

THE POSTER EXHIBIT ON SOLAR RADIATION DATA

Betsy Palmer Eldridge, Toronto

The Poster on Solar Radiation Data exhibited during the afternoon session on light bleaching was intended first to acquaint Conservators with the availability of this type of information, and second to show how it might be used both in a general way and in specific situations. In this case, it was applied to the sun bleaching of rag paper, but the information could be used by anyone who had to deal with natural as opposed to artificial light. While everyone is aware of seasonal variations in natural light, it is normally difficult to quantify those differences, or to know how they relate to the seasonal differences experienced elsewhere. The study of the solar radiation data can be extremely useful in establishing these more definitely and can lead to a more accurate and thorough understanding of the natural light phenomenon wherever it occurs.

The Poster was based on information supplied by Environment Canada from the Atmospheric Environment Service at the Canadian Climate Centre, Downsview, Ontario. Comparable information for the United States should be available from the National Climate Centre, NOAA, Federal Building, Ashville, North Carolina. A recent telephone conversation however, implied that budget cuts have prevented them from publishing their current data although it is available on microfiche.

Canada uses megajoules per square metre, the metric unit, for all of its measurements while the United States uses langleys. As both are units of energy measurement, recorded on the same devices (generally an Epply pyranometer) which measure the total energy received in the ultraviolet, visible and infrared wavelengths, they can be easily converted at an approximate ratio of 1:24. It is not appropriate however to try to convert these energy units into units of illumination measurements such as lux (metric) or foot-candles which are recorded on different devices (light meters or illuminometers) that measure the light in a narrow band of the visible wavelengths. Thus energy and illumination are two different aspects of the same radiation phenomenon that cannot be translated although they are often parallel.

In Canada, the solar information is available in seven different forms called Radiation Fields. Two of these are the most pertinent for light bleaching: "full sun" which is Radiation Field I or Total Global Solar Radiation and "open shade" which is Radiation Field II or Diffuse Sky Radiation. Radiation Field VII which gives the illumination values in kilolux hours is also available. The terminology in the United States may vary slightly.

The climate centers take specific daily measurements on an hourly basis at various key locations across the continent. This data has practical application in that one can assign in retrospect definite values to specific work that has been done. For example, in the course of work done for the previous paper, A Sun Bleaching Project, it was possible to establish that an aggregate of 10-15 megajoules was adequate to remove either the overall discoloration of the Chambers prints or the more localized foxing, mold stains and tide lines of the Turpin prints. The total of 10-15 megajoules, whether in June or October, could be either in "full sun" or "open shade" or a combination of both.

The climate centers then average the specific daily measurements over longer periods to produce the monthly normals also on an hourly basis. It was these monthly normals that confirmed the observation made in the previous paper that June radiation is twice as strong as October radiation and therefore that October exposures needed to be twice as long as June exposures to accomplish the same result. Similarly, they showed that "full sun" was invariably twice as strong as "open shade", so that the exposure time once again needed to be twice as long if "open shade" was used.

All of the above conclusions were drawn from data specific to the Toronto location and would need to be modified for other locations. The solar radiation maps that are drawn from the monthly normals clearly illustrate this fact. For example, while Miami and Toronto in June have roughly the same amount of radiation available, Miami in December has three times as much as Toronto. Similarly, they show that Toronto in June has five times as much radiation available as it has in December, while Miami in June has three times as much as it has in December. Such information can be helpful both in comparing the results of work done in various locations and in estimating the amount of exposure time needed whatever the location or the time of the year.

A general study of the solar radiation maps which demonstrate the dramatic changes of the solar patterns that sweep across the continent emphasizes the difficulty of depending on natural light for light bleaching and encourages the search for an effective artificial source that would be more constant and dependable for use in conservation. However natural light, properly quantified, should still be a useful tool.