Announcement for the fourth

Summer School for Planetary Science and Exploration in East Asia (SSPSEEA)

July 17-21, 2019 (Wuhan, China)

Recent space exploration programs led by the countries in East Asia require the active involvement of many planetary scientists with creative and collaborative ideas. Especially for the future development of this field, it is of importance for young scientists to expand not only their scientific capabilities but also mutual communications among countries. The summer school aims to educate outstanding graduate students with majors in planetary science, to bridge friendship among them and to provide the opportunity for future collaboration in East Asia. Three summer schools have been successfully held in China (2016), Korea (2017) and Japan (2018). The fourth summer school of SSPSEEA returns to China.

The theme of the summer school of 2019 is Mars science and exploration.

1 Topic and Lecturers

This year's summer school focuses on Mars Science and Exploration. Two distinguished lecturers, Prof. James Head and Prof. Harry McSween will give lectures regarding Mars science and exploration, such as martian climate, geology, astrobiology, exploration and future missions.

- Prof. James Head, Brown University
- Prof. Harry McSween, University of Tennessee

2 Timeline:

- July 17 (Wed): Registration/Welcome Dinner
- July 18 (Thur) - July 20 (Sat): Lectures, Visit Geological Museum and group discussion (see below)

- July 21 (Sun): end of the summer school

3 Place:

China University of Geosciences, Wuhan
388 Lumo Road, Wuhan
Hubei Province

4 Registration

- Registration fee is US$ 500 or 3000RMB, including lunch, dinner and accommodation

5 Important Dates

- March 1: First announcement opens
- April 1: Application for registration opens
  Registration shall be sent by email to LOC contact for each country
- May 20: Application closes
- May 21-30: Student selection by LOC member
  LOC helps VISA application for students and others if needed
- June 20: Second announcement with timetable
- July 17: SSPSEEA 2017 begins

6 Student allocation by countries

- 5 from Korea, 5 from Japan, 15 from China, 5 from any country: Total: 30

7 Selection of students and supports

- Chinese, Japanese and Korean students are selected by organization committee in each country. Students from other countries are discussed by the organization committee via email.
- Every student is recommended to seek his/her own funding.
- Information required for selection
  Affiliation
  Year in grader school
  Major
  Research interest (a few paragraphs in English)
  Recommendation and financial support letter by advisor

8 In addition to the lectures, group discussion by students will take place during the summer school. All students are divided into 5 or 6 groups to discuss a certain topic related to the theme of the summer school, such as "Scientific goals for future Mars exploration" and “Landing on Mars”. Each group will make a 15-min presentation for all participants.

9 Contacts

- Korean students email to Prof. Young-Jun Choi: yjchoi@kasi.re.kr
- Chinese and other countries students email to Prof. Long Xiao: longxiao@cug.edu.cn
- Japanese email to Prof. Noriyuki Namiki: nori.namiki@nao.ac.jp

RELATED INFORMATION

Followed by this summer school, students are welcomed to participate the Lunar and Deep Space Exploration Forum in Zhuhai, from July 22 to 24. It is an independent workshop, participate shall pay additional registration fee and accommodations for their self.

Contents of the summer school:

1. Head: Geologic evolution of Mars: an overview
2. McSween: Global-scale geochemistry and geophysics of Mars: an overview
3. Head: Volcanism on Mars: theory of ascent and eruption
4. McSween: Igneous rocks on Mars
5. Head: Volcanism on Mars: changes in style with geologic time
6. McSween: Exploration of Gusev crater, a magmatic province
7. Head: Impact cratering on Mars: from the northern lowlands to the current flux
8. McSween: Craters on Mars: shock and hydrothermal metamorphism
9. Head: The climate history and atmospheric evolution of Mars
10. McSween: Sediments and soils on Mars through time
11. Head: The martian water budget and history of water on Mars
12. McSween: Astrobiology and the ALH 84001 meteorite controversy
13. Head: The early climate of Mars: warm and wet or cold and icy?
14. McSween: Mars is not so Earth-like after all
15. Head: The geologic evolution of Mars: outstanding questions and future exploration

Student discussion groups and presentation by students

Topics by Prof. Hap McSween.

