabase and felsic volcanic rocks.

Evening: Arrive at the hotel in the city of Ningbo.

Day 3 (Oct. 11):

Morning: Meet in front of the hotel and depart for the Mount Yandangshan (Wenzhou, Zhejiang Province) by train.

Afternoon: We will examine a variety of Cretaceous volcanic rocks (tuff, ignimbrite, rhyolite) that represent multiple episodes of magmatism and which occur as beautiful landforms and structures. We will also visit Mount Yandangshan Museum.

Day 4 (Oct. 12)

Morning: Continuation of Day 3 field trips.

Afternoon: Arrive at the Yandangshan railway station and return to Nanjing by train. This is the end of the field trip.
Mid-conference field trip:

Cretaceous adakitic quartz diorite and sedimentation around Nanjing

Time: Wednesday October 16th, 2019

Price: This mid-conference field trip is included in the registration fee.

The mid-conference field trip will include excursions to the Anjishan pluton, the Upper Cretaceous Pukou Formation, and cultural heritage sites around Nanjing.

The Anjishan pluton is located in the Ningzhen area of the Lower Yangtze region. It is composed of porphyritic granodiorite and quartz diorite. New LA-ICP-MS U–Pb zircon ages suggest that the Anjishan granodiorite formed at 108.8 ± 1.2 Ma (Liu JM et al., 2014, Geol. Rev.). The Anjishan rocks are characterized by geochemical features typical of adakitic rocks (i.e., high Mg#, Sr/Y, La/Yb, and low Y and Yb). These geochemical features suggest that the thickness of the crust in this area exceeded 40 km in the Early Cretaceous, which is greater than the present-day thickness of ~30 km. This indicates that the crust had been thinned by at least 10 km since the Early Cretaceous (Xu JF et al., 2002, Geology).

The second component of this field trip is a visit to the Yanziji Park on the southern bank of the Changjiang (Yangtze) River, where continental conglomerates deposited in an alluvial fan are well exposed. The conglomerates belong to the Late Cretaceous Pukou Formation and were deposited in an extensional sedimentary basin. They are gray-red in colour, poorly sorted, and poorly graded. The Yanziji Park is also an excellent scenic vantage point for the Changjiang River.

Fig. 5 Simplified geologic map showing the location of the Anjishan pluton in the Ningzhen area, eastern China (after Xu JF et al., 2002, Geology).

Fig. 6 Photograph illustrating the porphyritic texture of the diorite, as well as small dark enclaves.
During the field trip, we will visit the Nanjing Homo Museum, as well as the ape man cave that preserves the bones of Nanjing Homo erectus that lived around 300,000 years ago. In addition, as a Ming Dynasty cultural experience, we will visit the Yangshan Stele park – one of the largest steles in the world, which is Permian in age and composed of micritic limestones originally deposited in hemi-pelagic marine environment. These are famous tourist attractions in Nanjing and are close to the Xianlin campus of Nanjing University.

**Post-conference field trip - 1:**

**Post-collisional granitoids and migmatites in the Dabie orogen, east-central China**

**Time:** Saturday October 19th – Tuesday October 22nd October, 2019  
**Price:** $500 US dollars

The Dabie orogen in east-central China is a continent-continent collisional orogen that was produced by northward subduction of the South China Block beneath the North China Block in the Triassic. It is characterized by the occurrence of ultrahigh-pressure (UHP) metamorphic rocks with index minerals such as coesite and microdiamond. These characteristics demonstrate deep subduction of the continental crust to subarc depths. Numerous post-collisional granitoids were produced in the Early Cretaceous, contemporaneously with migmatites. Relict zircons in both granitoids and migmatites have similar U–Pb ages indicating that they were derived from reworking of the deeply subducted continental crust in the post-collisional stage. The post-collisional granitoids in the Dabie orogen can be subdivided into two magmatic phases. The early phase was emplaced at 130–143 Ma, and exhibits an adakitic affinity and varying degrees of structural deformation. In contrast, the late
phase was emplaced at 120–130 Ma and exhibits neither adakitic affinity nor considerable deformation. Multiple lines of evidence indicate the formation of granulite–migmatite–granite associations in the Early Cretaceous. This four-day field trip will focus on the post-collisional granitoids and migmatites in the Dabie orogen. During the field trip, we will visit representative outcrops of granitic batholiths, a granite-hosted Mo deposit, migmatites, and granulites that occur in the same lithotectonic zone.

Day 1 (Oct. 19):
**Morning:** Depart from Nanjing to Jinzhai County by bus.
**Afternoon:** Depart from Jinzhai County to Shapinggou village. We will visit the Early Cretaceous quartz syenite porphyry and associated Mo deposit, which formed in the post-collisional stage. Afterwards we will go to the hotel in Jinzhai County.

Day 2 (Oct. 20):
**Morning:** Depart from hotel at 8:30 am to Tiantangzhai village and visit the Early Cretaceous Tiantangzhai granitic batholith, which was emplaced at 130–143 Ma. The batholith exhibits an adakitic affinity and varying degrees of structural deformation. Afterwards we will move to Yanzhihe village to visit a migmatite outcrop that also formed in the Early Cretaceous.
**Afternoon:** We will go to the Daoshichong and Manshuihe villages, and examine the migmatites that occur there. These migmatites formed in the Early Cretaceous and associated with the granitic magmatism.
**Evening:** We will arrive at the hotel in Huoshan County.

