Transcript

Planet Mercury – The questions for BepiColombo to answer

JOHANNES BENKHOFF:

Every indication is there that it must be water, but it's not really measured that it is water. And so BepiColombo is a [INAUDIBLE] instrumentation where we, at the end of the day, can say yes, there's water, and we have measured it, and found it, and we may be able to quantify it. That would be something which is really special.

GABRIEL CREMONESE:

I think that first of all, we should understand which is the source. The main source of the water maybe is due to comets. But how can I explain comets so close to the sun?

KARSTEN SEIFERLIN:

I think we would like to understand how planets form in general. And the likeliness of forming a planet that is similar to our own planet.

JUHANI HUOVELIN:

To understand the connection between the Sun and planet Mercury and also that will give us much more information about the connection between the Sun and the Earth. And BepiColombo mission, since we make a long cruise from the Earth to Mercury-- 7 years. We will be able to measure the solar wind, the particles that come from the sun all the time, which is so far unstudied and unmeasured.

LOUISE PROCKTER:

I have to say that one of the things that has fascinated me the most, and I am a geologist, is the magnetic field. Why is the magnetic field shifted northwards by 400 kilometers? That's something that certainly no one on the magnetic team of Messenger has been able to completely explain. There are some theories. I understand it's to do with the dynamo. But that's something that is still an unknown. So that is one of the big questions.

VALENTINA GALLUZZI:

I am a geologist, so I am interested on surface features, such as folds. And the most interesting question is, what is the link between the folds and all the other features on Mercury? We need a keystone model that can link the evolution of the oldest features.

SIMON LINDSAY:

Messenger's orbit meant that, whenever it was looking at the south of the planet, it was also very far away from the planet. So we have a sort of blurry picture of the southern half of the planet, which we'll be able to get a much better picture of because our orbit is symmetrical to the north and to the south. The other thing, from my point of view, that's really interesting is that we've got two spacecraft.

There's the European spacecraft, MPO, which is orbiting the planet and looks at the surface. But there's also this Japanese spacecraft, MMO, which is orbiting in a much higher orbit and is looking at the magnetosphere. So that means that we can get simultaneous observations of the planet's surface and of what's going on in the magnetosphere. Whereas, messenger can only do one at a time.

GABRIEL CREMONESE:

The idea to have 3D images of the entire surface of Mercury. I can study the morphology of the volcanoes. I can study the morphology of their impact crater or some other new feature discovered by Messenger. This is very exciting to me because we realize a completely new concept INAUDIBLE] that never flow on even on the terrestrial satellites.

ADRIAN MARTINDALE:

One paper that's recently been published is this idea that meteorite impacts on the surface are putting carbon onto the surface of Mercury. And that's giving some darkening agent which is making it appear much darker than it should be. If we're very lucky [INAUDIBLE] will be able to answer that question.

JACK WRIGHT:

The planet has a core which is far too large for a planet of its size. So its method of formation, or some point during its history, something cataclysmic has happened. And its composition is entirely the opposite of what planetary scientists would predict. It bears too many volatile elements. Things that in the heat of the sun you would expect to evaporate away. It has far too many of these.

And there are processes happening on the surface of the planet, such as hollow formation, which are dependent on this composition. So basically I'm asking BepiColombo, how did all of this happen?

DAVID ROTHERY:

Well I'm going to give you two things I'd like BepiColombo to find out. And I think it will. One is, what is the volatile material that is being removed to form the hollows where the surface looks so moth-eaten? A very young active process going on. We don't know.

If we find out what it is that's being removed, we'll understand the process. At the moment, we're mystified. That's a very young active thing. What I also think BepiColombo is capable of doing is identifying the areas of the most ancient crust on Mercury. What was the first crust that formed on mercury?

There's something called low reflectance material. We think it might be that. It's dark material. Is it dark because it's carbon rich? And carbon would float in the magma ocean on Mercury when it was a very young hot molten body. But we don't know.

We can measure carbon abundance with the X-ray spectrometer on BepiColombo. The instrument I'm involved in. So that's an important target. Find the oldest crust, then you get closest to the birth of the planet.

ADRIAN MARTINDALE:

One of the most important things that BepiColombo can help us to understand is this high magnesium region. And why it should be there. Why it should be the shape that it is. Where it is. And trying to correlate that with something to do with the evolution of Mercury.

SANTA MARTINEZ:

So the most important thing to come out of BepiColombo will be the fact that we will be able to measure parts of the planet that have not been explored before. So in a more detailed way. And also the fact that we have the two orbitals around the planet. We will have different illumination conditions.

So I think the results will complement all the data that has been taken by the recent Messenger mission. But from different points of view. So I think that will be the main contribution of BepiColombo to the exploration of the planet.

JONATHAN MCAULIFFE:

What I like about Mercury and BepiColombo is that it puts us right into the gravity well of the sun. And we have the radio science experiment on BepiColombo will be used to measure the distance from the other spacecraft from the Earth.

And as well, the rate at which it moves away from us or moves towards us. And because the speed of light is slower close to large gravitational bodies, and since Mercury is closer to the Sun than we are, this will allow us to measure, to a certain extent, the curvature of space time. And to test Einstein's theories of relativity. And this for me is a really cool experiment that we can do onboard the spacecraft.

JIM HEAD:

So we look forward to BepiColombo really filling in a lot of the details of the mineralogy, the chemistry, and the global characteristics of the planet. We kind of see what's going on. But BepiColombo will really help us to essentially fill in all the missing blanks in the history of Mercury.