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A Tracer Study of Sediment Transport in the Vicinity of a Groin: New York, U.S.A.

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ABSTRACT

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A field experiment was conducted at Riis Park, New York in October, 1986, to measure sediment transport paths past the end of a semi-permeable, rubble groin. Fluorescent-tagged sands were used to identify patterns of transport. Flow characteristics of waves and currents were measured with current meters. Tube cores were taken to sample sediment and recover tracer sands. Sampling runs were conducted at approximately half-hour intervals for two hours, and a final run was made approximately 24 hours after injection.

The results indicate that a primary path of sediment transport is past the end of the groin and then immediately shoreward. After the 24-hour interval, approximately 30% of the deployment volume was represented in samples onshore and downdrift of the injection point. The findings suggest that this groin does not contribute to downdrift erosion under the measured circumstances, but short-term, prototype studies such as these may not be representative of typical conditions in a nearshore system.

ADDITIONAL INDEX WORDS: *Sediment transport pathways, groins, tracer studies, nearshore currents, lee eddies, coastal engineering.*

INTRODUCTION

Groins are one of the most common shore-protection structures along chronically-eroding, coastal reaches. The presence of groins on beaches with net alongshore sediment transport usually results in the formation of a characteristic plan form; an updrift accretional fillet and a downdrift spiral beach (YASSO, 1966; EVERTS, 1983). This configuration alters local wave and current fields, and hence alongshore sediment transport. Although fluid flows in the vicinity of groins have been modeled (*e.g.*, HORIKAWA, 1988) and associated form changes have been surveyed and modeled (ORME, 1977; REA and KOMAR, 1975; FOWLER and SMITH, 1987; BODGE and DEAN, 1987), little work has been done on specific sediment pathways in the presence of groins (PERLIN and DEAN, 1978). Furthermore, verification of these models has been hampered by the dearth of empirical field data, especially with regard to beach sediments moving past the end of a groin.

The focus of this paper is on a field experiment using fluorescent-tagged, tracer sand to identify sediment movement around a stone rubble groin at Rockaway, New York. The groin is at the eastern boundary of Riis Park, an extensively used recreational beach in the Breezy Point Unit, Gateway National Recreation Area. The structure was rebuilt and enlarged by the Corps of Engineers in 1982, with the specific proviso that the Corps retain responsibility for mitigation of adverse impacts of the structure on the downdrift National Park Service beaches. This study was part of a larger investigation, sponsored by the National Park Service, to assess the erosion threat within Riis Park with particular concern for the bath house backing the principal recreation beach (Figure 1).

STUDY SITE

Riis Park is located on Rockaway spit on the southwestern shore of Long Island (Figure 2).

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Figure 1. Air photo of study site, showing the groin (at right) and downdrift bathhouse (at left).

The spit is exposed to ocean swell and storm waves generated by mid-latitude and tropical cyclones. The dominant direction of sediment transport is from east to west, as indicated by the shape of Rockaway spit and its continued growth towards the west. Historical analysis of shoreline change shows substantial movement of the shoreface. The 18 ft. (5.5 m) depth contour, for example, migrated almost 1,200 m landward between 1885 and 1961 (U.S. HOUSE OF REPRESENTATIVES, 1966, Table F-2). Despite this local sediment loss, the subaerial portion of the beach accreted during this period. Part of the accretion is attributed to several, large-volume, beach-nourishment projects. Since the mid-1920's, approximately 15,000,000 cubic meters of beach fill have been emplaced along Rockaway spit, and 198 groins were built. Approximately 100,000 cubic meters of sand were emplaced in Riis Park in the summer of 1986, immediately prior to this field experiment. The nourishment operations have filled the groin compartments, favoring continuous sediment transport through the groin system.

Profiles taken by the Corps of Engineers show a nearshore zone dominated by a single bar-trough configuration (Figure 2). The bar is relatively large, with relief of approximately 2 m and a crest elevation of about −1.5 m NGVD (NEW YORK DISTRICT ENGINEER, 1985). The offshore location of this bar corresponds closely with the position of the end of the 149th Street groin, as indicated by the presence of wave breaking shown by air photos (Figure 1). The bar-trough system was not present during the October 1986 experiments, presumably because of the recent beach nourishment. Low tide observations of inter-tidal zone morphology during this period indicated the presence of a quasi-stationary, low relief rip channel in the immediate lee of the groin.

