testing alternative ideas to explain how things might be different at night, when a stable layer of cool air typically prevents warm air from rising and churning to generate storms.

One idea involves a fast-moving ribbon of air called a low-level jet, which can form when air over higher elevations cools relative to that at lower elevations, setting up a pressure gradient. Computer simulations suggest that these jets can lift moist air above the stable layer, where they can feed storms (A. J. French and M. D. Parker *J. Atmos. Sci.* **67,** 3384–3408; 2010).

"But sometimes there are just nights when you have no obvious forcing like a low-level jet," says Rita Roberts, an atmospheric scientist at the National Center for Atmospheric Research in Boulder. Other atmospheric patterns may be at play, such as wave-like structures called bores that PECAN is also hunting this summer.

Project storm-chasers have had only mixed success, observing lots of low-level jets but not as many full thunderstorm complexes as they would have liked. "It's been a frustrating year," says Matthew Parker, an atmospheric scientist at North Carolina State University in Raleigh.

Each day, the team decides where to deploy an armada of trucks, vans and aeroplanes laden with instruments including radar, radiosondes and balloons. The scientists fan out ahead of where they think the storms will move, and hope to intercept them as they sweep through.

"If we could forecast them precisely, we wouldn't need to be out here."

"We have to wait for nature to provide us with storms of different types," says Joshua Wurman, president of the Center for Severe Weather Research.

Since PECAN began on 1 June, Wipf and Morganti have clocked up long hours collecting meteorological data ahead of approaching storms. This means a lot of driving along country roads in the dark and the rain — not exactly the glamorous stereotype of storm-chasing. "Everybody always thinks it's just like *Twister*," Wipf says. "It's not."

On 24 June, they find themselves in western Illinois, swerving to avoid low-hanging trees that could take out the towering measurement mast fixed to the front of their truck. "Tree tree tree!" Wipf shouts, just before Morganti swings the wheel yet again.

At 11:29 p.m., Wipf gets a text ordering them to deploy five stations along the side of the road, spacing them every 2 kilometres to gather data on temperature, relative humidity, wind speed and pressure. They wrestle two stations out of the truck before lightning begins hitting too close and they are forced to stop for the night.

In the end, it doesn't really matter that the stations are not up and running. The worst storms pass about 80 kilometres west of the pair, because PECAN forecasters have failed once again to predict how the night's events will unfold.

"If we could forecast them precisely," says Wurman wistfully, "we wouldn't need to be out here." ■

COMPUTING

Europe sets its sights on the cloud

Three large labs hope to create a giant public–private computing network.

BY ELIZABETH GIBNEY

From astronomy to genomics, scientists are increasingly storing and studying their data sets on shared remote 'cloud' computing servers, accessed through the Internet. Three of Europe's biggest research labs now want to help academics by working with commercial firms to create a continent-wide cloud-computing portal — and they are hoping to get backing from the European Commission.

Many researchers find cloud computing to be more flexible and efficient than buying expensive hardware — they can rent servers from firms such as Amazon and Google when they need a burst of power for an intensive computation, for example (see *Nature* **522,** 115–116; 2015). Despite the advantages, some academics are concerned about security and reliability when storing their data on outside servers, says Bob Jones, a computer scientist at CERN, Europe's particle-physics lab near Geneva, Switzerland.

Jones thinks that a single portal combining offerings from commercial providers and publicly funded infrastructure could solve some of these problems, and ultimately increase access to key data sets. Since 2012, CERN — with the European Space Agency and the European Molecular Biology Laboratory (EMBL) in Heidelberg, Germany — has been developing a test-bed system called the Helix Nebula. Run for two years with funding from the European Commission, and coordinated by Jones, the initiative has since evolved into a portal involving 30 different cloud providers, known as the Helix Nebula Marketplace (HNX). CERN has simulated particle collisions on the platform, and EMBL has used it to analyse genetic sequences, including some moved from Amazon's cloud, says Rupert Lück, EMBL's head of IT services.

Ambitions to expand were bolstered when, in May, the European Commission announced plans to fund a Europe-wide 'research cloud'. "The commission likes the idea of open science," Jones said on 26 June at a meeting in Geneva to discuss a European Open Science Cloud. "What we have to do now is take that enthusiasm from the public sector, the private sector and European institutions, and put it in place."

