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ERTS-1 VIEWS THE GREAT LAKES AREA

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ABSTRACT

With the launching of Earth Resources Technology Satellite (ERTS-1) in July 1972, a powerful new tool for studying mesoscale atmospheric phenomena associated with the Great Lakes has come on the scene.

It has been found possible to discriminate air pollution patterns from large sources of suspended particulates. Plumes from major steel mill operations in the Chicago-Gary-Hammond area can be seen spreading in southwest flow over Lake Michigan for over 50 nm. The excellent background provided by water in the near infrared makes for optimum viewing. Conversely, over land even very dense smoke plumes become difficult to distinguish from terrain.

Comparison of same area viewed at different portions of the spectrum allows the detection and identification of cirriform clouds. At shorter wavelengths (0.5-0.6 micrometers) cirrostratus layers might appear a total undercast. Yet in the near infrared (0.8-1.1) almost complete penetration to the underlying features is found. Denser clouds, such as altocumulus, stratus, cumulus, etc., do not exhibit this characteristic at all.

In a similar manner, views of the Toronto area under cloudless but hazy conditions, reveal the marked haze penetrating characteristics of the near infrared. Reconstructed color infrared views (made by combination of the three longer wavelength bands) reveal sharp ground features almost totally obscured by haze and pollutants in the "green" band (0.5-0.6 micrometers).

Snow cover is readily apparent in ERTS images. A localized record early season (October 18) lake snow squall in the south-Chicago and Hammond, Indiana region produced a well defined path through the metropolitan Chicago area. Though depth determination is difficult (maximum 4" in this case), such images can clearly reveal freshly deposited lake snow squall swaths as soon as the skies clear.

Aircraft condensation trails also appear in several photographs, including one with a peculiar circular shape.

Summer lake phenomena, such as lake breeze fronts are ideally studied. Even the smallest cumulus elements are resolved. During an all-shore lake breeze over Lakes Erie and Ontario, the cloud-free zone extended almost uniformly inland around the perimeter of the lakes. Smaller lakes and reservoirs also show marked cloud suppression. Cloud streets on downwind shorelines show great similarity to laboratory studies of cold fluids advecting over heated plates, including Benard cell type patterns.

Several sets of simultaneous views of cloud patterns from ERTS and all-sky cloud cameras are compared. These are helpful in showing the extremely high resolution of the satellite, as well as the horizontal viewing range with the lens filter combination used.