Observations of nearshore processes were made on 229 days in 1984 as part of the Corps

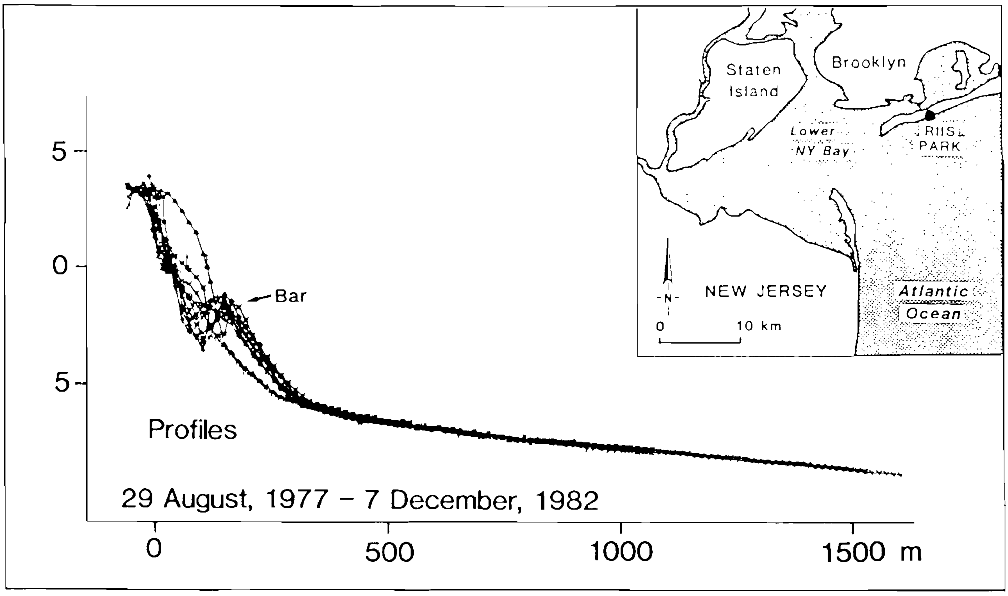

Figure 2. Inset of location of Riis Park: Corps of Engineers profiles showing bar-trough system.

of Engineers monitoring project for beach nourishment at the Rockaways (NEW YORK DISTRICT ENGINEER, 1985). The mean breaker height was 0.60 m, and wave period averaged 5.6 s. Estimates of longshore current velocity showed flow from the west averaging 0.13 m/s (n = 102), and flow from the east averaging 0.09 m/s (n = 105). Interestingly, the predicted net sediment transport, based on these data, was from east to west at the rate of 73,000 cubic meters per year, (NEW YORK DISTRICT ENGINEER, 1985). This indicates that the most pronounced alongshore sediment transport events occur as a result of low-frequency, high magnitude storms that generate strong westward currents for short periods of time.

EXPERIMENTAL DESIGN

The field experiments were conducted October 10–17, 1986. The Corps' data (NEW YORK DISTRICT ENGINEER, 1985) indicate that mean wave height and period for this month should be 0.99 m and 6.8 s, respectively. During the study period, the sea state was representative of non-storm conditions with westward alongshore transport. At the time of tracer deployment (October 16), the beach was still recovering from the effects of a storm on October 11 (significant breaker height and period approximately 2 m and 7 s, respectively). The major components of the field experiment included: (1) monitoring beach changes by profiling; (2) measuring nearshore flow characteristics with electromagnetic current meters; (3) evaluating surface currents with dye injections; and (4) assessing sediment migration pathways with fluorescent-tagged tracer.

Repetitive beach profiling was done along six transects, spaced at 50 m intervals (Figure 3). Rod and level measurements were made through the surf zone, and a boat-mounted, recording fathometer was used in deeper water. The horizontal baseline (at x = 0) is an arbitrarily-selected, shore-parallel line that links the set of six transects.

Two Marsh-McBirney model 511 electromagnetic current meters were used to monitor flow conditions in the surf zone. The sensors were mounted on portable bases with the electrodes 0.15 m above the bed. The instruments were relocated periodically across the surf zone with rising tide, and the flowmeter axes aligned relative to the beach (Figure 3) for each deployment. The sensors were cable-linked to a shore-based station where the signals were processed

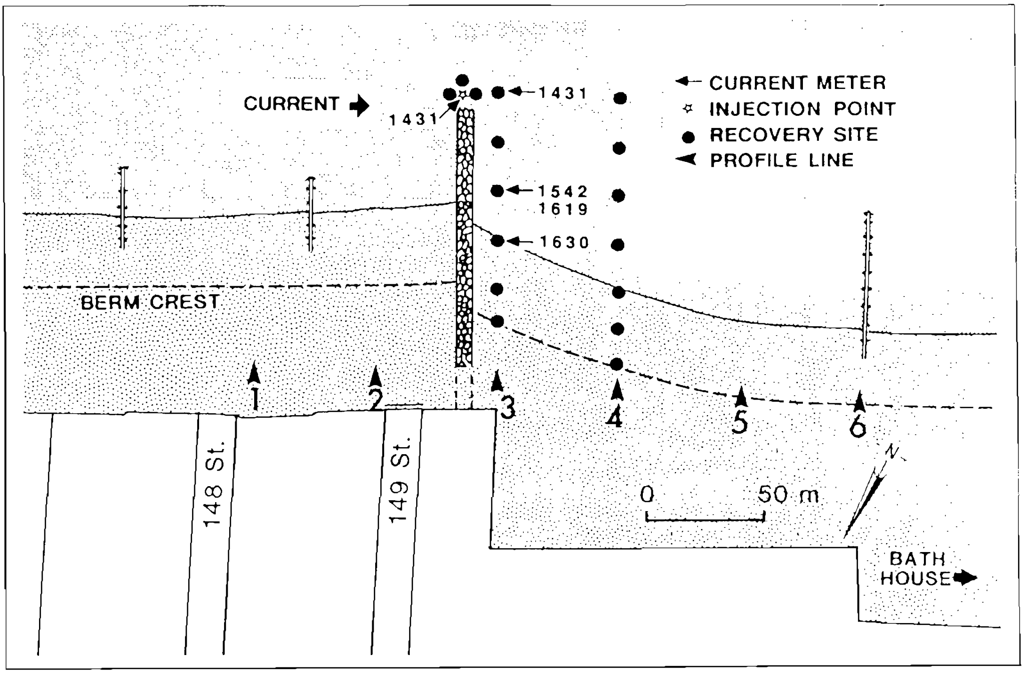

Figure 3. Locations of transects, current meters and tracer sample grid.

