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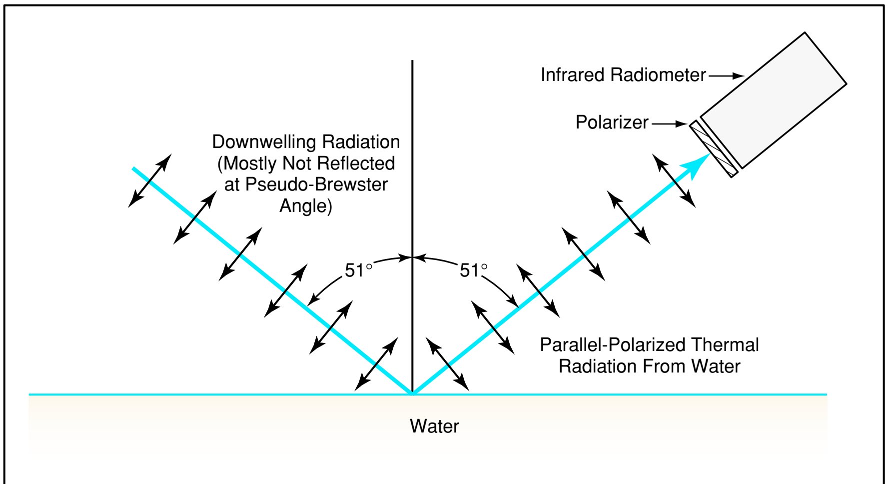
sides of the aerogel transpiration membrane: Each silicon chip contains a dense array of 20-μm-diameter through holes, made by deep reactive-ion etching, that serve as tubes for heating or cooling the gas in them. Thin gold film heaters are patterned on both silicon chips; hence, either silicon chip can be the hot-side thermal guard. The aerogel has an average pore size of 20 nm and a very low thermal conductivity (17 W/K at atmospheric pressure), and thus satisfies the essential requirements for thermal transpiration to occur when a voltage is applied to one of the heaters.

*This work was done by Stephen Vargo, E. Phillip Muntz, and Geoff Shiflett of Caltech for **NASA's Jet Propulsion Laboratory**. Further information is contained in a TSP [see page 1].*
NPO-21110

Instrument for Measuring Temperature of Water

An infrared radiometer is able to view water as an almost pure blackbody source.

Stennis Space Center, Mississippi



An **Infrared Radiometer** would be aimed toward water at the pseudo-Brewster angle and would respond to radiation polarized parallel (but not perpendicular) to the plane of incidence.

A pseudo-Brewster-angle infrared radiometer has been proposed for use in noncontact measurement of the surface temperature of a large body of water (e.g., a lake or ocean). This radiometer could be situated on a waterborne, airborne, or spaceborne platform.

The design of the pseudo-Brewster-angle radiometer would exploit the spectral-emissivity and polarization characteristics of water to minimize errors attributable to the emissivity of water and to the reflection of downwelling (e.g., Solar and cloud-reflected) infrared radiation. The relevant emissivity and polarization characteristics are the following:

- The Brewster angle is the angle at which light polarized parallel to the plane of incidence on a purely dielectric material is not reflected. The pseudo-Brewster angle, defined for a lossy dielectric (somewhat electrically conductive) material, is the angle for which the reflectivity for parallel-polarized light is minimized. For pure water, the reflectivity for parallel-polarized light is only 2.2×10^{-4} at its pseudo-Brewster angle of 51°. The reflectivity remains near zero, several degrees off from the 51° optimum, allowing this angle of incidence requirement to be easily achieved.
- The wavelength range of interest for measuring water temperatures is 8 to 12 μm. The emissivity of water for parallel-polarized light at the pseudo-Brewster angle is greater than 0.999 in this wavelength range.

The radiometer would be sensitive in the wavelength range of 8 to 12 μm, would be equipped with a polarizer to discriminate against infrared light polarized perpendicular to the plane of incidence, and would be aimed toward a body of water at the pseudo-Brewster angle (see figure). Because the infrared radiation entering the radiometer would be polarized parallel to the plane of incidence and because very little downwelling parallel-polarized radiation would be reflected into the radiometer on account of the pseudo-Brewster arrangement, the radiation received by the radiometer would consist almost entirely of thermal emission from the surface of the water. Because the emissivity of the water would be very close to 1, the water could be regarded as a close approximation of a blackbody for the purpose of computing its surface temperature from the radiometer measurements by use of the Planck radiation law.

*This work was done by Robert Ryan, Thomas Nixon, and Mary Pagnutti of Lockheed Martin Corp. and Vicki Zanoni of **Stennis Space Center**.*

Inquiries concerning rights for the commercial use of this invention should be addressed to the Intellectual Property Manager, Stennis Space Center [see page 1]. Refer to SSC-00134.

Improved Measurement of Coherence in Presence of Instrument Noise

The coherence function can be measured more accurately by accounting for the effects of instrument noise.

John F. Kennedy Space Center, Florida

A method for correcting measured coherence spectra for the effect of incoherent instrument noise has been developed and demonstrated. Coherence measurements are widely used in engineering and science to determine the extent to which two signals are alike. The signals may come from two different sources or from the same source at different times. The coherence of time-lagged signals from a single source is an excellent indication of the effective lifetime of the signal components as a function of their frequency. Unfortunately, incoherent instrument noise will bias the measurement to lower values and may lead the user of the data to false conclusions about the longevity of significant features.

The new method may be used whenever both the signal and noise power spectra are known and the noise is incoherent both