

Project Details

ROSES ID: NRA-00-OSS-01

Selection Year: 2001

Program Element: Independent Investigation: LWS

Project Title:

Earthshine Measurements of the Earth's Albedo

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Summary:

The earth's climate depends on the net sunlight absorbed by the globe, which is quantified by the earth's albedo. A global and absolutely calibrated albedo can be determined by measuring the amount of sunlight reflected from the earth and, in turn, back to the earth, from the dark portion of the face of the moon (the "earthshine" or "ashen light"). Such data provide a critical complement to satellite data.

We have been measuring earthshine since December 1998, and have already demonstrated that the earthshine can be observed with sufficient precision to derive meaningful information about the earth's optical reflectivity. We have measured 20% seasonal variations in the earth's global albedo.

We propose to continue these observations from Big Bear Solar Observatory (BBSO), and expand them to a three-station network that will give us global coverage. The albedo data will also enable us to quantitatively assess the global effects of secular and seasonal variations, as well as those of transient phenomena such as a volcanic eruption, El Nino or La Nina. During the three year period proposed here (2001-2004), we will obtain a data base covering solar activity maximum and the declining phase of the current cycle, enabling us to determine the level of solar cycle dependence of the albedo. We propose to continue our modeling of earthshine by using scene models developed for the Earth Radiation Budget Experiment (ERBE). We have already found shortcomings in its averaging, which we propose to correct. Finally, we have begun seasonal observations of the earthshine spectra using the 60" telescope on Mt. Palomar and its Echelle spectrograph. We propose to use earthshine spectral data to search for the degree of large-scale changes in the earth's atmosphere, its structure and composition.

Publication References:

Summary: no summary

Reference:

Goode, P. R.; Pallé, E.; Yurchyshyn, V.; Qiu, J.; Hickey, J.; Rodriguez, P. Montañés; Chu, M.-C.; Kolbe, E.; Brown, C. T.; Koonin, S. E.; (2003), Sunshine, Earthshine and Climate Change: II. Solar Origins of Variations in the Earth's Albedo, Journal of the Korean Astronomical Society, vol. 36, S1, pp. S83-S91, doi: 10.5303/JKAS.2003.36.spc1.083

Summary: no summary

Reference: Montañés-Rodriguez, P.; Pallé, E.; Goode, P. R.; Hickey, J.; Koonin, S. E.; (2005), Globally Integrated Measurements of the Earth's Visible Spectral Albedo, The Astrophysical Journal, Volume 629, Issue 2, pp. 1175-1182, doi: 10.1086/431420