and stored on an analogue recorder for subsequent digitization and analysis. The instruments were employed only during daylight hours because of safety concerns and potential vandalism.

Two sets of dye experiments were conducted at different tidal stages to indicate near-surface currents in the vicinity of the groin, and to identify potential injection sites for the tracer sands. In the first experiment, dye solution was released 10 m updrift and onshore of the end of the groin at low tide. Other dye releases were made at high tide, 5 m off the end of the groin and in the middle of the surf zone on Profile 3.

The use of tracer materials in the surf zone has been well-documented in the literature (*e.g.*, BOON, 1969; GREER and MADSEN, 1978). Tracer methodologies remain the only reasonable approach to approximating sediment transport rates over short time periods, if a sequence of assumptions concerning tracer behavior are met (MADSEN, 1987). Removal (hence transport) has also been shown to be time-dependent because of burial of tracer grains (GALVIN, 1987). These restrictions limit the circumstances under which tracers can be used for transport modeling. The use of tracer sediments as indicators of transport pathways is not as limited. Recovery of tagged sands provides at least a gross indicator of patterns of movement.

In this tracer experiment, about 90 kg of native beach sand were washed, dried, and coated with a mixture of fluorescent paint and resin according to the methodology described by McARTHUR (1980, p. 10). A 16-element sampling grid was established for tracer recovery at the end of the groin and along Profiles 3 and 4 (Figure 3). Coring tubes 50 mm in diameter and 200 mm long were used to sample the substrate at each sampling grid location. Upon retrieval, cores were sliced into four, 50 mm, stratified sub-samples to define tracer mixing-depths more accurately. The surface sub-samples were also used to estimate local grain size characteristics.

The fluorescent tracer sand was injected off the end of the groin at about 1430 hours on October 16. The tide was at low stage, but rising, and the breaker line was approximately 10 m landward of the injection point. Five sets of cores were obtained; the first four recoveries

Table 1 *Riis Park Wave Characteristics: October 16, 1986.*

TIME (hrs)	H_s (m)	T_p (s)	U_{ms} (m/s)	v (m/s)	x* (m)
14:31–15:08	0.81	9	1.28	n/a	120
14:31–15:08	1.03	9	1.44	0.18	110**
15:42–16:00	0.62	9	1.12	n/a	80
16:19–16:51	0.62	9	1.12	n/a	80
16:30–16:51	0.58	17	1.08	0.11	60

* sensor location along Profile 3.

** sensor located 5 m off end of groin.

were made within two hours of tracer injection, the fifth recovery was made 24 hours after injection. In the laboratory, each sub-sample was illuminated under an ultraviolet lamp to aid in counting tracer grains. The quantity and depth distribution of tracer grains were used to calculate representative concentrations across the sampling grid.

METHODS

Spectral analysis and summary statistical methods were used to derive estimates (Table 1) of longshore current velocity (v) and wave orbital velocity (u). Significant maximum orbital velocities, u_{ms}, were derived on the basis of a significant wave height analogy using the relationship $u_{ms} = 4\sigma$, where σ is the standard deviation of the current velocity record (CERC, 1984). Average longshore current velocities were obtained from the mean of every shore-parallel current meter record.

Estimates of significant wave height, H_s, were derived from the approximations of significant orbital velocity using the solitary wave relationship $u_{ms} = \delta(gh)^{0.5}$, where δ is the solitary wave breaking criterion (assumed to be 0.4), g is gravitational acceleration, and h is water depth. Wave height was then obtained from $H/h = 0.8$. Solitary theory was used because the current meters were located in the zone of spilling breakers or immediately outside the surf zone. Wave period, T_p, was obtained from the frequency of the energy density peak of each spectrum. Values obtained from these relationships correspond well with visual observations. Breakers were spilling continuously across the surf zone and propagating almost shore-normal during the experiment.

The surface sediment samples were washed, dried, and split in the laboratory, and mechanically sieved at ½ phi intervals. Grain size statistics were derived using the method of moments (FOLK 1974).

Tracer concentrations were calculated using grain counts from the stratified sub-samples in order to control for depth-integration of the tracer. Grain size statistics for the local sediments were used to derive approximations for concentrations based upon assumptions of uniform density and diameter for tagged sands. The control volume for each sample was determined by the deepest sub-sample containing tracer and assuming a uniform tracer distribution through this volume. Estimates of total tracer recovery were made by extrapolating the point concentrations to representative control volumes by constructing surface polygons and using tracer-depth distributions obtained from the recovery depths described above.

