tropics called the Quasi-Biennial Oscillation (QBO). During the west phase of the QBO, winter winds travel from west to east, and the opposite holds true for the east phase. On average, the wind reverses each year, but sometimes it misses a year.

During her recent visit to NCAR, Labitzke and van Loon probed deeper into this problem. By examining only the years of the western QBO they uncovered a remarkable correspondence between the solar cycle and the air pressure and temperature in certain areas, such as the eastern United States. For example, she says, "If the QBO is in the west phase, and we are in the solar minimum, the winter in Charleston [S.C.] will be normal or mild. And if we are in a solar maximum, the winter will be normal or cold."

Over the North Pole and extending down into Canada, this correlation appears strongest, measuring as great as 0.8 on a scale of 0 to 1. This means that the link between the solar cycle and the weather accounts for 64 percent of the variability in winter temperatures and air pressure in that region. Considering all the elements that affect weather, says van Loon, this is a huge correlation.

For other areas, the connection between solar cycle and weather is weaker or nonexistent. In general, a map of the areas of correlation is a blotchy affair with no apparent pattern. (The years of the eastern QBO also show correlations, but they are weaker than during the western phase.)

Statistical tests have indicated that there is an extremely low probability that these patterns are coincidental, says Labitzke. In computer runs, the correlations emerged out of random sequences a mere 25 out of 10,000 times.

Still, the data on the QBO go back only to 1953, limiting the researchers to 3 1/2 periods of the solar cycle, and Labitzke acknowledges that the pattern could fall apart during upcoming periods.

The disreputable history of solar-cycle correlations has made scientists wary of reports of new links. And no one can yet explain the mechanism of the correlation. They wonder how a small oscillation in several solar properties can exert such a drastic influence on earthly weather.

But the statistics are beginning to speak out to scientists. "I think it's really very convincing that there's something going on," says Brian A. Tinsley of the National Science Foundation.

Many people have wondered whether this correlation will help in making weather predictions. However, van Loon says, "This is purely statistics, and we don't understand the physical mechanism. Until we understand it, we should not use statistics to form predictions." Labitzke believes the most important effect of her find will be to force meteorologists to consider basic questions about the role of the QBO and the solar cycle. *– R. Monastersky*

Kids suddenly gain in grasp of symbols

When is an object not what it appears to be? When it serves as a symbol of something else.

The development of an infant's ability to see an object as a symbol is also not what it appears to be, says psychologist Judy S. DeLoache of the University of Illinois in Urbana-Champaign. Although researchers have often proposed that symbolic understanding develops gradually throughout childhood, there appears to be a rapid advance in an important type of symbolic thinking between 2 1/2 and 3 years of age, reports DeLoache in the Dec. 11 SCIENCE.

In that short span of six months, children become able to think of a small-scale model of a room in two ways at once — as a room in its own right and as a symbol of a larger room that it represents. This broadening of the scope of symbol use, says DeLoache, is a big step on the road to mature symbolic thought, in which virtually anything can stand for anything else.

She tested 16 infants between 30 and 32 months old and another 16 between 36 and 39 months old. The children were from white, middle-class families, and boys and girls were equally represented. Half the subjects in each age group watched as a miniature toy was hidden in a scale model of a room located next to a corresponding full-sized room, and half saw the larger version of the toy hidden in the room itself.

Given four trials, 3-year-olds found the analogous toy in the corresponding location nearly 80 percent of the time without error; 2½-year-olds were successful on only 15 percent of their searches, regardless of which hiding incident they witnessed. Both groups, however, located the toy that they actually saw being hidden 80 percent of the time.

To see if the three-dimensional nature of the model interfered with the younger children's appreciation of it as a symbol, the researchers tested 16 more 2 1/2-year-olds, once with the model and once after being shown a color photograph of where the toy was hidden. The same poor performance was noted in the former situation, but the children used the photographs to find the toy in the room nearly 80 percent of the time without error.

"This is a totally counterintuitive finding," says DeLoache. It is known, for example, that young children's memories for objects in a three-dimensional model are better than their memories for objects in a comparable photograph. But the only function of a photograph is as a symbol, she explains; it does not need to be thought of as a real object as well as a symbol. Thus, the 2 1/2-year-olds understood that the photographs represented the room and acted accordingly, whereas they treated the model only as a real object that could not be generalized to represent the room next door.

While this finding is intriguing, says psychologist Dennie Wolf of Harvard University, it is unclear why the younger children performed so much better with photographs. Youngsters of that age realize that a scale model represents a real house and that it is for dolls rather than for people, she notes. Further research must clarify whether some aspect of the experimental task influenced the results, or if the finding applies to most children, says Wolf. *– B. Bower*

Fanning flames in space

A flame, whether from a candle or a gas burner, is a remarkably simple, efficient way of transferring large amounts of energy to a specific location. Convection currents bring fresh chemical fuel into the flame's luminous combustion region and carry away hot products, giving the flame its distinctive profile. In the absence of gravity, however, no convection occurs, and flames are spherical. They eventually suffocate under a blanket of their own products. That drawback limits the potential usefulness of flames in space applications.

One way to direct hot combustion products so that they transfer heat efficiently is to keep the fuel under pressure in cylinders. But this solution requires bulky, heavy equipment. Now, two British researchers propose the use of electric fields as an alternative method for controlling flames in zero gravity. "There is little doubt," the researchers report in the Dec. 17 NATURE, "that this principle, using simple and lightweight equipment, could be applied to provide intense heating of small areas, making economic use of the oxygen available in the working environment."

A flame is the luminous product of chemical reactions taking place within a region of swirling, combustible vapors. Within the reaction zone, chemical reactions generate relatively large concentrations of short-lived charged particles, mainly electrons and positive ions. Felix J. Weinberg and F.B. Carleton of Imperial College in London suggest that a high-voltage "chimney" would push the charged particles so that the flame is directed toward the region to be heated. The resulting "ionic wind" would provide the required convection currents.

The researchers have successfully tested their scheme during brief periods of near-weightlessness on aircraft in parabolic flight. *– I. Peterson*