Fig. 8. Photograph of the Tianzhu Mountain in the Dabie orogen.
Day 3 (Oct. 21):

**Morning:** Depart from the hotel at 8:30 am to visit the Baimajian granitic batholith and the migmatite at Qingtian.

**Afternoon:** We will visit the Zhubuyuan granitic batholith. Both Baimajian and Zhubuyuan granitoids were emplaced at 120–130 Ma, neither of which exhibit the adakitic affinity or considerable deformation.

**Evening:** We will arrive at the hotel in Qianshan County.

Day 4 (Oct. 22):

**Morning:** Depart from hotel at 8:30 am to visit the Tianzhusan granitic pluton, which was emplaced in the Early Cretaceous into the UHP granitic gneisses of Triassic age, and these gneisses have the igneous protoliths of Neoproterozoic age.

**Afternoon:** Depart from Qianshan County to Nanjing by bus.

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**Post-conference field trip - 2:**

*Cretaceous granitic complexes and the Tiger Hill Park in Suzhou, Jiangsu Province*

**Time:** Saturday October 19th – Monday October 21st, 2019

**Price:** $450 US dollars

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Fig. 9. Simplified geologic map of the Dabie orogen showing the distribution of post-collisional magmatic rocks. The insert shows the location of the area within the Triassic Qinling–Dabie–Sulu orogenic belt in east-central China. BHYZ = Beihuaiyang low-T/low-P greenschist-facies zone, NDZ = North Dabie high-T/UHP granulite-facies zone, CDZ = Central Dabie mid-T/UHP eclogite facies zone, SDZ = South Dabie low-T/UHP eclogite-facies zone, SZ = Susong low-T/HP blueschist-facies zone, XMF = Xiaotian–Mozitan fault, WSF = Wuhe–Shuihou fault, HMF = Hualiangting–Mituo fault, TMF = Taihu–Mamiao fault.
This three-day field trip will bring the Hutton Symposium attendants to the Suzhou Mesozoic granitic complex and the volcanic rocks of the Tiger Hill park.

The Suzhou granitic complex is located approximately 10 km west of Suzhou in southeast Jiangsu Province. It was emplaced into Devonian sandstones and is exposed over an area of 11 km². The trip will examine three units of the Suzhou granitic complex, including the amphibole- and biotite-bearing granite, biotite granite, and fine-grained K-feldspar granite.

A unique rock type, glimmerite, is present at the top of the main granite unit and comprises about 30% biotite. Zircon U–Pb ages (~124 Ma) indicate that the Suzhou granitic units were all emplaced in the Cretaceous. These granitic rocks are also enriched in rare metals (e.g., Be-Nb-Ta); which were the rare-metal hosted rocks to be firstly discovered in China.

Suzhou has a long history of over 4000 years and Tiger Hill is regarded as a major landmark of old Suzhou. Here you can see Jurassic rhyolites, as well as several historical heritage sites. (This is a scenic spot — No hammering or sampling)

Fig. 10. A photograph showing a view of the Suzhou granite.

Fig. 11 A view of the 1400-year-old Tiger Hill Pagoda, which was built upon Jurassic rhyolitic rocks.
Day 1 (Oct. 19)

Morning: Depart from Nanjing to Suzhou (3 hrs)

Afternoon: We will visit the Hengshan or Tianpingshan granite in Suzhou.

Here we will examine the late Jurassic / early Cretaceous porphyritic medium-fine-grained K-feldspar granite and porphyritic coarse-medium-grained biotite-K-feldspar granite. The contact between the granites and the wall-rock (sandstones of the Wutong Formation) is very obvious. Roof pendants can also be observed.

Day 2 (Oct. 20)

We will visit various granitic phases that were emplaced around Suzhou.

1) The porphyritic amphibole- and biotite-bearing granite in Bai’eshan near Taihu Avenue;

2) The Jinshan granite;

3) The porphyritic biotite granite in Tianchishan, one typical spot of the main granitic units in the Suzhou complex;

4) The porphyritic Nb-Ta-bearing biotite granite and glimmerite at the top located on the Yangshan East Road (near Xinmin Cemetery).

Day 3 (Oct. 21)

Morning: We will examine the rhyolitic volcanoclastic rocks in Tiger Hill (Huqiu) Park.

A complete profile of the volcanoclastic rocks can be observed, which, from the base upwards include volcanic breccia, gravel tuff-bearing rhyolite, rhyolitic tuff-containing gravel, rhyolitic tuff, and tuffaceous sandstone. Fissure springs can also be observed.

After lunch: We will travel back to Nanjing and visit the Gaozi granodiorite if time permits. Overseas participants can go directly to Shanghai Pudong International Airport.

Welcome to attend the 9th Hutton Symposium on the origins of granites and related rocks!

For more information, please contact:
Dr. Gang Zeng: hutton9nj@126.com, Mobile phone: +86-13914700143.