RESULTS

The nearshore profiles (Figure 4) show a gently sloping bottom in the vicinity of the groin. The pronounced bar-trough system that frequently occurs at the study site was absent throughout our measurement period. However, the offset in foreshore alignment that is common across a groin was conspicuous. The downdrift beach slope seaward of the berm crest was substantially less than the updrift slope. A low-relief, rip channel was discernible at about 90 m on Profile 3. Mean sediment diameter for the samples taken along the outer edge of the grid averaged 2.06 phi (0.25 mm), with a mean standard deviation of 0.66 phi during the recovery period. Values for the inner samples averaged 1.80 phi (0.29 mm) with a standard deviation of 0.78 phi.

The wave energy spectra obtained during this experiment were highly variable across the surf zone. The water velocity records measured in deep water indicated an incident wave period of approximately 9 s. Inside the groin embayment the motions were complex, and the spectra contained more energy at lower frequency. Figure 5 shows two energy spectra for shore-normal flows taken at 80 m and 60 m from the baseline (approximately 20 and 40 m from the shoreline at that time). The water depth was less than 0.7 m at both locations, and despite the small separation distance, the spectra are completely different. The total variance of these spectra are

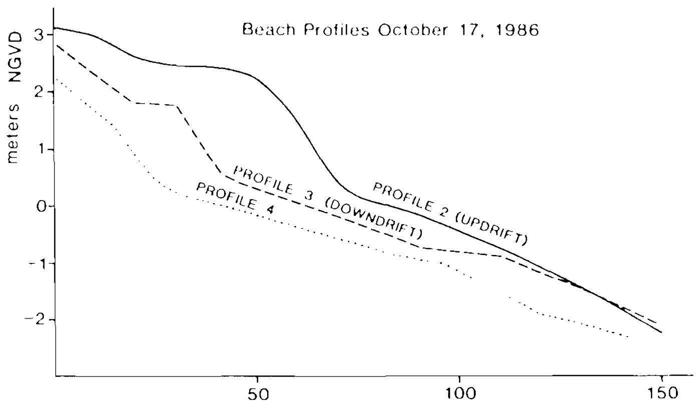

Figure 4. Riis Park beach Profiles 2,3, and 4.

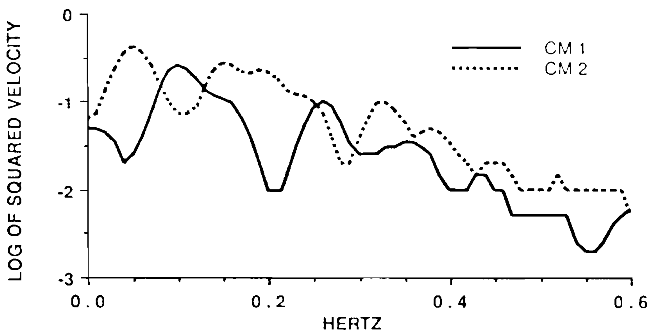

Figure 5. Sample spectra, October 16, 1986, 16:30 hrs. CM1 and CM2 were 80 m and 60 m, respectively, from baseline.

almost identical, but the energy peaks are at different frequencies. The spectrum measured 80 m offshore has essentially the same shape as the spectra measured farther offshore, with an incident peak centered around 9 s. Closer to shore, at a distance of 60 m from the baseline, however, water depth was slightly less and the spectrum shows a dominant low frequency peak at 17 s, and a broad, incident band between 5 and 7 s. At a period of 9 s, the period of the incident waves, an energy trough occurs, although no explanation of this peculiar trend can be offered at this time. It appears that the hydrodynamic motions in groin embayments are inherently complex due to multiple wave reflections and resonances, and to secondary current generation associated with mass conservation.

The dye experiments demonstrated that the near-surface flows were also variable, depending on tidal stage (Figure 6). At high tide, the dye released at the end of the groin moved mainly alongshore and slightly onshore, with considerable dispersion. Note that the dashed arrows in Figure 6 indicate the location of the leading edge of the dye plume at subsequent times rather than the vector of motion; the net surface current around the end of the groin was never offshore. Thus, the length of the arrows show the combined effect of advection and dispersion. The dye released in the mid-surf zone position at high tide moved alongshore, following the shoreline contour until deflected around the downdrift groin where it immediately moved back onshore. The pattern of the inner dye patch is similar to that of the low tide release updrift of the groin which also followed the edge of the groin toward shore and then along the foreshore.

