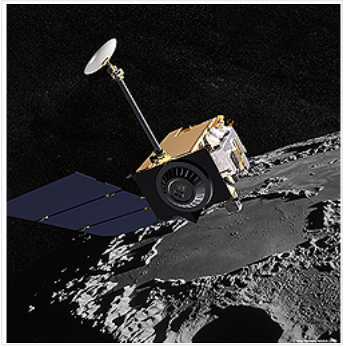
Related links
DLR Institute of Planetary Research

NASA Orbiter mission to the Moon scheduled to launch on 18 June 2009

16 June 2009

DLR is supporting two groups of German researchers – to provide a data platform for future missions



NASA Lunar Reconnaissance Orbiter (LRO) over the lunar surface

Almost 40 years after the first manned Moon landing of Apollo 11 with Neil Armstrong and Edwin 'Buzz' Aldrin, the NASA motto has been: 'Back to the Moon'. No astronauts are going to be landing on this occasion of course. Instead, an unmanned probe carrying seven high-tech instruments will be orbiting Earth's satellite for at least one year at an altitude of 50 kilometres. The Lunar Reconnaissance Orbiter (LRO) is scheduled to launch from the World Space Station at Cape Canaveral in Florida on Thursday, 18 June 2009 at 23:12 Central European Time (CET).

The 'launch window' during which the mission can get under way remains open until 21 June 2009. The transfer time to the Moon will last about four days. The aim of this mission is to research important details of the Moon to hitherto unachieved standards of measuring precision. The results will be of great value to science as well as to manned missions at a later date. On this Moon mission, the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) is supporting two groups of German researchers, one from Berlin and one from Münster. The costs for this NASA mission run to about US$680 million (which equates to roughly €483 million). Germany will be contributing somewhere in the region of €600 000 to the venture.

Scientists from Berlin and Münster are involved on this US mission to the Moon

The Moon mission will launch on a powerful Atlas V rocket. The 'virtual crew' for this mission will include two scientists from Germany and their support staff. The German side will be led by the team of Prof. Jürgen Oberst, from the DLR Institute for Planetary Research in Berlin and the Technical University in Berlin. His research group will be placing their specialist knowledge in the field of geophysical and geodetic interpretation at the service of the mission, primarily for the data generated by LOLA, the Lunar Orbiter Laser Altimeter.

The scientists from Münster are eagerly awaiting the first results from the Moon mission, especially Prof. Harald Hiesinger from the Institute for Planetology at the Westphalian Wilhelms-Universität in Münster. He and his colleagues are delivering their expertise to the field of geological image data evaluation and age determination to the NASA team, specifically for the images to be recorded by the Lunar Reconnaissance Orbiter Camera (or ELROC), on which Prof. Hiesinger is the only German scientist to be involved (as a 'Co-Investigator').

Lunar maps urgently need to be improved

It is fairly staggering to consider that, even 40 years after the Apollo era, mapping of the Moon should still be at a less advanced stage than that of the vastly more distant planet Mars. For future missions to the Moon, including manned ones – for example, in relation to research projects in the fields of physics and astronomy, or as a first stage for later missions to Mars – you need to have high-resolution images, precise to the nearest metre, and accurate maps of potential landing sites which should, if possible, also provide information about usable resources.

The Moon is now the focal point of planetary research

Of particular interest to lunar researchers are the virtually unknown areas at the north and south poles of the Moon, which are either at a high elevation where they are exposed to constant sunlight or which are in permanent darkness. Deep craters, into which virtually no light ever penetrates, may possibly contain small amounts of water ice. For future astronauts, water on the Moon would be a raw material of inestimable value, since they could then save at least some of the trouble and cost of taking water and fuel from the Earth.

One tenth of the Moon's surface to a resolution of half a metre

There are also still some large areas on the far side of the Moon that have yet to be properly documented. This is because the Moon takes as long to rotate around its own axis as it does to complete one orbit of Earth, meaning that its far side cannot ever be observed from Earth. This NASA moon mission will therefore be recording at least ten percent of the surface of the Moon, especially in the two polar regions, to an image resolution standard of half a metre per pixel.

