McAlister measurements of heat flows through ocean layer

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How fast heat flows through a layer of the ocean thinner than a sheet of writing paper is being studied at the University of California's Scripps Institution of Oceanography.

The daily transfer of heat through this layer is large and variable. On clear, sunny days, enough heat flows into the sea surface to boil off the top centimeter of water if it were not that the heat is transferred elsewhere. After sundown, an equivalent amount of heat leaves the sea surface on a worldwide basis; otherwise, the temperature of the oceans would increase rapidly. It is this latter heat flow that E. D. McAlister, Research Physicist, is measuring.

By selecting two different wavelengths of radiation in the infrared spectrum, McAlister is measuring differences in water temperature between half a millimeter and six hundredths of a millimeter deep. The differences relate how fast the water is losing or gaining heat.

At present, the heat flow through an area approximately one yard in diameter has been studied. McAlister states in a recent paper in Applied Optics that it should be possible to mount a specially designed instrument in an aircraft and scan several hundreds of square miles in a few hours.

The information gained would be of interest in studies of the heat exchange at the sea surface and in such applications as fog formation and dissipation,, where slight temperature differences can have major effects.

The measurement of "apparent sea surface temperature" by infrared means is fairly common. However, McAlister's method for the first time measures true water temperature for the surface layer. This is accomplished by measuring the sky radiation in an upward-looking beam and correcting the radiation from the sea surface for its exchange of radiation with the sky. Reflected sky radiation, which changes with the absence or presence of cloud cover, has been ignored previously, hence the term "apparent temperature."

Scientists at Scripps have found that the thermal boundary layer of the sea is extremely sensitive to a number of influences. At night, it is usually but not always cooler than the water underneath.

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