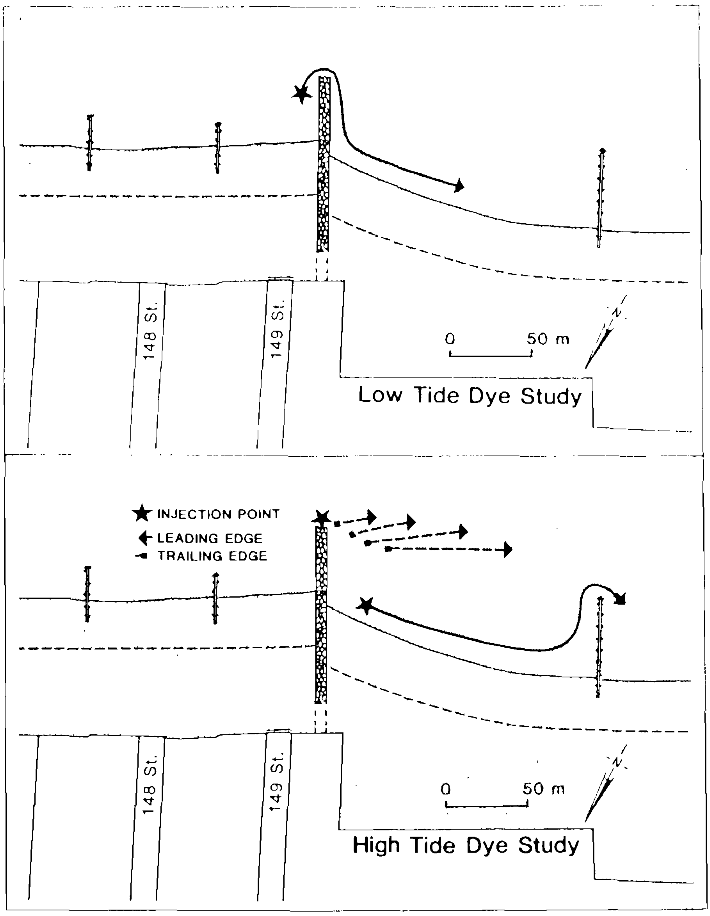

Figure 6. Movement of Dye, October 16, 1986. Dashed arrows for high tide release indicate dispersion and advection of dye, not vectors of transport.

The migration of the tracer sand cloud over the sampling interval is represented in Figures 7a–d. Twenty minutes after injection (Figure 7a), the bulk of the tracer-sand had been displaced only slightly downdrift of the end of the groin. The extremely high concentration off the end of the groin represents sampling at the injection site. A secondary mass of tracer had separated from the main cloud, and migrated about 30 m downdrift and shoreward.

By 15:10 there had been substantial tracer dispersion at the injection point where the concentrations had decreased by more than an order of magnitude. The secondary cloud continued to spread and move onshore and downdrift. By 15:40 (Figure 7b), the bulk of the tracer had shifted around the end of the groin and moved onshore. The location of highest tracer concentration was centered downdrift of the injection point. In addition, the tracer concentrations in the secondary tracer cloud actually increased, demonstrating the dominance of advection over dispersion in the migration of tracer at this time.

Figure 7c shows the distribution of tracer at 16:20, less than 2 hours after injection. Concentrations at the end of the groin were much smaller than at 15:40, and the importance of dispersion by wave action is evident through the updrift and downdrift expansion of the tracer cloud at the injection point. The secondary tracer cloud in the lee of the groin was less

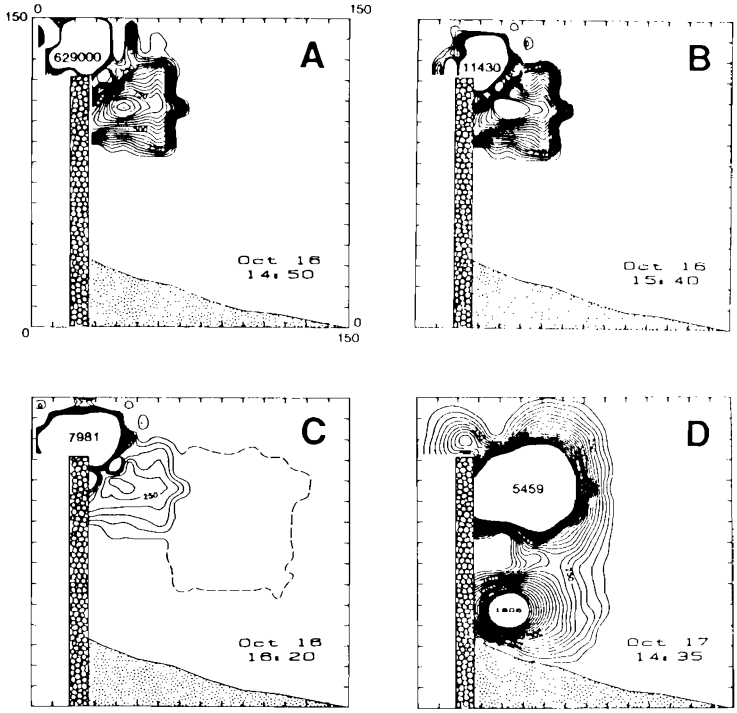

Figure 7(A–D). Maps of tracer concentration showing movement between release, October 16, 1986, and final sampling 24 hours later. The dashed line on C is outside the sampling grid and is an artifact of the calculation procedure used to produce the contour lines.

distinct, with decreased concentrations spread over a greater area of the groin embayment. The edge of this tracer cloud (identified by the 50×10^{-4} g/kg contour line on Figure 7) was approximately 120 m from the original injection location. The exact alongshore position of this contour line is not known since it fell outside the sampling grid, however, there was an evident downdrift and onshore elongation of the cloud.

