'GREENHOUSE EFFECT' AND OTHER REFLECTIONS ON SATELLITE IMAGERY

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A visible-light picture from a weather satellite contains nothing but sunlight reflected by clouds or by the earth's surface. Nevertheless, anomalously-strong reflections of sunlight from the earth's surface can sometimes easily be mistaken for normal clouds on satellite imagery. In such cases it is possible to distinguish between clouds and reflections only by comparison with infrared pictures taken at the same time. Further, anomalously strong reflections from clouds can cause an erroneous estimation of cloud type. The reflections occur when the line of sight of the sensor lies in the plane of the incident and reflected solar beams and the elevation of the satellite is equal to the solar elevation. The situation is then conducive to a mirror-like reflection, if there is a high reflective substance between the sun and the satellite at a location called the specular point. More details on finding the sun's specular point are given by Tsui and Fett (1980).

The most common of these reflections seen in satellite imagery is 'sun glint', a bright area over a sea or ocean caused by reflection from the water surface. (Anderson and Veltishchev 1973, Fett 1979). Fig. 1 gives an example of sun glint in the Gulf of Gdansk, as seen by NOAA 8 on 23 June 1983, 0751 GMT. Four other, more rare

Fig. 1 NOAA 8, pass 1232, 23 June 1983, 0751 GMT visible-light picture with sunglint in the Gulf of Gdansk and reflections in lakes and rivers

reflections are seen in Figs. 1 and 2. The vertical streak of light in Fig. 1 extending southward over Poland from the coast of the Gulf of Gdansk is caused by reflections of sunlight from the many rivers and lakes in that area. The exact brightness and shape of the sun glint is affected by the state (waviness) of the water surface.

In order to be able to distinguish between reflections and clouds, the infrared (IR) picture that corresponds with Fig. 2 is given as Fig. 3. Both were made by NOAA 8 on 7 June 1983, 0839. The most striking difference in suggested cloud cover is associated with a bright spot on Fig. 2 extending from the south edge of the Ijsselmeer in the direction of Antwerp. As a cloud deck of the same size and shape cannot be seen on the IR picture, one could be inclined to interpret the bright spot as thick low clouds whose temperature is about the same as that of the surface below. However, the synoptic reports of the stations within the bright spot region (06265, 06260 and 06350)