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Joint Request for Information from the Chinese National Space Administration (CNSA) and the European Space Agency (ESA)

Prepared by **HRE-S**

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1 INTRODUCTION

The European Space Agency's (ESA) Directorate of Human Spaceflight and Robotic Exploration (ESA-HRE) and the Chinese National Space Administration lunar Exploration and Space Engineering Center (CNSA-LESEC) are jointly requesting information relating to scientific collaborations for future lunar Exploration between China and in Europe.

The respective lunar exploration programmes of the European Space Agency and the Chinese National Space Administration share a common goal: establishing sustainable lunar exploration activities. For establishing long term sustainable exploration activities, a step-wise approach is envisioned. In first instance the basic capabilities are developed and deployed for prospecting lunar resources, including supporting capacities such as communication relays, orbital missions, landing capabilities and robotic surface exploration capabilities. These basic capabilities will allow for the assembly of platforms and facilities, allowing to conduct lunar surface environment exploration and the demonstration of advanced technologies, including in situ resource utilisation. From the start, these activities allow for early opportunities for both basic scientific research and filling knowledge gaps for future exploration. Building on this, the lunar infrastructure will evolve in long term sustainable platforms, able to carrying out continuous scientific research and exploiting the lunar resources. This vision is especially reflected in ESA's Moon Village concept and CNSA's plans for a robotic lunar station.

To promote collaboration and the interaction between Chinese and European scientists in the area of lunar science, two workshops were co-organised by ESA and CNSA, in Bejing (2017) and in Amsterdam (July 2018). As an outcome of these workshops, it was decided to further cooperation between the European and Chinese scientific communities by investigating:

(1) setting-up an International lunar Science Team, jointly investigating a potential shared long term vision of an International lunar research station,
(2) establishing a CNSA/ESA Virtual Laboratory for lunar Samples and Materials, and
(3) specific opportunities for payload contributions to Chinese or European lunar missions.

2 PURPOSE AND GOALS

The purpose of the present Joint Request For Information (RFI) is to identify and map existing scientific activities and opportunities for cooperation between European and Chinese scientific teams to support the missions of both agencies, enhance the overall scientific return and to prepare for an international lunar research station.
The Request For Information has the following goals:

- Identify and provide visibility of existing collaborations between European and Chinese researchers in the area of lunar science;
- Identify research groups and individuals with an interest in partnering with Chinese/European counterparts;
- Identify research areas of mutual interest for the Chinese and European science communities;
- Identify specific potential international contributions to the science teams of Chinese and European lunar missions.

Important note: The identification of specific opportunities for payload contributions to International (including Chinese), European or Commercial lunar missions is not covered by this RFI. A dedicated self-standing "Request for Information - Lunar Exploration Campaign Science and Technology Payloads" is currently open and can be found here: http://exploration.esa.int/moon/60923-request-for-information-lunar-exploration-campaign-science-and-technology-payloads/ .

3 SCIENTIFIC OBJECTIVES AND INFORMATION SOUGHT

The scientific research of interest includes:

(1) *Science of the Moon*. Scientific investigations with improve our understanding of the origin and evolution of the Earth-Moon system;
(2) *Science on the Moon*. The use of the lunar surface and it's environment as an enabling platform for scientific research in multiple disciplines;
(3) *Science from the Moon*. Using the lunar surface as a platform to perform astronomical observations and observations of the Earth;
(4) *Lunar Resources*. Characterisation of resources available on the Moon including their abundance, distribution and physical properties;
(5) *Exploration enabling research*. Research into aspects of the lunar environment and its effects on humans and systems including dust, plasma, magnetic fields, radiation and physiology.

Information sought includes

- Existing research interests and major scientific achievements;
- Existing European / Chinese research collaborations;
- Research areas of interest for future collaborations;

- Potential science team contributions for planned missions of both agencies;
- Potential contributions to a joint International lunar Research Team and/or a CNSA-ESA Joint Laboratory for lunar Samples and Materials.

4 SUBMISSION, CRITERIA AND EVALUATION

Responses to this Request for Information should be sent to lunarRFI@esa.int by **20 December 2018**.

Submissions submitted in response to the present Joint Request For Information are requested to adhere to the following:

- Submissions are open for members of research institutions and universities in ESA Member States and in China;
- Submissions should be submitted by a lead researcher who is the nominated point of contact for the submission;
- Submissions should be prepared using the template provided in Annex 1;
- Responses should be less than 10 pages; with any additional information provided in annex;
- There is no limit to the number of submissions from any given entity. However, it is requested, that individual submissions are prepared and submitted as separate files.

Once received, ESA and CNSA will review the submissions to inform future potential partnerships and cooperation in areas including joint scientific research activities, a Joint International Lunar Research Team & preparations for an International Lunar Research Station, and a Joint Laboratory For Lunar Samples and Materials. Respondents may be contacted by ESA and CNSA for further information on their submission and may be invited to provide support to future activities. The information provided may also lead to follow-on calls for e.g. collaborative study activities. ESA/CNSA will not release details of information collected through this RFI without prior approval from the respondents.

ANNEX 1: SUBMISSION TEMPLATE

1. Author Details							
Lead author needs to be affiliated with an ESA Member State institution or a Chinese institution							
Lead author							
Organisation & address							
Organisation website							
Contact Email address							
Contact telephone							
(Co-)author(s) background, experience, and affiliation							
2. Information on your activities and interests							
Summary of activities	**Missions**	Please indicate the areas that apply to your research					
		Returned sample analysis	In situ sample analysis	In situ Measurements	Remote sensing	Payload development	Modelling
	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
Overall scientific domain/interest	Science of the Moon						Yes/No
	Science on the Moon						Yes/No
	Science from the Moon						Yes/No
	Lunar Resources						Yes/No
	Exploration enabling research						Yes/No
Research interests and major scientific achievements.	Rationale for the scientific investigation and expected impact in the field						
Existing European / Chinese research collaborations							
Areas of interest for future collaborations							
Potential science team contributions for already planned missions							
Interest in Chinese/European cooperation	I am interested in an International Lunar Science Team researching requirements and architecture for an International Lunar Research Station						Yes/No
	I am interested in an ESA/CNSA Laboratory for lunar Samples and Materials						Yes/No
	I am interested in future China-Europe scientific collaborations						Yes/No
	I am already involved in an China-Europe scientific collaboration						Yes/No
	I am already involved in a China-Europe collaboration related to space instrumentation or payload development						Yes/No
	I am interested in providing a science or payload contributions to a Chinese/European mission (i.e. not from your own agency)						Yes/No
Related publications and/or patents	A list of relevant publications and/or patents						
Support / funding	Information on present or previous funding for the activities						
Additional Information	Any further information deemed relevant to the submission						