

now vindicate Planck's findings and produce a very similar value for the Hubble constant.

But neither result matches direct measurements of the Hubble constant – a discrepancy that has become known as the Hubble-constant tension. Astronomers who use the brightness of particular stars and supernova explosions, collectively called standard candles, to calculate the expansion rate find that galaxies rush away from each other roughly 10% faster than CMB maps predict.

Many researchers had hoped that, as techniques became more accurate, the gap would shrink. Instead, narrowing error bars for each type of study have only made the inconsistency more significant.

The ACT is the first ground-based CMB experiment that could have challenged Planck's results, says Erminia Calabrese, a cosmologist at Cardiff University, UK, who led the analysis of the data. The telescope's design and location, just inside the tropics, enables it to map more of the CMB sky than can other ground-based or balloon-borne telescopes, which have typically been limited to smaller regions.

Mapping the sky on a large scale is crucial for calculating the key parameters of cosmic expansion, Calabrese says. Another strength of the ACT was that an upgrade in 2013 allowed it to make precise measurements of the polarization of the CMB radiation, says principal investigator Suzanne Staggs at Princeton University in New Jersey. Polarization data reveal the effect of galaxies in the foreground on how the CMB travels, and help to make the cosmological measurements more precise.

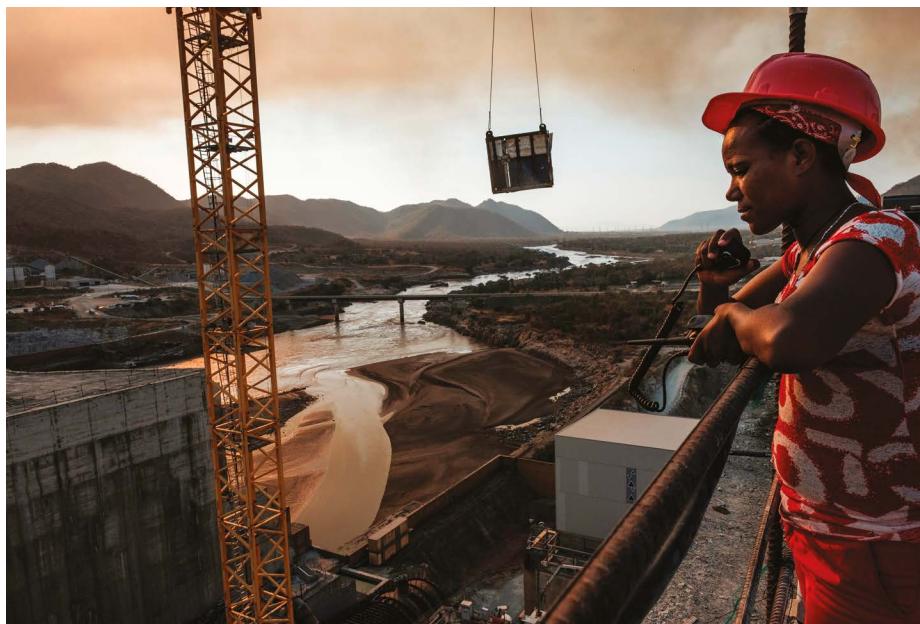
"For the first time, we have two data sets measured independently and with enough precision to make a comparison," Calabrese says. Having also been a member of the Planck team, she says it was a relief to find that the two experiments' Hubble-constant predictions agreed to within 0.3%.

This agreement between ACT and Planck is "a truly major milestone", says Paul Steinhardt, a theoretical physicist at Princeton University. "I am very impressed by the quality of the new data and their analysis," he adds.

Adam Riess, an astronomer at Johns Hopkins University in Baltimore, Maryland, who has led much of the cutting-edge work on standard candles, says that the ACT data's agreement with Planck is "reassuring" and "a testament to the quality of the experimenters' work and carefulness".

But the tension over the Hubble constant remains. Techniques developed by several teams could help to resolve it. Steinhardt thinks that the measurements will eventually converge as experimentalists perfect their methods.

But Riess says that perhaps it is cosmology's standard model that is wrong instead. "My gut feeling is that there's something interesting going on."



EDUARDO SOTERAS/AFP/GETTY

Ethiopia's Grand Renaissance Dam is two-thirds built.

ROW OVER GIANT NILE DAM COULD ESCALATE, EXPERTS WARN

Ethiopia wants to start filling the dam's reservoir this summer. Egypt calls the project an 'existential threat'.

By Antoaneta Roussi

Researchers are warning that Egypt, Ethiopia and Sudan need to move faster to resolve a long-running dispute over the building of Africa's largest hydroelectric dam.

Seasonal rains are starting to fill the reservoir of the Grand Ethiopian Renaissance Dam, set to become Africa's largest hydroelectric power plant, on the Blue Nile river. Two-thirds of the dam has been built.

Egypt's government, which has opposed the project since it began in 2011, calls the dam an 'existential threat'. It is concerned that the dam will reduce the nation's water supplies, which come almost entirely from the Nile, particularly during times of drought.

Ethiopia, by contrast, calls the dam an 'existential necessity'. Its citizens – whose taxes mostly paid for the dam's nearly US\$5-billion price tag – are anticipating electric power, a boost for industry and new jobs. The World Bank estimates that nearly half the country's population lacks access to electricity.

According to hydrologists and political scientists, already-strained relations between Ethiopia, Egypt and Sudan could worsen if a deal isn't quickly reached.

South Africa's President Cyril Ramaphosa has been hosting talks on behalf of the African Union, and the three nations have resolved some key issues, including the volume of water and time needed to complete the fill. But the latest talks ended without agreement on 13 July.