"During the preparations for the forthcoming NASA mission to the Moon, we have been involved in a selection of observation objectives", explains Prof. Oberst when outlining the role of his Berlin-based team. "Once the first measurements reach Earth, we will be assisting the science team with calibration of the cameras and the laser altimeter. We will also be collaborating on correction of the raw data". Prof. Oberst runs the Planetary Geodesy Department (measurement and mapping of planetary bodies) at the Berlin-based DLR Institute for Planetary Research (Institut für Planetenforschung). Among other things, this specialises in the evaluation of the stereo image data used to create digital terrain models.

Prof. Oberst and his team will also be striving to identify, and perform precision measurements of, the landing sites used by previous missions to the Moon. The laser reflectors and radio antennas left behind by the Apollo astronauts are important terrain marker points with precisely known coordinates and these effectively define the Moon coordinate system. The data from the LROC Moon camera and the LOLA Lunar Orbiter Laser Altimeter will deliver the basis for a revised coordinate system for the Moon. "With these new measurements of the Moon, we will be better able to calculate topographical lunar maps, free of distortion", states Prof. Oberst in excited anticipation of the first measurements from the lunar probe. These supply an important platform in the search for suitable landing sites for future lunar missions, especially with regard to water ice in craters at the polar regions.

Logo of the LRO mission

The scientists from Münster are looking forward with great anticipation to results from the NASA mission to the Moon: "After more than five years of intensive preparation and planning, we are now ready for a new and exciting chapter in lunar research which will show the Moon in an entirely new light", states Prof. Hiesinger, the person in charge of geological planetology in Münster. "With this extremely high resolution, we will even be able to detect the small craters which have formed on the Moon's surface since the Apollo era. By comparing the Apollo images with the images from the new lunar camera, we will obtain a significantly better understanding of the current rate of meteor strikes", states Prof. Hiesinger with pleasure. "At the end of the day, these new data will enable us to produce high-precision estimates of the age of the Moon's surface and to establish its mineralogical-geochemical composition – an essential prerequisite for our understanding of the geological and thermal development of the Moon. To a certain extent, we will be putting the Moon under the LROC magnifying glass and will definitely be teasing out new scientific insights, including the question of whether water ice can exist at the poles", adds Prof. Hiesinger.

Artificial impact on the Moon to provide information about the possibility of water ice existing there

Together with the lunar orbiter, an impact body known as the Lunar CRater Observation and Sensing Satellite (LCROSS) will also be setting out on this journey to the Moon. This impact body, weighing about one ton, is expected to separate from the lunar orbiter about four months after the launch date and then plummet down to the Moon's surface, first sending back images of the impact zone of the upper stage of the Atlas Centaur carrier rocket using its on-board cameras and other measuring equipment, before then hitting the Moon itself four minutes later and disintegrating. The aim of this manoeuvre is to induce an artificial impact, which will cause blast rock debris to be blown upwards from the surface of the Moon. This collision impact is expected to send up a cloud of rocky Moon minerals to an altitude of some five to ten kilometres and these may contain clues about the presence of water ice, which can be detected using spectroscopy. The ‘dust cloud’ from this collision impact will probably also be visible from Earth and can be observed using ground-based telescopes.

The Moon is once again the crucible for planetary research

Fifty years after first being explored by probes, the Moon is regaining international stature as a research objective. Back in 1959, the former Soviet Union sent three spacecraft to the Moon. The Moon mission being planned by NASA will be in a synchronous lunar orbit with the Indian Moon mission Chandrayaan-1, which launched in October 2008. Last week, on 11 June 2009, and following successful completion of its mission, the Japanese probe Kaguya, launched in October 2007, was finally deliberately crashed into the southern Earth-facing side of the Moon. The Chinese Moon mission Chang'e-1 was also launched in October 2007 and disintegrated on the lunar surface on 1 March 2009.

Contact

Eduard Müller
German Aerospace Center
Communication Department
Tel.: +49 2203 601-2805
Fax: +49 2203 601-3249

Prof.Dr. Jürgen Oberst
German Aerospace Center
Institute of Planetary Research, Planetary Geodesy
Tel.: +49 30 67055-336
Fax: +49 30 67055-402

Ulrich Köhler
German Aerospace Center
Institute of Planetary Research, Planning and Common Management
Tel.: +49 30 67055-215
Fax: +49 30 67055-402

Prof. Dr. Harald Hiesinger
Westfälische Wilhelms-Universität Münster
Institut für Planetologie
Tel.: +49 251 83-39057
Fax: +49 251 83-36301