The commission is not specifically backing Jones' plan: it will launch its call for proposals in 2016 and says there are "a range of possibilities for business models". It wants a virtual platform to host data and encourage their analysis and reuse across disciplines and borders. Climate and satellite data, for instance, "represent a goldmine for research, innovation and new business opportunities", says the commission.

A European cloud for researchers built around the HNX would be a single gateway through which users could access cloud services and open research data from existing public infrastructure — for example, through

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NATURE PODCAST

Unicellular eyes, ethical robots and sex-morphing lizards nature.com/nature/podcast the European Grid Infrastructure Federated Cloud, a network of largely publicly funded cloud services such as the Supercomputing Centre of Galicia in Spain — and through companies, such as Cloudwatt, a provider based in Paris. A pilot platform would start relatively small, with the computing equivalent of 100 million hours of processor time and some 10 petabytes of storage (1 petabyte is 10^{15} bytes). The network would need to expand to 20 times this size to serve the whole of Europe, says Jones.

An advantage of such a system is that all data would be stored, protecting them if a provider were to stop operating, says Jones. And the system's standard terms would make it quicker and easier for researchers to sign up to and access, he says. "The most valuable thing for researchers is their data. If we're going to convince researchers to trust cloud services, we really do need this hybrid model." A federated European cloud could also deal with restrictions that require sensitive data to be analysed in its country of origin, says Lück.

In the United States, researchers and funders are also thinking about how to increase access to data stored on clouds variously funded by the US National Science Foundation, individual institutions and companies, says David Lifka, director of the Cornell University Center for Advanced Computing in Ithaca, New York, which runs a service called Red Cloud. "Sharing cloud capacity is the next logical step," he says. But creating a system that is fair and does not constrain users is not easy, he adds.

US computer giants Google, Amazon and Microsoft are notably absent from the HNX. Mark Skilton, who studies information systems at the University of Warwick, UK, suggests that the focus on European companies may reflect the commission's desire to boost homegrown providers. "The issue is whether this will suffer for the lack of Amazon and Google scaling," he says. Some researchers see the likes of Amazon and Google as a route to open data. Writing in *Nature* this week, genomics researchers call on funding agencies to expand access to major data sets by paying to place them in popular cloud services (see page 149).

The biggest barrier to cloud computing for small labs is the cost of accessing high-quality cloud resources, says Skilton. If the negotiating power of a European initiative can bring costs down, many could benefit, he says. But it is unclear whether commercial providers will play ball, says Lifka. Although firms often give trial periods for free, "from my experience, their price is their price", he says. Getting everyone — especially commercial partners — to work under the same governance system and according to the same conditions will be an organizational challenge, says Skilton. ■

NIGEL CATTLIN/VISUALS UNLIMITED/CORBIS

The bright-line brown eye (*Lacanobia oleracea*) is just one of many potential tomato residents.

BOTANY

Plant dwellers take the limelight

Researchers seek holistic view of botanic ecosystems.

BY HEIDI LEDFORD

A plant may be rooted in place, but it is never lonely. There are bacteria in, on and near it, munching away on their host, on each other, on compounds in the soil. Amoebae dine on bacteria, nematodes feast on roots, insects devour fruit — with consequences for the chemistry of the soil, the taste of a leaf or the productivity of a crop.

From 30 June to 2 July, more than 200 researchers gathered in Washington DC for the first meeting of the Phytobiomes Initiative, an ambitious proposal to catalogue and characterize a plant's most intimate associates and their impact on agriculture. By the end of the year, attendees hope to carve out a project that will apply this knowledge in ways that will appeal to funders in industry and government.

"We want to get more money," says plant pathologist Linda Kinkel at the University of Minnesota in St Paul. "But beyond that, let's just all try to talk the same language and come up with some shared goals."

The effects of microbes and insects on plant health have often been studied in pairs — one microbe and one plant. But advances in genetic sequencing have opened up ways to survey entire microbial communities. Meanwhile, engineers and computational biologists have developed better ways to manage large data sets, merge disparate recordings into cohesive models and rapidly collect information on the physiology of every plant in a field. "Historically, we haven't had the capacity to look at this as a system," says plant pathologist Jan Leach at Colorado State University in Fort Collins. "Now we need to begin to integrate not just the data about the plant and the plant's environment, but all the biological components in that system."

Leach coined the term phytobiome in 2013, at a retreat about food security. She defines ▶