There is still an impasse over what would happen in the event of a drought, as well as some other technical and legal issues. Ethiopia is keen for reservoir filling to begin properly during its rainy season of July and August. From Ethiopia's perspective, if it misses the summer window, it would have to wait another year to start filling.

In a normal-to-wet year, Ethiopia, Egypt and Sudan have effectively agreed that, after an initial 2 years of filling, the dam's reservoir would reach 18 billion cubic metres (b.c.m.). After that, Ethiopia would retain around 10 b.c.m. each year to operate electric power from the dam if conditions are normal to wet, researchers familiar with the talks have told *Nature*.

In the case of a drought year, the filling period would extend to seven years. However, the three sides have yet to agree on what to do in this case – one of the sticking points in the current negotiations.

According to Kevin Wheeler at the Environmental Change Institute at the University of

News in focus

Oxford, UK, there is no single standard definition of 'drought'. But the countries have agreed that when the flow of Nile water to the dam falls below 35–40 b.c.m. per year, that would constitute a drought. In such an event, Egypt and Sudan want Ethiopia to release some of the water stored in the dam's reservoir.

Representatives of both countries say this would still allow Ethiopia to continue generating electricity. But Ethiopia prefers having the flexibility to decide how much water to release during drought conditions, because more water equates to more power per unit of water. The country also wants to reduce the risk of running the dam's reservoir to low levels.

Law in action

The agreement's legal status and how disputes will be resolved are other impasses. Egypt wants any final agreement to have the status of an international treaty. It also wants a third party, such as the African Union or the United Nations, to resolve any disputes. Ethiopia prefers disagreements to be settled between the riparian states, with no foreign parties involved.

Egypt and Ethiopia do not have a formal water-sharing agreement. Under the 1959 Nile Waters Agreement between Egypt and Sudan, Egypt takes 55.5 b.c.m. of water from the Nile each year, and Sudan takes 18.5 b.c.m. That agreement was reached shortly before Egypt began constructing its own mega dam, the Aswan High Dam. Ethiopia, however, was not part of this agreement and therefore does not recognize it.

Ashok Swain, who studies peace and conflict at Uppsala University in Sweden, says that the countries might decide to sign a short-term agreement, perhaps lasting a year, if they are unable to agree on all outstanding issues.

"There have been several examples of one-year agreements in these kinds of treaties, like the 1975 one of India and Bangladesh on the Ganges," he says. "The two countries couldn't agree how to operate, so they started with one year first and then extended to 3, 5 and then 30 years, which I think could be the case [here] as it will buy both sides some time."

Mohamed Fouad, a member of the Egyptian parliament, told *Nature* that if Ethiopia needs power, then involving a third party, such as the World Bank, in financing Ethiopian power stations could help to break the stalemate.

Egypt's water minister Mohamed Abdel Aty has proposed that Egypt could potentially share electricity with Ethiopia, similar to its arrangements with other countries such as Sudan. Such a proposal would mean that Ethiopia has access to energy and so could slow the filling of the dam until the nations reach an agreement, Fouad says. "One nation's need for electricity is pinned to another nation's need for water."

Swain says a military confrontation is unlikely, but that goodwill between the countries is in short supply.



Volunteers in Barcelona, Spain, prepare food packages for vulnerable people.

XINHUA NEWS AGENCY/SHUTTERSTOCK

PANDEMIC SPEEDS MAJOR TEST OF UNIVERSAL BASIC INCOME

Economists welcome chance to see whether giving people no-strings cash can improve livelihoods.

By Carrie Arnold

Spain's government has started what might just be remembered as the world's biggest economics experiment. On 15 June, spurred by the coronavirus crisis and its economic fallout, it launched a website offering monthly payments of up to €1,015 (US\$1,145) to the nation's poorest families.

The programme, which will support 850,000 households, is the largest test yet of an idea called universal basic income (UBI) – in which people are given a cash payment each month to spend however they choose. It has often been discussed, but never satisfactorily tested, and economists around the world are watching closely to see what the impact of the scheme on livelihoods will be.

The move comes at a time of unprecedented economic turmoil brought on by the coronavirus pandemic. Spain was one of the hardest-hit countries in the early days of the outbreak. The nationwide lockdown curbed the spread of the virus, but came at a staggering financial cost. Millions of people lost their jobs as the economy shrank rapidly, putting many of the most vulnerable citizens at risk.

"If there's ever an opportunity to try to push for some sort of income floor that can

be paid out in cash to people, this is the time to do it," says Damon Jones, an economist at the University of Chicago in Illinois.

Even before the coronavirus struck, the country's left-leaning coalition government had proposed the scheme – a variant of UBI called guaranteed minimum income – but the resulting economic emergency brought the timeline forward. The system will allocate a fixed monthly sum to each eligible household – no strings attached. The aim is to provide recipients with enough cash to meet their basic needs without trapping them in poverty in the same way as existing welfare programmes that offer support only to those without jobs or other income, says Spain's social security minister, José Luis Escrivá.

He estimates that the scheme will cost the government at least €3 billion per year. "There is a huge interest in Spain for this," he says. The website where people can apply for grants launched on 15 June and received more than 50,000 applications in the first 4 hours.

Several other countries have experimented with UBI, but until now, most trials have been limited to a few hundred or thousand people. Spain's scheme – which was passed by the Cabinet on 29 May – is the first to be rolled out nationwide. For researchers, it could provide a real-world opportunity to study the impacts