After 24 hours, the greatest tracer concentrations were downdrift and landward of the injection point. Two major tracer concentrations were found in the lee of the groin (Figure 7d); one concentration locus was at the approximate location of the secondary cloud at 15:40, whereas the other was located at about the mid-foreshore. These two centers of large tracer concentration were separated by a zone devoid of tracer, according to our samples. The 50×10^{-4} g/kg contour line no longer extended obliquely in the downdrift and onshore direction but trended cross-shore, parallel to the groin.

Ideally, all the tracer sand should have been accounted for at the end of the experiment, although in practice this never occurs, especially over small sampling grids and relatively long time periods (two complete tidal cycles in this case). About 79% of the injection volume was represented by the recovery at 14:50. The percentage was decreased substantially for the next three recoveries: 8% at 15:10; 12% at 15:40; 11% at 16:20. It is believed that the small recovery percentages at these times were associated with the largest tracer concentrations being situated between sampling points. Indeed, after 24 hours, 32% of the injected tracer volume was accounted for. Given the rather limited scale of the sampling grid, this reasonably large accountability indicates that a substantial proportion of the tracer was still resident in the groin embayment.

DISCUSSION

It is apparent from the tracer concentration patterns in Figure 7 that the principal pathway of sediment transport past the end of the groin was oblique toward shore in the downdrift direction, at least during the early period after injection. The establishment of the secondary tracer cloud immediately inside the lee of the groin is indicative of the important role played by advection due to longshore currents around the end of the groin. This circulation around the end of the groin and onshore is corroborated by the surface dye experiments (Figure 6). The subsequent expansion of this secondary tracer cloud, with preferential elongation in the downdrift and shoreward directions, indicates that dispersion by incident waves and advection by secondary currents dominated sediment transport in the lee of the groin. At the time of injection, the current meters were deployed 120 m from the baseline (one at the injection site, and the other approximately 25 m downdrift), and both instruments measured mean near-bottom flows toward shore on the order of approximately 0.08 m/s. Mean onshore flows were measured throughout the entire 2.5-hour period following injection, as expected with spilling breakers and a rising tide.

The evolution of the tracer pattern over the 24 hours after injection is more difficult to explain because measurements were not taken at night. It is intriguing, however, to note the correspondence of this pattern with those observed by others. The work of KRAUS (1985) and SUNAMURA and KRAUS (1985) suggests that two remnant tracer clouds should appear solely as a response to variable depth of mixing of tracers as determined by the shear stress and grain size distributions across the surf zone. Their results indicate that maximum mixing depths should be expected near the break point and on the foreshore. Thus, tracer residence times and concentrations are greater at these locations, especially for a slightly eroding or equilibrium nearshore. Analysis of the nearshore profiles in the lee of the groin show that the zone between approximately 40 m and 100 m offshore from the baseline, which encompasses the tracer clouds, experienced little change between October 15–17, whereas the beach face experienced erosion; ideal conditions for the manifestation of the mixing-depth hypothesis. Nevertheless, the specific sediment transport mechanisms generating this pattern remain unexplained. The observed mean onshore flows associated with the incident waves could account for a near-bed transport pathway for tracer sands to the foreshore. However, significantly more alongshore dispersion than observed would be expected with this mechanism because a large amount of tracer had already spread alongshore by 16:20. If waves alone were the transporting mechanism, an extensive linear deposit of tracer stretched along the foreshore would be expected, rather than the distinct centers of accumulation observed along the groin.

A potential mechanism of sediment transport is suggested by the dye release experiments. At low tide, there was a pronounced surface current around the end of the groin and immediately onshore parallel to the groin (Figure 6). If this current extended down to the bed, then tracer sand entrained at the end of the groin would have been transported toward shore alongside the groin and mixed with the foreshore sediments by the swash motion. The edge of the observed tracer cloud 24 hours after injection (Figure 7d) did have a shore-normal trend, and the tracer concentrations decreased rapidly in the alongshore direction from maxima immediately beside the groin. The primary direction of transport in the lee of the groin is thus assumed to have been shore-normal, with little alongshore advection. The zone between 70–80 m from the baseline contained relatively small amounts of tracer sand because this was a zone of net sediment transport with negligible mixing below the sediment surface. Therefore, the elongated pattern that had evolved by 16:20 the previous afternoon (Figure 7c) was representative of sediment transport pathways during the rising tide only. Some of the tracer sediment may have been advected past the downdrift groin and outside the groin embayment altogether during this stage, or simply mixed with other sediments to very low concentrations in the ensuing period.