1. **Igneous rocks on Mars – shield and pyroclastic volcanoes, sources of information on composition, radiometric and crater counting ages, young (meteorites, types) versus old (rover rocks, types), mineralogy and geochemistry, global comparison with orbital spectroscopy, global magmatic evolution.**
2. **Exploration of Gusev crater – traverse of an ancient magmatic province by the Spirit rover, how rover data can be used to assess igneous processes**
3. **Mars is not so Earth-like after all– basalt-covered world, no felsic rocks (except tridymite) but feldspathic rocks from orbit and Curiosity, MELTS models explain compositions without plate tectonics so no continental crust**
4. **Sediments on Mars – soils have basaltic composition, impact origin and aeolian sorting, mineralogy and textures of sediments and sedimentary rocks from rovers (XRD and amorphous component, clays, dunes, crossbedding), stratigraphy at landing sites from rovers, NWA 7034 breccia is ancient sediment, variation in sedimentary environments with time**
5. **Metamorphism and impacts – craters and shock effects, shock metamorphism in shergottites (shock veins, polymorphs), impact breccias in rover-analyzed strata, hydrothermal metamorphism in craters and orbital detection of metamorphic minerals**
6. **Global-scale geochemistry and geophysics – bulk planet composition (volatiles and water) and how it's estimated, global crustal dichotomy, gravity and magnetics from orbit, ore/mantle dimensions (moment of inertia and InSight), isotopic information on planetary differentiation and the mantle from meteorites**
7. **ALH 84001 and astrobiology – a critical assessment for the purported evidence for life in a martian meteorite; carbonates, nanophase magnetite, organics, pseudo-fossils, an impact model can explain all the evidence.**

Topics by Prof. Jim Head

1. "The Geologic Evolution of Mars: An Overview": This is a summary based on the Carr and Head EPSL paper of the same name. What are the main themes in the geologic evolution of Mars and what are the main outstanding problems? What key areas of investigation can help to constrain or resolve these questions?

2. "Volcanism on Mars: Theory of Ascent and Eruption": How is magma generated on the terrestrial planets and what are the major physical processes in the genertion, ascent and eruption? How can we use the characteristics of volcanic deposits to learn about these physical volcanological processes? How do these process differ on the Moon and Mars?

3. "Volcanism on Mars: Changes in Style with Geologic Time": How do the styles of volcanism change with time on Mars? Is there evidence for a change from explosive to effusive volcanism? What does this mean about the evoution of the mantle and changes in the atmosphere? How does the presence of groundwater and ground ice influence the geomorphology of volcanic deposits? Is Mars still volcanically active today?

4. "Impact Cratering on Mars: From the Northern Lowlands to the Current Flux": How does the impact flux change with time? What is the range of influence of impact cratering on other environmental factors? How can we use impact rcrater size-fequency distributions to learn about lunar chronology and variations in the importance of processes with time? Do impacts have an influence on the environment and atmosphere? Do they excavate lower crustal and mantle material? Did a huge impoact form the northern lowlands of Mars?

5. "The Climate History and Atmospheric Evolution of Mars": Mars may have been "warm and wet" in its early history but today it is a hyperarid, hypothermal desert. What is the history and evolution of the atmosphere? How did the climate vary with time? Could Mars have been "cold and icy" in its early history? We see eviedence fo huge south circumpolar deposits in the Noachian; how did they tget there and why? We see evidence for huge tropical mountain glaciers; how did they get there?

6. "The Martian Water Budget and the History of Water on Mars": Water is a critical component in the geologic, climate and atmospheric evolution of Mars. How much water did Mars start out with? How was it partitioned with time? How much was lost to space? Were there ever oceans in the northern lowlands of Mars or in the large impact basins? We will start from the present and work our way back into history, tracing the water budget for Mars and critically assessing it against geologic processes and environments.

7. "The Early Climate of Mars: Warm and Wet of Cold and Icy?": What is the evidence that Mars was "warm and wet' in its early history? Cound it have been cold and icy, with episodes of heating and melting? We will review the evidence for both end-member cases and address research that might resolve this critical question.

8. “The Geologic Evolution of Mars: Outstanding Questions and Future Exploration”: What are the remaining fundamental questions about Mars? How can we address them with research and exploration? What questions can be addressed in the laboratory, with orbiters, landers, rovers and sample return?