

## The Other Climate Theory

Al Gore won't hear it, but heavenly bodies might be driving long-term weather trends.

By ANNE JOLIS, THE WALL STREET JOURNAL - SEPTEMBER 7, 2011

In April 1990, Al Gore published an open letter in the New York Times "To Skeptics on Global Warming" in which he compared them to medieval flat-Earthers. He soon became vice president and his conviction that climate change was dominated by man-made emissions went mainstream. Western governments embarked on a new era of anti-emission regulation and poured billions into research that might justify it. As far as the average Western politician was concerned, the debate was over.

But a few physicists weren't worrying about Al Gore in the 1990s. They were theorizing about another possible factor in climate change: charged subatomic particles from outer space, or "cosmic rays," whose atmospheric levels appear to rise and fall with the weakness or strength of solar winds that deflect them from the earth. These shifts might significantly impact the type and quantity of clouds covering the earth, providing a clue to one of the least-understood but most important questions about climate. Heavenly



bodies might be driving long-term weather trends.

**A cutting-edge physics experiment at the European Organization for Nuclear Research has scientists' heads in the clouds.**

The theory has now moved from the corners of climate skepticism to the center of the physical-science universe: the European Organization for Nuclear Research, also known as CERN. At the Franco-Swiss home of the world's most powerful particle accelerator, scientists have been shooting simulated cosmic rays into a cloud chamber to isolate and measure their contribution to cloud formation. CERN's researchers reported last month that in the conditions they've observed so far, these rays appear to be enhancing the formation rates of pre-cloud seeds by up to a factor of 10. Current climate models do not consider any impact of cosmic rays on clouds.

Scientists have been speculating on the relationship among cosmic rays, solar activity and clouds since at least the 1970s. But the notion didn't get a workout until 1995, when Danish physicist Henrik Svensmark came across a 1991 paper by Eigil Friis-Christensen and Knud Lassen, who had charted a close relationship between solar variations and changes in the earth's surface temperature since 1860.

"I had this idea that the real link could be between cloud cover and cosmic rays, and I wanted to try to figure out if it was a good idea or a bad idea," Mr. Svensmark told me from Copenhagen, where he leads sun-climate research at the Danish National Space Institute.

He wasn't the first scientist to have the idea, but he was the first to try to demonstrate it. He got in touch with Mr. Friis-Christensen, and they used satellite data to show a close correlation among solar activity, cloud cover and cosmic-ray levels since 1979.

They announced their findings, and the possible climatic implications, at a 1996 space conference in Birmingham, England. Then, as Mr. Svensmark recalls, "everything went completely crazy. . . . It turned out it was very, very sensitive to say these things already at that time." He returned to Copenhagen to find his local daily leading with a quote from the then-chair of the U.N. Intergovernmental Panel on Climate Change (IPCC): "I find the move from this pair scientifically extremely naïve and irresponsible."

Mr. Svensmark had been, at the very least, politically naïve. "Before 1995 I was doing things related to quantum fluctuations. Nobody was interested, it was just me sitting in my office. It was really an eye-opener, that baptism into climate science." He says his work was "very much ignored" by the climate-science establishment—but not by CERN physicist Jasper Kirkby, who is leading today's ongoing cloud-chamber experiment.

On the phone from Geneva, Mr. Kirkby says that Mr. Svensmark's hypothesis "started me thinking: There's good evidence that pre-industrial climate has frequently varied on 100-year timescales, and what's been found is that often these variations correlate with changes in solar activity, solar wind. You see correlations in the atmosphere between cosmic rays and clouds—that's what Svensmark reported. But these correlations don't prove cause and effect, and it's very difficult to isolate what's due to cosmic rays and what's due to other things."

In 1997 he decided that "the best way to settle it would be to use the CERN particle beam as an artificial source of cosmic rays and reconstruct an artificial atmosphere in the lab." He predicted to reporters at the time that, based on Mr. Svensmark's paper, the theory would "probably be able to account for somewhere between a half and the whole" of 20th-century warming. He gathered a team of scientists, including Mr. Svensmark, and proposed the groundbreaking experiment to his bosses at CERN.

Then he waited. It took six years for CERN to greenlight and fund the experiment. Mr. Kirkby cites financial pressures for the delay and says that "it wasn't political."

Mr. Svensmark declines entirely to guess why CERN took so long, noting only that "more generally in the climate community that is so sensitive, sometimes science goes into the background."

By 2002, a handful of other scientists had started to explore the correlation, and Mr. Svensmark decided that "if I was going to be proved wrong, it would be nice if I did it myself." He decided to go ahead in Denmark and construct his own cloud chamber. "In 2006 we had our first results: We had demonstrated the mechanism" of cosmic rays enhancing cloud formation. The IPCC's 2007 report all but dismissed the theory.

Mr. Kirkby's CERN experiment was finally approved in 2006 and has been under way since 2009. So far, it has not proved Mr. Svensmark wrong. "The result simply leaves open the possibility that cosmic rays could influence the climate," stresses Mr. Kirkby, quick to tamp down any interpretation that would make for a good headline.

This seems wise: In July, CERN Director General Rolf-Dieter Heuer told *Die Welt* that he was asking his researchers to make the forthcoming cloud-chamber results "clear, however, not to interpret them. This would go immediately into the highly political arena of the climate-change debate."

But while the cosmic-ray theory has been ridiculed from the start by those who subscribe to the anthropogenic-warming theory, both Mr. Kirkby and Mr. Svensmark

hold that human activity is contributing to climate change. All they question is its importance relative to other, natural factors.

Through several more years of "careful, quantitative measurement" at CERN, Mr. Kirkby predicts he and his team will "definitively answer the question of whether or not cosmic rays have a climatically significant effect on clouds." His old ally Mr. Svensmark feels he's already answered that question, and he guesses that CERN's initial results "could have been achieved eight to 10 years ago, if the project had been approved and financed."

The biggest milestone in last month's publication may be not the content but the source, which will be a lot harder to ignore than Mr. Svensmark and his small Danish institute.

Any regrets, now that CERN's particle accelerator is spinning without him? "No. It's been both a blessing and the opposite," says Mr. Svensmark. "I had this field more or less to myself for years—that would never have happened in other areas of science, such as particle physics. But this has been something that most climate scientists would not be associated with. I remember another researcher saying to me years ago that the only thing he could say about cosmic rays and climate was it that it was a really bad career move."

On that point, Mr. Kirkby—whose organization is controlled by not one but 20 governments—really does not want to discuss politics at all: "I'm an experimental particle physicist, okay? That somehow nature may have decided to connect the high-energy physics of the cosmos with the earth's atmosphere—that's what nature may have done, not what I've done."

Last month's findings don't herald the end of a debate, but the resumption of one. That is, if the politicians purporting to legislate based on science will allow it.

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