Another sediment transport mechanism involves the rip-current feeder channel (Figure 8) that was exposed at low tide in the groin embayment. This rip system was close to shore and trended in a transverse direction toward the groin. The circulation elements associated with the rip system are represented by arrows

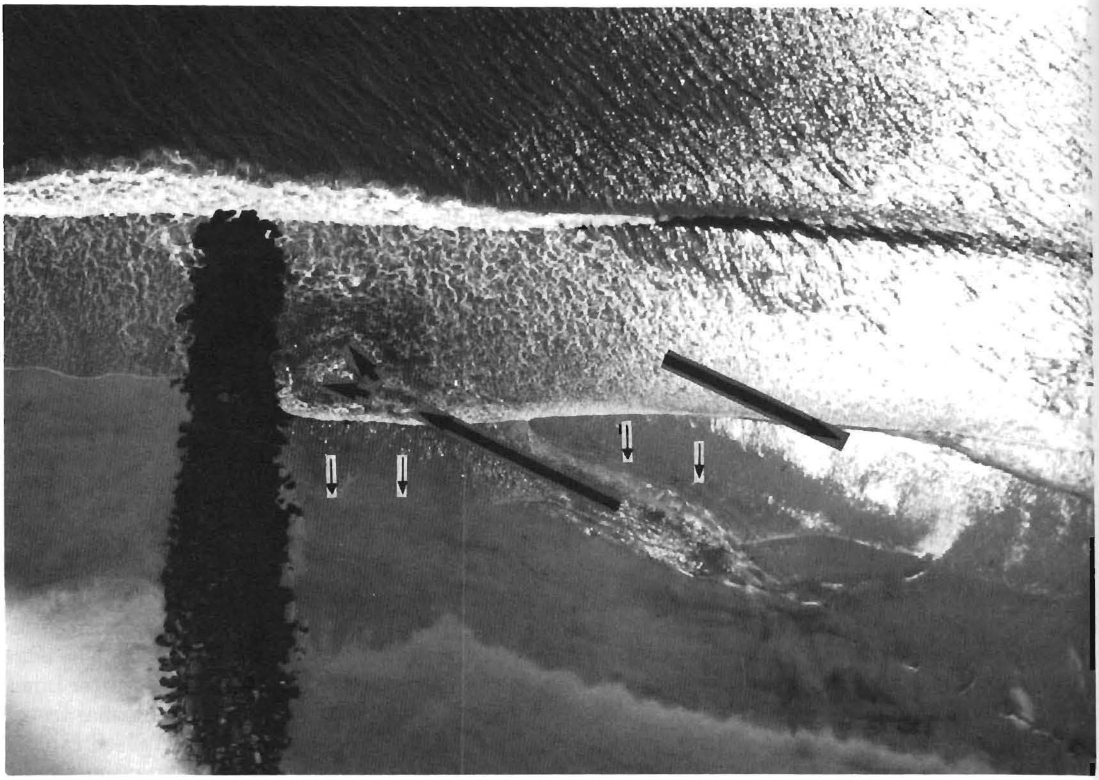

Figure 8. Oblique view of rip channel at low tide. Line in center foreground is rope along Profile 3. Arrows represent posited directions of sediment movement.

on Figure 8. On the rising tide, sediments follow the onshore-downdrift path indicated by the sequence of tracer concentration maps in Figure 7. As these tracers are moved shoreward, they are channeled into the rip-feeder current which moves them toward the groin. At the groin base, the rip current is re-directed offshore. The turning of the rip current at the base of the groin causes flow velocities to decrease, and hence, settling of particles in transport. These sediments are mixed with the beach face sediments by swash motion. Some sediments continue to be transported by the current and are moved seaward toward the end of the groin where a small, secondary-circulation eddy exists. Sediments are either deposited there or are reintroduced to the longshore current.

This sediment circulation process is enhanced at low tide when the terrace just seaward of the rip channel becomes exposed. The direction of transport is predominantly shoreward because of bore propagation, and then alongshore in the rip channel, where the influence of wave action is minimal. Near the groin base, the swash motion is able to move sediments onshore. The next high tide moves these sediments even higher up the foreshore. The net result of this circulation pattern is two zones of tracer accumulation; at the base of the groin where the structure intersects the beach face, and near the end of the groin immediately in the lee where the rip circulation encounters the longshore current causing the recirculation eddy.

The rip-current circulation process discussed above corresponds well with the current patterns described by NISHIMURA *et al.*, (1985). Their computer simulation of flow past a groin (Figure 3-15, page 291, in HORIKAWA, 1988), shows that a large, lee eddy develops downdrift of the groin. In this eddy, a return flow exists very close to shore, and it turns offshore along the side of the groin. This is the pattern we believe to be present during high tide. NISHIMURA *et al.* (1985) also conducted wave tank experiments to test their numerical model, but found that the flow patterns in the physical model were much more complex than anticipated. In the wave tank experiments there was onshore flow close to the groin and weak, rip-type circulation near the mid-surf position. This pattern corresponds most closely with our low-tide, dye experiment (Figure 6). Although the computer simulations and wave tank experiments presented by NISHIMURA *et al.* (1985) appear contradictory, it is critical to recognize that the exact nature of eddy circulation in the lee of a groin can vary depending on angle of wave approach, wave height, longshore current velocity, water depth, and distance to which the groin projects into the flow. All of these parameters can vary through time in response to tidal fluctuations alone, making interpretation of the hydrodynamics in groin embayments exceedingly complex.

