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APPLICATION OF ERTS-1 IMAGERY IN COASTAL STUDIES

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The basic ERTS output is four black-and-white photographs presenting the same scene recorded in each multi-spectral scanner band. Mosaics covering large regions at a 1:250,000 scale can be compiled from these photographs. Office study of the image of each band separately, in combination with other bands, and in conjunction with other available data (navigation charts, tide tables, etc.) permits extraction of data useful in coastal engineering planning and coastal processes studies. Specific examples are listed below in which significant information on regional shoreline configuration or nearshore water movements has been obtained from unenhanced ERTS imagery.

Tidal Inlet Configuration. An MSS 5 image of 16 Aug 72 clearly defines the configuration of Indian River Inlet, Del. The offset between the barrier islands north and south of the inlet gives an indication of predominant south-to-north longshore littoral transport at the inlet. In general, sediment plumes emanating from an inlet may be discernable on MSS 4 or MSS 5 and may give some indication of longshore transport direction at the time of the image. This type of information is important in coastal engineering planning.

Navigation Information. Timely information useful for navigation is shown in ERTS imagery of the Sangi Islands obtained on 27 Jul 72. These islands are in the tropical Pacific between the Celebes Islands and the island of Mindanao. Data from the ERTS images is a valuable supplement to available navigation charts, which are based on data collected in March 1939 and updated in June 1966.

The particular islands in this vicinity selected for detailed examination are Pulau Tahulandang, Pulau Ruang and Pulau Pasige. MSS 7 shows a narrow, incised body of water on the eastern shore of Pulau Ruang not indicated on available charts. This may indicate a recent change

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in the land mass, which may have been caused by volcanic action or major erosion of the island. The uncharted bay has a different tone on MSS 5, and exhibits a deltaic feature, possibly indicating deposition of eroded sediments in the nearshore area.

The full extent of coral reefs fringing these islands is shown in MSS 4, while comparison of MSS 4, MSS 5 and MSS 6 gives an indication of the relative depths of these reefs. The absence of coral reef development on the northern and eastern shores of Pulau Taulandang may be interpreted as indicating the direction of predominant wave action.

Nearshore Water Movement. Nearshore flow patterns may be traced using the recorded suspended sediment patterns in ERTS imagery. An ERTS image of Lituya Bay, Alaska, obtained on 18 Sep 72, shows a well-defined plume of turbid water associated with the Alsek River. Water flow to the northwest may be inferred from this plume's shape.

ERTS imagery of the Laptev Sea coastline on the northern shore of Siberia on 16 Sep 72 shows important fluid mixing phenomena. A mosaic of MSS 4 images displays a convoluted interface between waters of markedly different turbidities. A narrow surface streak (of ice, probably) extends from the center of the Laptev Strait indicating flow of the sediment-laden water towards the west into the Laptev Sea. Well-defined counterclockwise gyres are prominent in the mixing interface; Coriolis effects would favor formation of such gyres.

A mosaic of MSS 4 images of the mouth of the Colorado River (30 Sep 72) slightly overlaps a mosaic of MSS 4 images of a region slightly further south in the Gulf of California (29 Sep 72). The structure of the complex suspended sediment pattern in the overlap area is quite different on the two days. The existence and lifetime of such fluid mixing features can be of great importance in the design of nearshore oceanographic measurement programs.

This analysis and report are a part of the research program of the U.S. Army Coastal Engineering Research Center of the U.S. Army Corps of Engineers. The full report, including the descriptive photography, is being published as Technical Memorandum No. 40 of the Coastal Engineering Research Center.