Embattled mega-telescope gets back-up site in Canary Islands

Continued opposition at Hawaii construction site drives the Thirty Meter Telescope's backers to consider a plan B.

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The Thirty Meter Telescope faces a perilous path to completion.

The Thirty Meter Telescope (TMT) could move to La Palma, in Spain's Canary Islands, if opposition from some Native Hawaiians prevents the next-generation observatory from being built atop the Hawaiian mountain of Mauna Kea, as planned.

The decision, announced on 31 October by the TMT International Observatory's board of governors, creates an alternative path forward for the troubled mega-telescope. The project's opponents blocked access to the Mauna Kea site in April 2015, halting construction, although work on the telescope's components continues at sites around the world. Some Native Hawaiians regard the decision to build the TMT on Mauna Kea as the continued desecration of a sacred mountain top that hosts 13 other telescopes, some of which are being decommissioned.

In December, Hawaii's state supreme court nullified the permit that would have allowed construction of the TMT to proceed. A fresh round of hearings began this month, in which TMT officials are seeking a new permit from the state's Board of Land and Natural Resources.

"We'll be watching the situation in Hawaii carefully, hoping that continues to move forward," says Fiona Harrison, an astrophysicist at the California Institute of Technology in Pasadena and a member of the TMT board of governors. "And the success of those efforts will determine whether we can build the TMT in Hawaii."

Running out of time

Mauna Kea remains the TMT board's preferred site, but the path to build the US$1.5-billion telescope there is narrowing. TMT officials want to start construction no later than April 2018. But the legal battle surrounding the telescope could drag on for months.

"We just want a mountain to start building on," says Christophe Dumas, a scientist with the TMT International Observatory in Pasadena.

The Observatorio del Roque de los Muchachos, on La Palma, won out for the second-place spot over San Pedro Mártir on Mexico's

Baja California peninsula and two sites in Chile. Existing infrastructure — such as a road going up the mountain, and dormitories for work crews — helped to tip the balance in La Palma's favour, Harrison says. The exact site has not yet been decided, but there is a spot just outside the current observatory boundaries that could work for the TMT, she says. "We could really move forward quickly should things not work out" at Mauna Kea, she says.

Observing conditions

Because La Palma's elevation of 2,250 metres is substantially lower than that of the 4,050-metre-high Mauna Kea site, there is more atmosphere between it and the stars that the TMT would observe. This means there would be more water vapour in the telescope's line of sight that might block mid-infrared wavelengths and degrade measurements.

Mid-infrared instruments, such as some proposed for the TMT, can penetrate dust-obscured areas, such as the centres of galaxies and star-forming regions. Harrison says that the telescope's operators might be able to accommodate mid-infrared astronomy by scheduling observations when conditions are best, and by developing sophisticated adaptive optics to sharpen measurements.

Matt Mountain, president of the Association of Universities for Research in Astronomy in Washington DC, notes that other organizations have chosen Mauna Kea because conditions there allow infrared observing. But such considerations might not be as important now, because the James Webb Space Telescope — which works in the infrared — is slated for launch in 2018.

The TMT board chose Mauna Kea in 2009 because of its superb observing conditions, including cool temperatures and low humidity. The runner-up at that time was Cerro Armazones in Chile, which the European Extremely Large Telescope chose the following year for its planned 39-metre observatory. A second large facility, the 24.5-metre Giant Magellan Telescope, is under way on a different Chilean mountain.

Hawaii battle ongoing

Some Native Hawaiians have long objected to astronomical development atop Mauna Kea. Protests against the TMT have taken on new significance as part of a push to restore sovereignty to Native Hawaiians — and a broader movement to recognize indigenous rights.

The Hawaiian proceedings about the future of the Mauna Kea site continue. Retired judge Riki May Amano is hearing testimony from both sides, despite complaints from TMT opponents that Amano has a conflict of interest because her family had maintained a membership in an astronomy-education centre in Hilo.

The hearings are expected to conclude in November, at which point the state's Board of Land and Natural Resources will decide again whether to issue a construction permit. No matter the outcome, that decision is likely to be appealed to the state supreme court, a process that could take months.

Work continues on the TMT's components outside of Hawaii. Meanwhile, the University of Hawaii has announced plans to remove 3 of Mauna Kea's 13 summit observatories, in response to an order in May 2015 from Hawaii's governor. The university leases land atop the mountain as a science reserve for astronomy — an arrangement set to continue through 2033.

Despite the TMT's woes, another big telescope destined for Hawaii received a rare bit of good news this month. On 6 October, the state supreme court upheld the permit that allowed the Daniel K. Inouye Solar Telescope to be built atop the mountain of Haleakalā on the neighbouring island of Maui. Its enormous telescope enclosure has already been built on the mountain, although its insides and instrumentation must be completed before the facility opens in 2019.

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