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At Closest Approach, New Horizons Takes Fresh Look at Jovian System（图）

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[摘要] 27 February, 2007．To make the most of the fly-by opportunity, the New Horizons team came up with a plan for no less than 700 separate observations stretching from early January to March. This is actually a greater number of observations over a more prolonged period of time than the spacecraft will conduct as it races between Pluto and it moons in the summer of 2015. "It is a stress test for the spacecraft" explained New Horizons Principal Investigator Alan Stern of the Southwest Research Institute, checking all its systems under "real life" conditions. If New Horizons performs well during the Jupiter encounter, then there is good reason to expect it will do the same in Pluto eight years down the road. So far it has been close to flawless. "The spacecraft has done everything we asked of it" said Stern, "there are no hardware problems, and everything is working normally."

[关键词] Horizons;spacecraft;solar system

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Among the observation highlights is an in-

depth look at Jupiter's atmosphere Previous spacecraft that have visited Jupiter, including the orbiter Galileo in the 1990's and Cassini in 2000, had recorded a turbulent region in the planet's atmosphere to the northwest of the gigantic storm known as the Great Red Spot. When planning the encounter the New Horizons team decided to follow up on the discovery with close observations of this region, in the hope of learning more about the dynamics of the Jovian atmosphere. Much to their surprise, however, as the spacecraft approached Jupiter it became clear that the turbulence had all but disappeared, and the region is as calm as it was when first observed by Voyager in 1979. According to Stern, howev

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dimensional images from deep within Jupiter's atmosphere. "Instead of studying a disturbance we will be looking at the structure of Jupiter's main atmosphere" said Stern.

New Horizons will also be looking at Jupiter's rings, first detected by the orbiter Galileo, searching for small moons orbiting inside them. Scientists know they are there, because the rings would not survive without them: the dust grains that compose Jupiter's rings are too small to remain in orbit for long, before drifting into space or falling into the planet. If the rings persist then their supply of dust grains is being regularly replenished, and that almost certainly means that tiny moons within the rings are constantly shedding these particles. New Horizons will try to find them.

Another major target for New Horizons is Io, Jupiter's volcanic moon. Io's surface is constantly being made and remade through the lava deposits streaming from its many active volcanoes. New Horizon's Ralph imager will make a complete global map of Io, making it possible for scientists to see how much the fiery moon has changed since the previous global map was produced in 2000

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2001. Ralph will also produce a temperature map of volcanoes on the moon's night side, which will help scientists determine the composition of Io's lava flows. The view of Io's volcanic plumes has long been a favorite among space enthusiasts, and New Horizons' will supply it share of these spectacular images, studying the manner in which they distribute minerals across the moon's surface and atmosphere. A beautiful view of the plumes of the volcanoes Tvashtar and Prometheus was captured by New Horizons on February 26 from a distance of 4 million miles.

Io's lively volcanoes do more than constantly repave the pock-marked surface of their moon. Every single second they also send one ton

(!) of plasma into Jupiter's magnetosphere, where it is trapped and forms a donut-

shaped cloud around the planet. One of New Horizons main goals in the Jupiter encounter is to study this magnetosphere, and in particular the "magnetotail" which stretches for hundreds of millions of miles from Jupiter towards the orbit of Saturn. New Horizons will travel for several months down this tail, providing the first close look ever of the magnetotail of a planet. Stern and his colleagues estimate that New Horisons' trajectory will take it around 150 million kilometers down the magnetotail, but they can't be sure exactly; that is because a magnetotail, like other more familiar tails, can flap unexpectedly.

These are only samples from the complete list of 700 observations the New Horizons is currently undertaking as it speeds by the King of the Planets. Eager though they are to get their hands on New Horizons discoveries, scientists will have to be patient. Only a thin stream of "real time" data will reach Earth in the next few days, providing samples of observations and assurances that the spacecraft is operating normally. The mass of the data, or "the data fire hose" as Stern calls it, will be stored aboard the spacecraft for the moment. It will arrive on Earth gradually over a month as New Horizons speeds away from Jupiter towards its ultimate destinations –

Pluto and the Kuiper belt.

If it is to continue on its way to Pluto as planned, the spacecraft must pass through a "keyhole" in space, only 300 kilometers (190 miles) square in size. If we consider that New Horizons travels 23 kilometers (14 miles) every second, and 1380 kilometers (860 miles) every minute, and that it has been traveling at such speeds for over a year with hardly any change of course, one can begin to appreciate what a remarkable feat of marksmanship it is for the spacecraft to thread its way through this keyhole. And yet, New Horizons is poised to do just that.

New Horizons holds a special place in the hearts of Planetary Society members. Time after time, when the mission to Pluto was on the budgetary chopping block, Planetary Society members mobilized, launching a grassroots campaign to save the mission. And as we watch the spacecraft race through space, performing flawlessly and providing a plethora of information on our solar system, we know that in no small part –

we made it happen. The Planetary Society also invited the public to contribute to the New Horizons Virtual Time Capsule, which will be sealed until the spacecraft reaches its destination. New Horizons still has long journey ahead of it before it closes in on Pluto and its three moons. When that day comes in the summer 2015 many things will have changed in our world, but of one thing we are certain: The Planetary Society and its members will be watching New Horizons, and our hearts will be with it, at the edge of the solar system.

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