

### ENERGY FROM A BROWN DWARF STAR

Mr. DOMENICI. Mr. President, I rise today to congratulate scientists working with the Very Large Array, VLA, astronomical radio observatory near Socorro, New Mexico on detecting energy from a brown dwarf star. For over twenty years, the VLA has provided significant scientific knowledge to astronomers.

Working on a student project, scientists, graduate, and undergraduate students discovered the first sustained radio emission from a brown dwarf star, an object similar to a small star without enough mass to sustain nuclear fusion of hydrogen. Discovered only 5 years ago, brown dwarf stars were considered unable to emit persistent radio emissions. This finding helps astronomers study the link between large, gaseous planets and small stars.

I am proud to support the VLA and the contributions being made to our understanding of the cosmos. I also applaud the work and efforts of the scientists and students involved in making this noteworthy discovery.

I ask that the February 21, 2001, New York Times article entitled, "Surprise in the Heavens as Energy Is Detected in a Brown Dwarf" be printed in the RECORD.

The article follows:

[From The New York Times Wed., Feb. 21, 2001]

#### SURPRISE IN THE HEAVENS AS ENERGY IS DETECTED IN A BROWN DWARF

(By James Glanz)

A dim, fading object wandering alone through space, something between a large planet and a tiny star, turns out to be roiled by storms several times more powerful than the most energetic flares on the Sun, a team of radio astronomers has found.

The existence of such powerful, stormy radio emissions in this kind of celestial object, a brown dwarf, is highly unexpected and could shed light on the dividing line between stars and planets.

The research had been considered so unpromising that the discovery was made not as part of any large-scale astronomical search but an accidental find in a student project at the Very Large Array a set of radio-telescopes at the National Radio Astronomy Observatory near Socorro, NM.

The students happened to have the array trained on the brown dwarf when it flared. Two senior radio astronomers, Dr. Dale A. Frail of the National Radio Astronomy Observatory and Dr. Shrinivas Kulkarni of the California Institute of Technology, then became involved in follow-up observations, which were led by Edo Berger, a graduate student at Caltech.

The follow-up observations showed that the object's magnetic fields were extremely weak, another surprise, since flares are normally powered by the energy in magnetic fields.

A paper on the study has been accepted at the journal Nature and was posted Monday and a Web site at the Los Alamos National Laboratory where most astronomers place their new work.

The existence of brown dwarfs, which are cool, dim and difficult to observe, was confirmed only five years ago by a team led by Dr. Kulkarni. Thought to have masses less

than 8 percent that of the Sun, their cores never become hot enough to ignite the fusion process that allows ordinary stars to shine for billions of years.

Instead, brown dwarfs gradually cool and fade after they form. Because brown dwarfs have an identity somewhere between that of large, gaseous planets like Jupiter and that of the smallest ordinary stars, astronomers said the new discovery should illuminate the structure of a crucial link between the two better-known classes of astronomical objects.

Dr. Adam Burrows, an astrophysicist at the University of Arizona, said energetic particles and waves in the magnetic fields around Jupiter split out radio emissions that could be detected on Earth. But Dr. Burrows said that at the distance of the brown dwarf, more than a dozen light-years into deep space, those emissions could never be picked up.

"That they do see emission from a sister object at such a distance is quite amazing," he said.

Ordinary stars with relatively low masses do show energetic flaring, Dr. Burrows said, but their magnetic fields are also much stronger. Flares on the Sun often occur when magnetic fields "reconnect," or suddenly snap like rubber bands after they break and then splice together in new configurations. So a weak magnetic field would not be expected to create strong flaring.

Another astrophysicist, Dr. Jeffrey Linsky of the University of Colorado, said those apparent mysteries might carry a message about the difference between true stars and brown dwarfs. The cooler cores of brown dwarfs, like a pot of soup on a low flame, might create less turbulence inside the dwarfs, Dr. Linsky said. That relative quiescence might generate weaker magnetic fields—but possibly with conformations, or geometries, that make them more likely to reconnect.

If that is the case, Dr. Linsky said, then perhaps "the geometry is very different in such a way that it produces a few very large flares."

Dr. Lars Bildsten, an astrophysicist at the Institute for Theoretical Physics at the University of California at Santa Barbara, cautioned that because brown dwarfs were so different from the Sun, it was hard to know what to expect from them. The radio observations were at least consistent with sketchy observations in other bands of the spectrum, Dr. Bildsten said.

Other scientists said they were at a loss to explain the puzzling findings, whose authors include Mr. Berger, Dr. Kulkarni and Dr. Frail as well as about a dozen graduate and undergraduate students from places like Oberlin College in Ohio, Agnes Scott College in Decatur, Ga., and New Mexico State University in Las Cruces.

"This is a pretty amazing result," said Dr. Jill Knapp, a Princeton astronomer. "There seem to be some quite unexpected things going on with these very cool, low-mass objects."

#### THE AIRLINE CUSTOMER SERVICE IMPROVEMENT ACT OF 2001

Mr. FEINGOLD. Mr. President, I rise today to voice my support for the Airline Customer Service Improvement Act. I commend Senator MCCAIN for continuing to press this crucial consumer issue before the Senate in a bipartisan manner. I also applaud the efforts of Senator WYDEN. Both have been leading advocates for air travelers. I am confident that we can work

together to pass a pro-consumer bill into law.

I am sure that each and every one of us in this body has experienced his or her fair share of frustration with air travel as have millions of Americans. Whether it's late flights, long lines, or lost luggage, we've all gotten the short end of the stick at one point or another.

When it comes to air travel, we are all consumers. And this bill assures the protection of consumer interests. The Airline Customer Service Improvement Act would, among other things, ensure that passengers have the information that they need to make informed choices in their air travel plans.

I think we were all encouraged in 1999 when the airlines came out with their own plan to improve customer service. While many of the airlines made improvements and responded to suggestions from the Department of Transportation's Inspector General, much more remains to be done.

It is time air travelers' interests once again receive our attention. According to the Department of Transportation, consumer complaints about air travel went up by 14 percent from 1999 to 2000. This, coupled with a 25 percent increase from 1998 to 1999, adds up to an increase of almost 40 percent in two years. These complaints run the gamut: unstable ticket pricing; oversold flights; lost luggage; and flight delays, changes, and cancellations. In addition, in 2000 one in four flights was delayed, canceled, or diverted, affecting about 163 million passengers. Obviously, the airlines are not solely responsible as weather and mechanical breakdowns are part of the business, and of course we need to ensure that we maintain and improve airport infrastructure. But this bill addresses some problems that the airlines can fix.

Perhaps of more importance, this bill does so without forcing airlines to compile information that they don't already keep. The bill simply allows air travelers the right to that basic information and the ability to make informed decisions.

I am fortunate enough to be a customer of the premier airline when it comes to customer satisfaction and to represent most of its employees. For years, Midwest Express Airlines has been showered with some of the highest airline customer satisfaction ratings in the country. For those of my colleagues who have not yet experienced a flight on Midwest Express, I, and I am sure I speak for the senior Senator from Wisconsin, encourage you to do so.

How does Midwest Express continue to maintain these superlative ratings? The answer is simple, it already incorporates some of the provisions spelled out in this bill. Midwest Express already tries to notify its travelers if it anticipates a flight delay, flight change, or flight cancellation. The airline already attempts to make information on oversold flights available to