CONCLUSIONS

Based on our interpretation of the tracer results and other corroborative data, we conclude the following:

(1) in non-barred, groin embayments, and under incident wave conditions similar to those during the experiment, the average transport vector for sediments passing the end of a groin is onshore;

(2) the specific pathway followed by the sediment may be,
    (i) directly onshore, adjacent to the structure; or
    (ii) the sediments may be circulated around the groin embayment following a longer path associated with eddy/rip current flow;

(3) after two complete tidal cycles, a large proportion of the tracer was still resident in the groin embayment, and this tracer was concentrated in two centers of accumulation rather than extended, linear deposits.

An accurate model of sediment transport around a groin should be able to replicate these processes. Although the rip current hypothesis proposed above is speculative, it is consistent with our observations. Furthermore, the commonly-observed, beach-face geometry in the lee of groins is suggestive of eddy circulation with deposition at the base of the groin where the structure intersects the beach. The mechanics of flow in the presence of right angles generates such eddies, and observations of eddy flows in the lee of engineering structures are common.

This research demonstrates the viability of tracer methodology to determine transport paths in a complex setting. Unfortunately, the scale of our investigation, especially with regard to sampling intervals and to horizontal extent of the sample grid, was too coarse to afford definitive explanation of specific transport mechanisms and transport rates in this environment. More research is required to measure, interpret, and understand transport patterns around groins under different environmental settings and over longer time frames in order to determine the impact of engineering structures on nearshore systems.

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RESUMEN

En Octubre de 1986, se realizó un ensayo en el Riis Park (New York) con el fin de medir el transporte de sedimentos a través de un dique de escollera seimimpermeable. Para identificar la forma del transporte se empleó areans trazadoras fuorescentes. Mediante la utilización de currentómetro se procedió a la medida de las características de oleaje y corrientes. Para la toma de muestras de sedimentos y la recuperación de arean trazadora se emplearon tubos de muestreo. La toma de muestras se llevó a cabo aproximadamente en intervalos de ½ hora durante dos horas, realizándose un muestreo final oximadamente 24 horas después de la inyeccióin. Los resultados indican la existencia de primeramente un trayecto del transporte de sedimentos a través del final del dique e inmediatamente después en dirección hacia la costa. Una vez transcurrido un intervalo de 24 horas, aproximadamente el 30% del material en suspensión aparecia en las muestras tomadas en dirección hacia la costa y aguas abajo del punto de inyección. Los resultados parecen indicar que el dique no contribuye a la erosión que se produce corriente abajo en las circunstancias en que se ha llevado a cabo las mediciones; sin embargo, estudios a corto plazo, como éste, no parecen ser representativos de las tipicas condiciones que se dan en la orilla.—*Department of Water Sciences, University of Cantabria, Santander, Spain.*

RÉSUMÉ

En octobre 1986, on a mesuré sur le terrain à Riis Park (New York) les champs de transport sédimentaire au delà de l'extrêmité d'un brise lame perméable en moellons. Des sables traceurs fluorescents ont permis d'identifier les réseaux de transport. Les caractéristiques des vagues et des courants ont été mesurées au courantomètre; on a prélevé par sondage au tube et retrouvé les sables tracés. Les échantillonnages ont été faits toutes les heures pendant 2 heures, puis 24 heures après l'introduction des traceurs. Les résultats indiquent qu'il y a un champ primaire de transport juste après lka terminaison du brise lame et immédiatement ensuite, il se dirige vers la plage. Au bout de 24 heures, environ 30% du volume de déploiement était représenté dans les échantillons de l'estran, dans le sens de la dérive littorale à partir du point d'injection. Ce travail suggère que dans les conditions de l'expérimentation, le brise lame ne contribue pas à l'érosion par la dérive littorale, mais à court terme, des études prototype telles que celles-ci ne peuvent être représentatives de conditions typiques du système de circulation littorale.—*Catherine Bressolier, Géomorphologie EPHE, Montrouge, France.*

ZUSAMMENFASSUNG

Bei Riis Park, New York, wurden 1986 Naturmessungen durchgeführt, um die Sedimenttransportwege am Ende einer halbdurchlässigen geschütteten Buhne zu bestimmen. Zur Darstellung der Transportwege wurden floureszierende Sande (Tracer) verwendet. Außerdem wurden die Strömungsverhältnisse bestimmt. Die Probenentnahme der Sedimente und die Rückgewinnung des markierten Sandes erfolgte durch Bohrkerne. Es wurden 2 mal Bodenproben im Abstand von ½ Stunde genommen, eine abschließende Beprobung erfolgte 24 Stunden nach Versuchsbeginn. Die Messungen zeigen, daß der Haupttransportweg der Sedimente um das Ende der Buhne herumläuft und dann direkt zum Ufer führt. Nach 24 Stunden konnten dort etwa 30% der markierten Sedimente in Proben im Unterstrom der Buhne gefunden werden. Dieses Ergebnis läßt vermuten, daß die untersuchte Buhne bei den vorherrschenden Versuchsbedingungen keine Lee-Erosionen erzeugt. Derart kurzfristige Grundsatzuntersuchungen sind jedoch nicht repräsentative für ufernahe Sedimenttransportsysteme.—*Reinhard Dieckmann, WSA Bremerhaven, FRG.*