Writing a Short Review

Read the two articles below. They have been adapted from articles published in the year 2001. Write in your own words a short review of the earthshine observations described in these articles.

Your review should contain:

- A suitable title.
- A statement of what earthshine is.
- The names of the scientists and what they did in historical order.
- The results found.
- A statement of the importance of the results for the Earth's climate.

From the *Bangkok Post*

Original by Randolph Schmid, Washington, AP

Scientists are using the sunlight reflected by the Earth onto the dark side of the moon to help monitor climate.

The glow, known as earthshine, helps researchers measure how much sunlight the Earth is reflecting, an important factor in determining global climate change.

During a crescent moon earthshine can be viewed with the naked eye, looking at the shaded portion of the moon.

Leonardo da Vinci (1452-1519) first explained the phenomenon, in which the moon shows the sunlight reflected from the Earth.

Scientists from the New Jersey Institute of Technology and the California Institute of Technology report in the May 1 issue of *Geophysical Research Letters* that they used earthshine to measure the Earth's reflectance. They concluded that the fraction of sunlight the planet reflects is currently 29.7 percent.

"Earth's climate is driven by the net sunlight that it absorbs," says Philip Goode, leader of the New Jersey Institute of Technology team.

"We have found surprisingly large seasonal variations---up to 20 percent---in the Earth's reflectance," he said.

If the Earth reflected even one percent less light on average, the effect could be significant enough to be a concern with regard to global warming, the scientists said. Less light reflected could mean more absorbed on Earth, resulting in warmer temperatures.

In the early 20th century, the French astronomer Andre-Louis Danjon undertook the first quantitative observations of earthshine. But the method was ignored for nearly 50 years, until Caltech professor Steven Koonin described its potential in a 1991 paper.

The new measurements are based on about 200 nights of observations of the shaded area of the moon at regular intervals over a two-year period, and another 70 nights during 1994-95.

The study relies on averages over long periods, because the reflectance changes substantially from night to night with changing weather, and even more dramatically from season to season with changing snow and ice cover.

The data suggest that the reflectance has decreased slightly during the past five years, as the sun's magnetic activity has climbed from solar minimum to maximum during that time.

Many scientists have noted changes in climate that seem to follow the 11-year solar cycle, and this research could support the theory that the sun's magnetic field plays an indirect role in the Earth's climate.

From the *Scientific American*

Original by Alison McCook

One way to study the earth is to look at the moon. For more than 200 nights, researchers led by Philip R. Goode of the New Jersey Institute of Technology measured earthshine, the soft glow on the dark side of the moon created by sunlight reflected off the earth. The team found that the earth's reflective ability, or albedo, fluctuates and may be about 2.5 percent lower than it was five years ago.

Interestingly, another recent study describes a previously disregarded influence on the earth's albedo: oceanic whitecaps. Apparently, the foamy crests of waves globally reflect about 15 million megawatts (or 0.03 watt per square meter), a climatic effect as influential as some greenhouse gases. The authors of both studies, which appear in the April 15 and May 1 issues of *Geophysical Research Letters*, say their results should be included in models of global climate change.

RHBE, July 2017.
